Do Electorally Vulnerable Legislators Dissent More Often? Evidence from Poland and the United Kingdom

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Abstract

Existing models of political accountability posit that legislators will exert effort and help the voter principal in order to win re-election. Are legislators in more vulnerable electoral environments – thus in greater need of additional votes to secure re-election – more likely to prioritise voters over the party? If so, we would expect legislators to dissent more often when they are electorally vulnerable. I propose a new, general measurement of electoral vulnerability and apply it to legislators in Poland and the United Kingdom to study its relationship on legislative dissent. The new measurement offers several key improvements compared to extant proxies such as vote margin or list position. It tracks vulnerability closely in conceptual validity; it is a non-linear function of the entire vote share distribution, and it is time-variant, allowing the measure to respond to changes in polled vote intention. Using a difference-in-differences strategy, I find that, in both countries, vulnerability has no independent effect on legislators' propensity to dissent, which raises questions about whether electoral accountability mechanisms are working.

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1 Introduction

Canonical models of accountability in political science suggest that elections – or, more precisely, threats of denying re-election – are essential tools for voters to punish poorly performing politicians (Ferejohn 1986). Frequently, however, electoral rules and party-based voting render the threat of denying re-election incredible. In countries with single-member plurality elections, this has led to calls for reform of electoral rules and redistricting to the effect of abolishing 'safe', that is, uncompetitive seats (Electoral Reform Society 2020). If incumbents face heterogeneities in the extent to which voters can hold them accountable, then we might also expect them to behave differently in office. This paper investigates how differences in legislators' electoral vulnerability affect their voting record – one of the most consequential facets of legislative behaviour.

An answer to this question is desirable independent of the effect size. Knowledge in this domain is helpful in strengthening accountability and designing processes of representation that correspond to reformers' normative goals. For example, it is generally desirable that legislators pay attention to their constituents' needs and local demands. This is particularly important in parliamentary systems, where strong political parties often form the main principal to which legislators are held accountable, even at the cost of their own voters (Strøm 2000). If highly competitive races are found to cause legislators to spend more time in their constituencies and allocate more effort towards these objectives, then electoral reform should emphasise this objective. If, on the other hand, electoral vulnerability is found to have no effect, efforts to improve responsiveness to local voters should focus on other institutional avenues (e.g., intra-party institutions).

In order to assess this question empirically, a reliable and accurate measurement of legislators' (perceived) probability of re-election is necessary: how "safe" is their position? A single-member, plurality district with two parties is the most straightforward case – the margin between the two candidates has been exploited as a popular measurement of "closeness" in RD designs (Lee 2001; Eggers, Fowler, et al. 2015; André, Depauw, and Martin 2015).

Yet, this measurement already faces limitations as soon as there is a substantial third party running. Operationalisation of this concept becomes even harder when applied to multi-seat districts or proportional electoral rules (with party lists). Existing work on how elections effect legislative behaviour has been limited by the lack of a valid and generalisable method to measure re-election probabilities (Kotakorpi, Poutvaara, and Terviö 2017; André, Depauw, and Martin 2015; Stoffel 2014; Stoffel and Sieberer 2017).

In this paper, I offer a new measurement of (perceived) electoral vulnerability that is widely applicable across countries and electoral systems. I model the distribution of vote shares in the upcoming election using a Dirichlet distribution whose mode is centred on a weighted average of the last election and additional information since then (e.g., more recent polls). I then estimate the probability that the incumbent will be re-elected under this probability distribution – conditional on the same parameters such as list position, etc. – using Monte Carlo sampling. This new approach offers a number of advantages. First, it takes beliefs about future vote shares as an input, which allows for further refinement in specific applications (e.g. if we have a better model about the next election that is superior to a Dirichlet). Crucially, the method tracks the theoretical concept – the probability of re-election – more closely than existing proxies such as list position or margin to the runner-up. Second, it is time-variant and sensitive to new information such as polls: as legislators' beliefs about future vote shares change, so does the probability of re-election. Extant proxy measures such as the margin of votes or list position are limited to approximating the information from the last election. Third, the votes-to-seats mapping is independent of the vote share belief and can be flexibly defined for various electoral systems. This, in turn, allows the *same* method can be applied across a wide range of electoral systems and yield a comparable measurement. Finally, compared to existing approaches, it allows for a more flexible and non-linear mapping of re-election probabilities as a function of candidacy parameters. Altogether, the new measurement offers improved conceptual validity and a more flexible way of modelling legislators' re-election probabilities that tracks the underlying vote share

distribution.

I also apply the measurement to legislators in Poland and the United Kingdom and find no significant effect of electoral vulnerability on legislative dissent. I leverage the variance in vulnerability within each legislator that comes with new elections and polls over time; this allows me to estimate a difference-in-differences model to check whether vulnerability has any effect on MPs' voting behaviour. The empirical strategy isolates legislators' responses to changes in their vulnerability and thus mitigates concerns about differences in legislators' dissent rates due to underlying characteristics (e.g., ideology or age). Although both countries examined in this paper feature electoral systems that allow for a reasonable degree of candidate-specific voting (single-member plurality and open-list PR, Carey and Shugart (1995) and André, Depauw, and Martin (2016)), and existing evidence that voters can value parliamentary dissent from the party line as a valence signal (Vivyan and Wagner 2012), more electorally vulnerable legislators do not dissent more. The results are also robust to various fixed-effects specifications and parameter choices when estimating electoral vulnerability.

The findings imply that more vulnerable legislators in parliamentary systems do not prioritise their voters in order to obtain additional votes. This undermines a key implication of the competing principals literature (Carey 2007): even in systems where voters can reward individual candidates with personal votes, and even when legislatores need those additional votes, they do not seem to choose voters over the party. Instead, the null result suggests that legislators' dissent is not motivated by electoral incentives, although it may occur for other reasons, such as personal ideology (Benedetto and Hix 2007) or career concerns (Slapin et al. 2018). While it remains unknown whether this conclusion is also true for other dimensions of legislative activity, a key takeaway is that more competitive districts do not seem to enhance voters' leverage over legislators in parliamentary systems.

Thus, this paper takes a step towards understanding whether and how electoral rules and environments shape legislators' behaviour (though much work remains to be done with

respect to other dimensions of legislators' activity). The rest of the paper proceeds as follows. The rest of the paper proceeds as follows. Section 2 reviews the existing literature on both legislative dissent and measuring electoral vulnerability. It discusses how existing competing principals theories imply that legislators should dissent more when they are in more vulnerable electoral environments and why extant measurements of vulnerability face limitations. Section 3 summarises the new measurement of electoral vulnerability. Section 4 introduces the application of that measurement to two cases – Poland and the UK – and discusses data and empirical strategy. Section 5 presents results from estimates on the effect of vulnerability on legislative dissent in these two countries. Section 6 concludes.

2 Literature and Theory

2.1 Electoral Vulnerability and Accountability

Regular elections are a key mechanism to hold legislators accountable and mitigate the risk of shirking. Voters can punish poorly performing officeholders by replacing them with challengers (Ferejohn 1986). As legislators usually seek re-election (Mayhew 1974), they are incentivised to put in effort and perform well in order to secure their goal. In contrast, where legislators face term limits and thus can no longer run for re-election, empirical evidence suggests that they are less productive, and accountability declines (Alt, Bueno de Mesquita, and Rose 2011; Ferraz and Finan 2011; Klašnja and Titiunik 2017). Elections are thus a successful mechanism to keep voters' agents accountable and responsive.

Yet, voters are not the only prinicpal to whom legislators answer. They often need to divide their loyalty between two competing principals (Carey 2007; Carey 2008) – their political party and their constituents. The logic of delegation in parliamentary systems produces political parties that form a powerful prinical in competition to the voter (Strøm 2000). Crucially, parties also provide key resources for successful re-election, which may come in the form of nominations in more promising districts, campaign finance or party label

reputation. Parties also reward loyal behaviour in the form of career promotion (e.g. higher offices, Slapin et al. (2018)). Officeholders thus have to balance their commitments to voters and the party whenever these are in conflict. This may distort constituents' representation and diminish accountability.

When voters' and parties' policy preferences are in conflict, legislators have a range of actions they can direct at either principal (Proksch and Slapin 2014). Their voting behaviour on the floor is the most consequential, as it affects policy outcomes; however, it is also strongly disciplined by the party (in parliamentary systems, at least). Voting dissent is therefore among the strongest actions that legislators can take to prioritise the constituents; often their dissent comes in less costly forms of motions or speech (Proksch and Slapin 2012; Proksch and Slapin 2014). Focussing on voting dissent gives an upper bound on how much legislators prioritise voters, and is also the most significant outcome affected by competing principals. At the same time, multiple reasons may motivate legislators' dissent: beyond electoral incentives, legislators may also dissent due to personal convictions or grandstanding (Slapin et al. 2018).

Electoral systems that allow for more candidate-centred voting may incentivise legislators to prioritise their constituents over the party. Electoral rules differ by the extent to which candidates can cast ballots for individual candidates (personal votes), rather than simply party labels. (Carey and Shugart 1995). Where the rules give voters a more direct way of rewarding or punishing individual legislators, rather than party labels, they can hold electoral representatives more accountable. (Carey 2007). A range of works has examined this relationship across countries (Sieberer 2006; Carey 2003; Carey 2007; Carey 2008; Coman 2015), and across electoral system tiers within the same country (Sieberer 2010; Kunicova and Remington 2008; Hix 2004; Jun and Hix 2010). The empirical findings are, at best ambiguous: while there is some evidence that countries with more personalistic voting systems exhibit higher aggregate levels of dissent, extant research has not come to a clear consensus

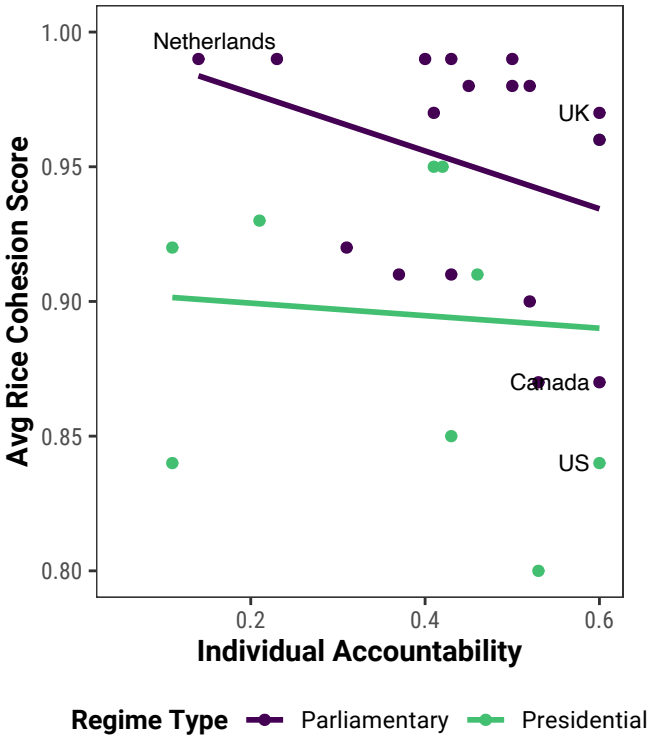

Figure 1: Party Cohesion in democratic legislatures, by regime type and candidate-centredness of the electoral system. Data taken from Coman (2015). "Individual Accountability" denotes the extent to which voters can vote for individual candidates, rather than just parties. The "Rice Cohesion Score" is a measure of the average proportion of the party that votes the same way in a legislative vote.

and faces methodological limitations from the use of cross-sectional studies.[1] Figure 1 plots average dissent rates by country and shows a linear best fit for presidential and parliamentary systems: even among parliamentary systems, there is significant variance in party cohesion. However, the number of cases is too small to draw a meaningful conclusion.

Given the empirical ambiguity at the cross-country level, we should investigate the implications of the competing principals theory at the microlevel. Even in more personalistic voting systems, voters can only execute oversight when the threat of withholding re-election is *credible*. Legislators in very safe electoral environments may shirk on voters and get re-elected regardless. This means that legislators in the same electoral system may face a very

[1]The use of cross-country data in Carey (2007) and Coman (2015) forms the most extensive dataset yet, although no causal claims can be inferred from this cross-sectional work.

different competing prinicpals calculus: where the *ex ante* probability of re-election is very high, officeholders should be more inclined to prioritise the party principal. In contrast, where they are highly uncertain about their re-election chances, they may want to prioritise voters' interests (where they can be rewarded in the form of personal votes (Carey and Shugart 1995)). Legislators' re-election chances should therefore be regarded as important determinants of their behaviour in office (André, Depauw, and Martin 2015).

The ex ante effect of legislative vulnerability on voting dissent is theoretically ambigiuous and depends on institutional factors. There is some evidence that voters in more personalistic electoral systems value more independent legislators (Vivyan and Wagner 2012; Vivyan and Wagner 2015; Vivyan and Wagner 2016; Wagner, Vivyan, and Glinitzer 2020). This supports the conjecture that legislators in more vulnerable electoral situations should have a stronger incentive to follow the voter principal and follow the party line less often. That way, they can attract additional 'personal votes' (Carey and Shugart 1995) that may prove essential obtaining re-election. However, at the same time, going against the party line may also prove costly in terms of future career trajectories and possibly campaign support. How exactly electoral vulnerability affects legislative voting behaviour is therefore contingent on the structure of party competition and the tradeoff between voters and parties in the given electoral setting.

Empirical work investigating how differences in legislators' re-election chances affect their behaviour is scarce outside of the US and UK context. In American Politics, work on the 'marginality' hypothesis examines whether congressmen spend more effort on their home districts if they were elected with a smaller margin in the general election (Fiorina 1974). Similiarly, legislators' behaviour in the UK House of Commons is analysed with respect to their electoral margin (Benedetto and Hix 2007; Kellermann 2016; Kellermann 2013). However, this strand of works struggles with a number of limitations. First, the electoral margin is only a proxy for re-election probabilities and risks being an inaccurate measure outside of a two-party, single-member district system. Second, evidence from the US does

not travel easily to parliamentary systems and more proportional electoral systems. Third, existing studies in the UK offer a high-level analysis of aggregate patterns, do not offer causal estimates. Only recently did work on this mechanism start to emerge outside of the Anglosphere. André, Depauw, and Martin (2015) offer survey evidence that legislators in more vulnerable electoral positions exert more 'effort' with respect to their constituency voters. Sieberer and Ohmura (2019) show that vulnerable legislators in German districts dissent more. Both of these papers rely on measurements with limited validity (discussed below).[2] It remains unclear how legislators' behaviour is generally affected by electoral uncertainty in parliamentary democracies and what consequences this bears for policymaking.

At the same time, understanding how and whether the electoral environment affects legislative behaviour, and voting in particular, improves our understanding of democratic accountability and can help us design better institutions in the future. If legislators respond to more competitive electoral environments by prioritising voters over their own party, then we are encouraged to draw electoral districts and write electoral rules in such ways as to maximise competitiveness. Differences in accountability may also exacerbate unequal representation of voters: those in highly competitive seats may end up having a greater sway over final policy outcomes. Alternatively, if no such effect is discernible, electoral reformers' arguments for the abolition of safe seats and party control over nomination processes – as frequently voiced in the UK, for example (cf. Electoral Reform Society) – may lose force. Furthermore, even small differences in legislative voting dissent can have highly significant policy-making consequences: in the 2017-2019 UK Parliament, several votes on key Brexit legislation occurred with a margin of just a few votes.[3]. These reasons highlight why an

[2]In the case of André, Depauw, and Martin (2015), the measurement of vulnerability relies on proxy measures such as vote margin to the runner-up or list position. Furthermore, it is unclear how the measured outcome, effort, maps into observed legislative behaviour. The vulnerability measurement by Sieberer and Ohmura (2019) relies on logistic models fitted to past elections to predict the probability of re-election for a given vote share given past results. This is a preferable approach, but (a) still relies on list positions and single party vote shares, rather than the whole vote share distribution; (b) offers separate measurements for list and district MPs.

[3]For example, on 3 April 2019, a vote that would have allowed further discussion and votes on alternative Brexit outcomes ('soft Brexit') and a second referendum ended up a tie. Speaker John Bercow, in accordance with precedent, then resolved the tie by voting No.

answer to the question of how elections affect legislative behaviour is so important.

2.2 Measuring Electoral Vulnerability

One major obstacle to a better understanding of elections and legislative behaviour is the lack of a easily applicable, generalisable method to measure legislators' chance of re-election (or the inverse of that quantity: electoral vulnerability). Extant work has relied on proxies in the form of vote margins or list positions (André, Depauw, and Martin 2015). These proxies are time-invariant and do not take into account the entire distribution of votes. In this section, I summarise and discuss existing work, arguing that we need a new, general method.

The vote margin between the winner and the runner-up may not be a good measure outside of two-party plurality systems. This is because the margin does not convey any information about competition by third or other parties.[4] Consider a single district election under plurality with candidates A, B, and C. Consider the two vote share distributions $v_1 = (0.40, 0.31, 0.29)$ and $v_2 = (0.50, 0.41, 0.09$. In both examples, the margin would be 9 percentage points. However, in the first scenario, the winning candidate's vulnerability is greater as there are two viable challengers. Even when the A's vote share stays constant, they may lose the election in the first scenariou by shifts in vote shares between the two other candidates. Put together, a conceptually valid measurement of electoral vulnerability should capture the entire distribution of votes, rather than focussing on the top two.

Similarly, a candidate's list position in a PR system cannot fully capture the probability of winning a seat. Vote share thresholds, varying district magnitudes, and malapportionment all mean that the mapping from vote shares to number of seats exhibits discontinuities and is non-linear.[5] For example, suppose that there is a 5% nationwide threshold for being allocated any seats. A party that got just enough votes to pass this threshold sees three

[4] The problem compounds with an even greater number of candidates.

[5] See Folke (2014) for an example in closed-list PR. These discontinuities can be exploited for an regression discontinuity, too.

representatives elected in district X, but only one in district Y. Just a small dip in the national vote share would mean that all elected legislators would lose their seats; conversely, a small increase would increase the probability of the fourth-ranked candidate in X and the second-ranked candidate in Y being elected. This highlights the non-linearities in the votes-to-seats mapping and once again re-inforces the need for a more general and flexible measurement.

Existing work that tries to model these non-linearities is scarce and still faces limitations. Though models of predicting multiparty elections exist (Katz and King 1999; Honaker, Katz, and King 2002), these remain limited to plurality electoral systems and have not been extended to generate probabilities of legislators' re-election.[6] André, Depauw, and Martin (2015) construct a comparative measure of electoral vulnerability across electoral systems, but the constituent parts of that model still rely on vote margins and list positions. Stoffel and Sieberer (2017) and Sieberer and Ohmura (2019) offer a logistic model that allows some non-linearities in the mapping from candidates' margin or list position to the probability of being elected. However, this measure still fundamentally faces the problem of not taking into account the entire distribution of vote shares – the estimated probability will be the same regardless of whether there are two, three, or four parties competing. One further limitation is that this method requires data on re-election attempts from the past, and thus cannot be used in contexts where the party or electoral system is relatively young. Finally, Kotakorpi, Poutvaara, and Terviö (2017) use simulated draws from a multinomial distribution to estimate re-election probabilities for municipal officials in Finnish local elections. This approach offers the most flexible approach of measuring vulnerability in the extant vulnerability; the method proposed in this paper builds and expands on the simulation idea.

In sum, a new measurement of electoral vulnerability can help us answer key questions regarding political accountability and legislative behaviour more precisely. Put simply, if we want to understand whether legislators at risk of losing their office are likely to behave

[6]Furthermore, the model is not sensitive to additional information beyond electoral data, e.g. polls. One advantage that the model does have is that it uses logistic-t distributions over the simplex.

differently, we need to first identify which who these legislators are. This paper thus makes two salient contributions: it offers a new, non-linear and flexible measurement of electoral vulnerability; and it studies the effect of such electoral vulnerability on legislative voting. Beyond legislative voting, electoral vulnerability may have effects on other parts of legislative behaviour (speeches, effort), which makes an accurate measure all the more important. A better understanding of these relationships, in turn, allows us to design improved electoral institutions that enhance accountability and responsiveness.

3 Measuring Vulnerability

In this section, I propose a novel way of measuring electoral vulnerability that is generalisable across electoral systems. The intuition behind the method is to set up a probability density function over the space of all possible combinations of vote shares between parties and admissible ballots. This belief over likely outcomes is centred on available information in the form of past election results and recent polling. As the electoral system maps vote shares into seats, I can then estimate the probability of a result under which each legislator would win a seat if they ran with the same profile (district, ballot rank, etc.) again.[7] As long as the mapping from vote shares to seats can be computed, the method is flexible enough to work across voting rules. The method captures the question of "how likely is a legislator's re-election" by simulating likely election outcomes, and then converting these into seat outcomes.

[7]While this assumption is easy to justify in a plurality system (UK) or open-list system (Poland) where incumbents run in the same district again, and there is no fixed list position, this assumption may be more problematic in a closed-list PR system where future list positions may also be endogenous to present-time legislative behaviour. Note however, that both André, Depauw, and Martin (2015) and Stoffel and Sieberer (2017) rely on the same assumption.

3.1 Formal Set-up

Let $\mathcal{C}$ denote the set of all admissible ballots (i.e. possible ways to vote).[8] Then, any vector $\mathbf{v}$ of length $|\mathcal{C}|$ (whose elements sum to 1) describes a possible allocation of vote shares across ballot options. The set of vote share allocations, $\mathcal{V}$, has support over the $|\mathcal{C}|$-dimensional simplex. Next, I define the the belief over election outcomes as a probabilility distribution $f(\mathbf{v})$ with support over $\mathcal{V}$. Let the electoral rule $E(\mathbf{v})$ be a mapping from votes to seats: $E(\mathbf{v}) : \mathbf{v} \rightarrow \mathbf{e}$, where $\mathbf{e}$ is a vector with as many elements as there are candidates and each element is 1 if the candidate has been elected and 0 otherwise. Denote $I(E(\mathbf{v}), j)$ (shorthand notation $(I(\mathbf{v}, j))$ as the indicator function, given an allocation of vote shares and the resulting set of candidates elected, whether candidate j has been elected or not. Let $\mathcal{W}_j$ be the set of all $\mathbf{v} \in \{\mathbf{v} : I(\mathbf{v}, j) = 1\}$, that is, the set of all vote share allocations where candidate j secures re-election.

With this set-up, the probability of re-election for candidate j given a set of beliefs about election outcomes can be set up as:

$$\mathbb{P}(I_j = 1) = \int_{\mathcal{W}_|} f(\mathbf{v}) \, \mathrm{d}\mathbf{v} = \int_{\mathbf{V}} f(\mathbf{v}) \; I(\mathbf{v}, j) \, \mathrm{d}\mathbf{v} \tag{1}$$

In order to estimate this probability empirically, we need an appropriate model of $f(\mathbf{v}$ and an adequate mapping from vote shares to seats (electoral rule). The electoral rule can simply be modelled on the real world rules.

3.2 Modelling Beliefs about Vote Shares

I model beliefs about future voteshares $f(\mathbf{v})$ with a Dirichlet distribution whose expected outcome is centred on the distribution of vote shares at the last election or latest poll average. This choice implies that shifts in the distribution of vote shares are equally likely in every direction; in doing so, I follow the extant literature on modelling beliefs about election

[8] This could be individual candidates in single-district plurality, or party lists in closed-list PR

outcomes (Fisher and Myatt 2014; Eggers and Vivyan 2020; Eggers and Nowacki 2020).[9] The Dirichlet distribution takes a vector of input parameters $(\alpha_1, \alpha_2, \ldots, \alpha_C)$ with length $|\mathcal{C}|$, which, when normalised, corresponds to the mode of expected shares. This allows me to reparametrise the distribution with the expected vote share $\mathbf{v}_0$ and an uncertainty parameter s:

$$f(\mathbf{v}) = \text{Dir}(\mathbf{v}_0 \times s) \tag{2}$$

A key challenge is how these beliefs change over time in light of changing public opinion and news. Right after an election, legislators have little additional information about where public opinion might move in the next four or five years, so, in the interest of generality, symmetric uncertainty around the last election seems appropriate.[10] Here, I set $\mathbf{v}_0$ to correspond to the vote shares in the most recent election. While polling and private information may give legislators a better sense of likely voting outcomes as the next election approaches, uncertainty remains high. Furthermore, as polling and most other public information is only available at the national (aggregate) level, it continues to be unclear how voters have moved within a legislator's district. Still, it is possible to update vulnerability estimates with respect to more recent information conveyed via national polling (cf. Section 4.2). In the empirical application below, I update $\mathbf{v_0}$ each month on the basis of the average of publicly available, national-level polls.

The other parameter that remains to be set is the level of aggregate uncertainty: just how much volatility in voting behaviour does one expect? Setting s too low would result in very high variance, and past vote rendered uninformative; consequently, all legislators would face a high risk of losing re-election. On the other hand, setting s too high would risk

[9] More complex beliefs could be modelled with a logistic-normal or logistic-t distribution following (Katz and King 1999), which allows for heterogeneous covariances between ballot types. However, modelling such heterogeneity in the face of limited information would be very demanding. It is also not clear that legislators' beliefs about future vote distributions actually follow this more sophisticated distribution. Furthermore, sampling from the logistic-normal distribution adds computational complexity.

[10] (though cf. incumbency advantage and cost of governing literatures)

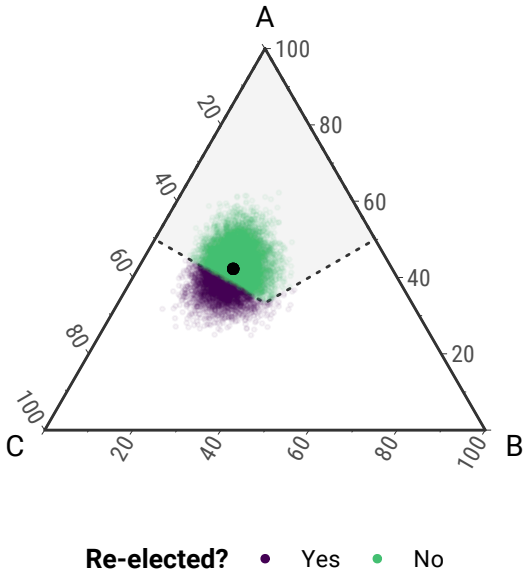

Figure 2: Simulating distribution of vote shares in a three-way plurality contest using 10,000 i.i.d draws from the Dirichlet distribution. The expected (modal) outcome is $(0.41, 0.35, 0.21)$, denoted with a black dot. Each dot in the ternary diagram represents a sample draw from a Dirichlet centred on this outcome with a precision of $s = 85$. Green dots denote draws where A is re-elected, purple ones denote draws where A is not re-elected. The vulnerability score is the proportion of draws in which A is re-elected.

highly certain beliefs that lead to even marginally elected legislators being modelled as 'safe' because the vote share is believed to move so little. Following Eggers and Vivyan (2020), I set $s = 85$ for the empirical application below, and employ additional robustness checks with values of $s = 25$ and $s = 125$.[11]

3.3 Computing Vulnerability Scores

With complex and often discontinuous votes-to-seat mappings, I cannot employ an analytical solution to calculating the probability of successful re-election under belief $f(\mathbf{v})$. Instead, I rely on Monte Carlo sampling and numerical integration to compute the quantity of inter-

[11] A choice of $s = 85$ corresponds to the level of uncertainty that British voters had right before the general election.

est.[12] Figure 2 visualises the procedure for a simple plurality election with three candidates. Each dot represents a draw from a Dirichlet distribution whose mode is centred on the expected outcome, $\mathbf{v}_0 = (0.41, 0.35, 0.21)$. The vulnerability score for A is the proportion of vote share draws under which candidate A is elected.

Algorithm 1: Computing Vulnerability

for (*each iteration* $i = 1, \ldots, M$) {
    Draw a random vote share allocation, $\hat{\mathbf{v}}_i$ from $\text{Dir}(\mathbf{v}_0 \times s)$;
    For $\hat{\mathbf{v}}_i$, return re-election vector $E_i(\hat{\mathbf{v}})$;
}
Compute the average of re-election success across all M iterations for every element in E.

3.4 Extensions

While the basic method serves well to illustrate the method and highlight its strengths, some real-world electoral systems are more complex than simple plurality or closed-list proportional representation. Where the seat allocation depends on sub-national vote shares, both modelling and updating them in response to national polling requires a somewhat more involved algorithm. Let $\mathbf{v}_E$ denote the vector of national vote shares at the last election, and $\mathbf{v}_0$ the vector of national vote shares for the most recent poll average. Algorithm 2 describes

[12] Katz and King (1999).

the procedure step by step.[13]

Algorithm 2: Computing Vulnerability with nested sub-national vote shares

for (*each iteration* $i = 1, \ldots, M$) {

- draw first nation-wide allocation of vote shares, $\hat{\mathbf{v}}_i$ from $f(\mathbf{v}_0, s_1)$;
- compute the relative swing from the last election result to the new draw, $\hat{\delta} = \frac{\hat{\mathbf{v}}_i - \mathbf{v}_E}{\mathbf{v}_E}$;
- adjust the expected vote share for each district d, $\mathbf{v}_{id} = \mathbf{v}_{Ed} + \delta \mathbf{v}_{Ed}$;
- given the expected vote share for each district, draw the district-level allocation of vote shares, $\hat{\mathbf{v}}_{id}$, from $\text{Dir}(\mathbf{v}_{id}, s_2)$;
- assuming constant turnout (and thus weighting) between districts, compute the national vote share, $\hat{\mathbf{v}}_i$ as a weighted average of all $\hat{\mathbf{v}}_{id}$;
- allocate seats according to electoral rule and the vote shares in $\hat{\mathbf{v}}_{id}, \hat{\mathbf{v}}_i$, returning re-election vector $E_i(\hat{\mathbf{v}}_{id}, \hat{\mathbf{v}}_i)$;

}

Compute the average of re-election success across all M iterations for every element in E.

Appendix C goes into further detail and describes additional information how the algorithm handles adjustments in beliefs due to new polling information and how to incorporate new parties that have emerged since the last election.[14]

One limitation of this approach is that any change between elections can only be inferred from national polling, and is assumed to be uniform across districts. This may not hold up in reality and lead to measurement error. However, sub-national and district-level polling is rare in most countries, especially those with PR electoral systems. Although it is possible that legislators at the time had access to more granular polling data and information about voting intention in their districts, it seems unlikely that such information was widespread and frequently updated, especially towards the beginning of the timeframe of the empirical

[13] In the application, I set $s_1 = s_2$.

[14] A key assumption here is that changes in the national environment affect all districts homogeneously (what UK election experts call a 'uniform national swing'.)

analysis.

3.5 Validation

Validating the proposed measurement empirically is challenging insofar as no reliable data on legislators' perceptions of their own vulnerability or even their beliefs about future election outcomes exist. Furthermore, legislators' *perceived* vulnerability given information at time t may not be perfectly predictive of re-election in two or three years' time as new information and shifts in public opinion occur in $t+1$. At the same time, a shock in public opinion should affect legislators' vulnerability in the same party and district monotonically.[15] Given that empirical methods of validating the measurement are unavailable, this section focusses on conceptual and face validity instead – arguing that the proposed measurement constitutes a significant improvement over existing proxies used in the extant literature.

3.5.1 Conceptual Validity

The suggested method of measuring legislators' vulnerability accurately maps the probability of re-election as long as beliefs over parties' vote shares in the next election are accurately modeled. At a theoretical level, the concept of vulnerability captures the probability of successful re-election, which is the same as the probability of a vector of vote shares such that the legislator is re-elected. Note that the method relies on two inputs – the electoral rule that converts votes into seats, and the belief over parties' vote shares in the next election. The first one can be modelled accurately, as the details of the electoral system in question provide an accurate mapping from votes to seats. The second input – the modelling of the vote share distribution – is where the validity of the measurement can be put into doubt.

The use of the Dirichlet Monte Carlo sampling to model likely vote shares reflects best practice in the field and represents a significant improvement over existing proxy measures.

[15] For example, if a party competing in a closed-list PR system tanks in the polls it would be impossible for the 4th list position to be re-elected without the 1st to 3rd list position also being re-elected. Whatever increase in vulnerability list positions 1 to 3 experience in response to the public opinion shift, list position 4's vulnerability must decrease by at least as much.

Existing work in different applications makes the same assumption when modelling expected vote shares in order to compute strategic voting incentives (Eggers and Vivyan 2020). While the Dirichlet assumption does not allow for heterogeneous covariances between different parties' voteshares, modelling such information with limited data is challenging; it is also not clear whether politicians accurately perceive such details.[16] The Dirichlet distribution imposes a somewhat more symmetric uncertainty profile, but buys us computational ease and a high level of generality that ensures this method can be applied widely. Finally, this modelling strategy still represents a more realistic

3.5.2 Face Validity

In order to further ensure validity of the measurement, I also inspect the relationship between existing proxy measurements and the vulnerability scores as computed by the method in this paper. For this purpose, I use the vulnerability scores as computed from the last election result (without sensitivity to polling), as they correspond most closely to the existing proxy measures. The scores exhibit a correlation – legislators in lower list positions have higher vulnerability scores – but there are some clear non-linearities in this relationship.

Figure 3 plots the vulnerabilility scores of all MPs elected in the 2005 UK general election (left panel) and all MPs elected in 4 selected districts in the Polish 2011 Sejm election (right panel).[17] These scores were calculated using the respective election as the expected outcome of the vote share belief; the score can therefore also be interpreted as a measure of whether a small perturbation in vote shares would have still elected the legislator in question. In the UK, the vulnerability measure has a straightforward 1:1 mapping to the margin, although the mapping is non-linear. This strengthens confidence in the results: in a party system with two main parties, the margin should correspond to vulnerability. At the same time, note the non-linearity: a seat with a 10 percentage point margin is just as safe as a seat with a 15

[16]For example, in the UK context, politicians would have to know that if the Liberal Democrats lose voters, x% would defect to Labour and y% would defect to the Conservatives.

[17]The visualisation is restricted to four constituencies due to space constraints.

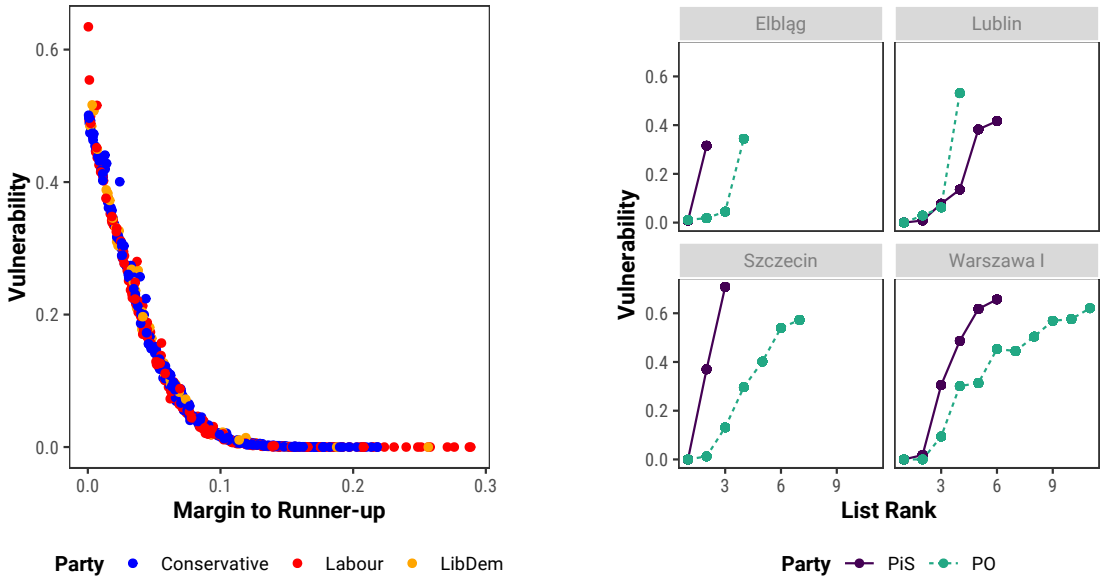

Figure 3: Vulnerability scores for United Kingdom (left panel, after 2010 election) and Poland (right panel, 4 selected districts, after 2011 election)

point margin, as voter swings large enough to overcome these margins are extremely rare.[18] In the Polish case, the relationship between list rank and vulnerability is less well-behaved. Here, too, higher list ranks are more vulnerable, but the relationship is shaped by district-contingent factors and individual candidates' received votes. This highlights the need for a more coherent measure that takes into account the vote share distribution, as list rank alone is not a good predictor of how likely legislators are to lose their seat. Jointly, these figures show that the measurement is correlated with existing proxies, but improves on them by introducing non-linearities and a score that can be interpreted as a probability.

4 Data and Empirical Strategy

4.1 Case Selection

To estimate the effect of electoral vulnerability on legislative dissent, I leverage two cases: the UK (2005 - 2015) and Poland (2011 - 2017), each spanning two legislative terms. These two

[18] One exception was the 2015 general election in Scotland, which took place in the middle of a political re-alignment after the 2014 independence referendum.

countries have very different electoral systems (single-member plurality districts, and open-list PR, respectively), although both allow voters to cast a ballot for individual candidates, rather than just party brands.[19] In both cases, I collected all legislative votes in the given time period and computed vulnerability scores using the method outlined in the previous section. Importantly, in both countries, recorded roll-call votes are the default procedure of voting, which mitigates issues of selection bias (Hug, Wegmann, and Wüest 2015)[20].

I retain all legislators in the dataset who served across both parliamentary terms and are members of a major party.[21] This leaves me with 367 MPs in the UK and 199 MPs in Poland. Appendix A provides further summary statistics on dissent rates and country-specific data.

Dissenting legislative votes are operationalised as votes that are cast in opposition to the party's modal vote choice.[22] It is worth noting that in both countries, the share of dissenting votes as a proportion of all legislative votes cast is very low. In the UK, the proportion of dissenting votes is around 1.5 percentage points in each legislative term; in Poland, the proportion is between 0.8 and 0.95 percentage points in each term. This is in line with the expectation of highly disciplined parties in parliamentary systems. Yet, even small differences in the dissent rate can affect the success of a bill in circumstances where the parliamentary arithmetic is tight: for example, several of the key votes on Brexit legislation in the UK's 2017-19 parliament were carried with a margin of just a few votes (often dissenting, moderate Tories).

In addition to vulnerability measurements and voting records, I also collected a number of time-variant covariates that might affect legislators' voting behaviour. Additional controls include whether the vote in question was on a bill as a whole (thus advancing it to the next stage of the parliamentary process), or an amendment or a procedural question. I also coded

[19] In the UK case, the vote for the candidate is synonymous with a vote for the party.

[20] In other countries, such as Germany, the opposition can use recorded votes as a strategic tool in close votes or votes where government MPs are expected to face conflicting pressures by constituents and party.

[21] Labour, Conservatives, and Liberal Democrats in the UK; Platforma Obywatelska and Prawo i Sprawiedliwosc in Poland. While this does not guarantee that legislators seek re-election after the end of the analysed time period, the retention of any such MPs should attenuate potential results.

[22] In line with Carey (2007), absences are treated as missing data, as their strategic component cannot be ascertained.

whether the legislator occupied any senior position in government or the opposition at the time of the vote.[23]

4.2 Vulnerability Scores

I measured legislators' vulnerability following the method outlined in Section 3. I employ a wide range of parameter strategies to demonstrate robustness. First, I measure vulnerability as a constant for each legislative term by modelling likely election outcomes on the basis of the most recent national election. (In formal terms, I set the voteshare vector $\mathbf{v_0}$ in district d to parties' vote shares in that district in the past election). I do so for a range of uncertainty parameters, and report results for $s = 85$ (the preferred parameter choice) in the main body. I show that results are robust to different parameter specifications (namely, $s = 25$ and $s = 125$) in Appendix D.2.

Since in reality, legislators are likely to update their beliefs with new information after the election, I also allow the expected vote share v_0 to respond to national polls. I collected publicly available national polls from both countries duing the timeframe of analysis and averaged parties' national vote share for each calendar month. I use the measurement that follows from the procedure in Algorithm 2 described above to generate polling-sensitive vulnerability scores for each legislator and each month.[24]

Figures 4 and 5 track the vulnerability scores of those legislators who remain in the dataset over time. The scores map neatly onto parties' overall trajectories in the polls – for example, the Liberal Democrat MPs' scores rise sharply around 2011. Parties in government generally exhibit higher average vulnerability, as they bear the 'cost of ruling' and are likely to lose support in the next election. It is also visible that there is significant within-unit variation – some scores move in a more volatile fashion, which indicates that they are in a

[23] We might expect that more senior legislators dissent less because they would face greater punishment by losing office. In the UK, for example, those serving on the 'frontbench' are expected to resign if they defy the whip.

[24] Appendix C reports details of this procedure and discusses country-specific implementation.

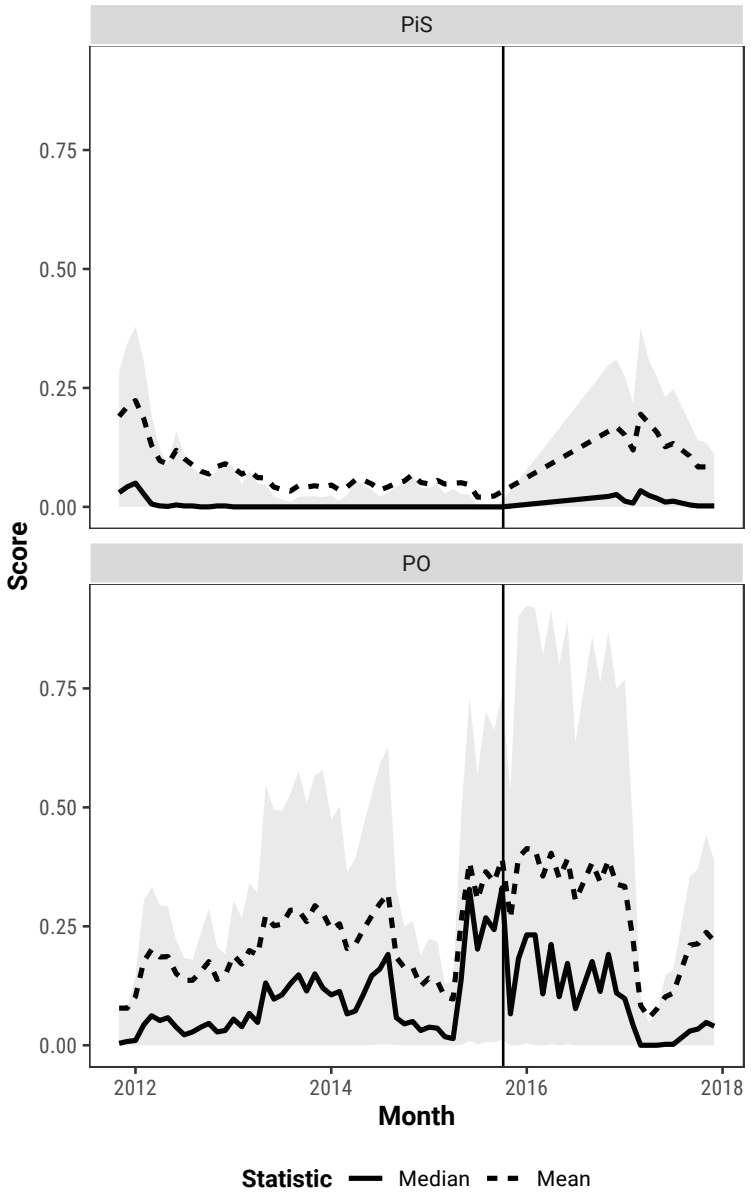

Figure 4: Summary of polling-sensitive vulnerability scores for Polish Sejm, 2011 - 2017. Solid line indicates median value by party; dashed line indicates mean value by party. Shaded area includes all values between the 25th and 75th percentile by month and party. Vertical bar shows date of general election.

more competitive electoral environment than some of their colleagues.[25]

Altogether, I report results from three different types of vulnerability measurements. First, I estimate the relationship with dissent using the method described above while ad-

[25]Those in very safe seats or high list positions will rarely see their vulnerability score increase.

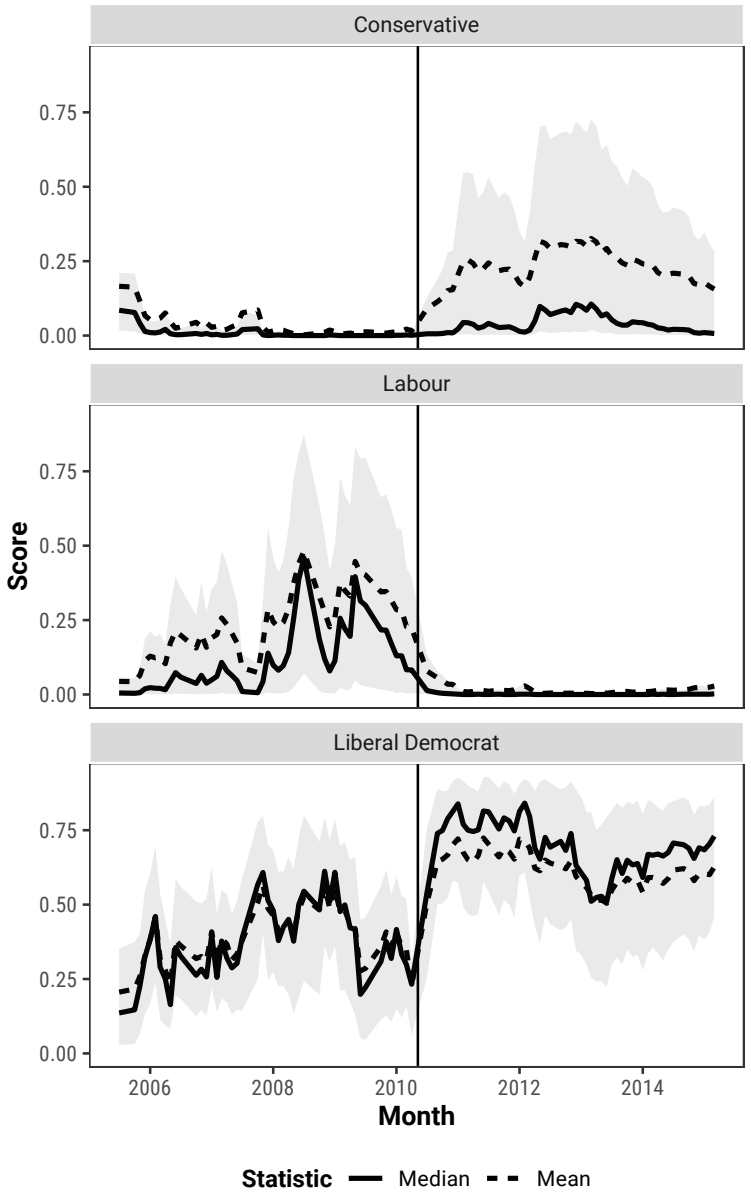

Figure 5: Summary of polling-sensitive vulnerability scores for UK House of Commons, 2005-2015. Solid line indicates median value by party; dashed line indicates mean value by party. Shaded area includes all values between the 25th and 75th percentile by month and party. Vertical bar shows date of general election.

justing vote share beliefs in response to national polling. This yields a score that varies over time and is preferred for causal estimates (see next subsection). I also report results from 'fixed' vulnerability scores, that are estimated using vote share beliefs centred on the last election result and do not change within a parliamentary term. These scores can be

interpreted as measures of vulnerability if legislators were to pay no attention to new polling information. Finally, to ensure comparability, I also report results from models fit to the existing proxy (vote margin or list position). Note that the interpretation of these estimates is somewhat different as they do not map onto the same [0, 1] scale as the vulnerability scores.

4.3 Empirical Strategy

In order to estimate a causal effect, I rely on a difference-in-differences design that exploits within-legislator variation in electoral vulnerability. There are two types of 'shocks' to legislators' electoral vulnerability: the first is an intervening election that changes legislators' electoral environment. A limitation here is that these shocks only occur every few years, and candidates' electoral performance is not fully independent from their past voting record. Th second, and more promising strategy, is to rely on updates of polling-sensitive vulnerability scores when parties' vote shares in national polls change. These monthly updates are plausibly more exogenous, as individual legislators have little influence over nationwide political opinion, yet are still forced to react to it.

All models are estimated on a panel data set. The unit of observation is a single parliamentary vote, cast by legislator i in the vote t. I include fixed effects for each legislator i and legislative term. One potential threat to inference is that MPs may behave very differently when in opposition versus when they are in government (Dewan and Spirling 2011). Because the party composition of government changes with the intervening election in both countries, I include party-by-term fixed effects. In all model specifications, I report standard errors clustered at the level of individual legislators. The general model strategy can be summarised as follows:

$$y_{itc} = vuln_{it} + \mathbf{X}_{it} + \alpha_i + \delta_c + p_i \times \delta_c \tag{3}$$

where y_{itc} is a binary indicator for whether legislator i rebelled in vote t in the legislative term c, $vuln$ is a measure of i's electoral vulnerability at the time of vote t, $\mathbf{X}$ is a vector of covariates, α_i are legislator fixed effects, δ_c are legislative term fixed effects, and $p_i \times \delta_c$ are party-by-term fixed effects.

The use of polling-sensitive vulnerability scores offers a robust framework for identification: as polls move to news events and national developments, legislators will be affected differently by the same shift in national public opinion: depending on the number of competing parties and overall distribution of the vote share, a one-percentage shift in voting intentions can have very different consequences in two previously similar constituencies.[26] This means that legislators' differential exposure to the treatment (electoral vulnerability) stems from the same overall shock (change in national polls) and is out of their own control. This mitigates concerns about underlying pre-treatment differences.

I also run the same specification on an aggregated-by-month version of the data to reflect the fact that vulnerability scores are, at best, calculated monthly. Here, the outcome is i's proportion of dissenting votes in a given month. (On the one hand, this allows me to run the analysis at the same level that the treatment – the scores – are changing, and reduces noise. On the other hand, it no longer allows me to control for vote-specific things like vote type.)

5 Results

In this section, I present and discuss the empirical estimates of the relationship between electoral vulnerability and dissent. Overall, the results suggest that, in both the UK and Poland, electoral vulnerability has no significant causal effect on legislators' voting patterns.

[26] At its simplest, consider two districts A and B, with plurality elections. Assume that polls are accurate representations of voting intention and that there there are only two parties (so the margin becomes equivalent). Both legislators belong to the same party which just saw its share drop by 2 percentage points in the national polls. In district A, this would reduce the margin to the nearest competitor from 10 to 8 percentage points; in district B, it would reduce it from 4 to 2 percentage points. A remains a secure seat, while B has dropped from a fairly safe seat into one that is marginal and now much more likely to be lost.

(The fact that this result holds across two very different electoral systems suggests that this relationship is not just due to the contingencies of one particular case, but we can't be sure). This result also holds across different levels of aggregation and controlling for vote-specific factors, and is robust to different parameter choices in the vulnerability measurement. In the remainder of this section, I present results for models run on the panel of legislative votes first, and subsequently present results for data aggregated by month.

5.1 Individual Vote Results

The findings demonstrate the value of the new measurement and allows us to be more confident in rejecting any causal effect of electoral vulnerability on dissent. Estimates from difference-in-difference models fitted to the indiviudal vote panels offer no evidence for a significant causal effect of vulnerability on legislative voting. This holds true across preferred specifications in both the UK and Poland. Results using the polling-sensitive vulnerability scores are more precise, smaller in magnitude, and differ in sign when compared to time-invariant or linear proxy measures. Where results are reported with vulnerability scores measured as outlined by this paper, the scores were calculated using a parameter setting of $s = 85$. (Appendix D.2 provides additional robustness checks showing that the results are robust to a variety of parameter options when applying the vulnerability measurement). Together, they suggest that legislators do not sway more towards the voter principal even in contexts when they can benefit from personal vote strategies.

In the UK, evidence from polling-sensitive scores suggests that no causal effect exists. Table 1 presents the estimates for the UK Commons (2005 - 2015). Columns 1-4 report estimates from models fitted using polling-sensitive vulnerability scores (using an uncertainty parameter of $s = 85$) with various fixed-effects specifications. Models (1) [without controls] and (2) [with controls] yield positive and significant coefficients, but do not account for term-by-party fixed effects. The estimate suggests that a legislator whose district changes from very safe to highly vulnerable (0 to 1) increases their dissent probability by about 1

	Pr(Dissent from Party Line) [0, 1]						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Vulnerability (Polling)	0.0105**	0.0096**	0.0032	0.0026			
	(0.0034)	(0.0034)	(0.0026)	(0.0026)			
Vulnerability (Fixed)					−0.0203*	−0.0036	
					(0.0087)	(0.0086)	
Proxy (Margin)							−0.0142
							(0.0138)
Division Type		0.0014***		0.0014***	0.0014***	0.0014***	0.0014***
		(0.0003)		(0.0003)	(0.0003)	(0.0003)	(0.0003)
Frontbench		−0.0061***		−0.0056***	−0.0061***	−0.0056***	−0.0056***
		(0.0011)		(0.0010)	(0.0011)	(0.0010)	(0.0010)
Time left		−0.0000**		−0.0000**	−0.0000***	−0.0000***	−0.0000**
		(0.0000)		(0.0000)	(0.0000)	(0.0000)	(0.0000)
MP Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Term Fixed Effects	✓	✓			✓		
Term × Party FEs			✓	✓		✓	✓
No of legislators	367	367	367	367	367	367	367
No of leg. votes	1257	1257	1257	1257	1257	1257	1257
R^2 (full model)	0.0227	0.0232	0.0235	0.0239	0.0232	0.0239	0.0239
R^2 (proj model)	0.0002	0.0006	0.0000	0.0004	0.0007	0.0004	0.0004

Standard errors clustered by MP.

Table 1: Estimates for Dissent in UK Parliament, 2005 - 2015

percentage point. The magnitude is meaningful and corresponds to the average legislator increasing their expected share of dissenting votes by about 75 per cent (from an average of approximately 1.5 per cent to 2.6 per cent). However, time-variant confounders (such as a party's move from government to opposition) threaten any causal interpretation of these estimates.

Models (3) and (4) represent the preferred specification and guard against time-variant confounders. The previous effect may be driven by Conservative MPs who, in 2010, went from opposition to government, and subsequently became more vulnerable, but also started dissenting more (because they were in government, cf. Dewan and Spirling (2011)). To mitigate this concern, Models (3) and (4) include term-by-party fixed effects and thus represent the preferred specification. They offer estimates that are still positive, but about a third in magnitude and no longer statistically significant. Despite the small numerical magnitude, the coefficients are economically not insignificant: a legislator whose seat turns from very

safe to a certain loss (0 to 1) would be 0.3 percentage points more likely to dissent. This represents about one quarter of a standard deviation in overall dissent rates across MPs in the UK. Since even small changes in voting patterns can have large policy consequences when the parliamentary arithmetic is tight, having more precise and credible causal estimates is important. The takeaway from these results allows us to be more confident in a true null effect.

Results from using a time-invariant vulnerability measure (Columns 5 and 6) and the vote margin proxy (Column 7) are more volatile and come with far greater uncertainty estimates. They all report negative signs on the coefficient, although the magnitude varies from 2 percentage points (Model 5) to 0.3 percentage points (Model 6) for a maximum change in the vulnerability score. The standard errors are larger than in the models using the polling-sensitive scores. This underscores the importance of a valid measurement, as time-invariant and proxy measures of vulnerability may offer very different results (different signs), and suggest different conclusions in inference (different standard errors). Overall, the preferred specifications in the UK context imply a much more precise null finding: legislators are unlikely to dissent more when faced with a more vulnerable electoral situation.

Table 2, which reports the estimates from models fitted to the Polish Sejm, tells a similar story. Models 1 and 2 report the results of a two-way fixed-effects diff-in-diff using polling-sensitive scores. The effect is positive and small – a unit change in vulnerability suggests a 0.26 percentage point decrease in dissent probability. Again, these specifications do not control for time-variant confounders and therefore offer no credible causal interpretation.

The preferred model specification with polling-sensitive vulnerability scores and term-by-party fixed effects finds little evidence of a meaningful causal effect on legislative dissent. The coefficients are positive and even smaller in magnitude – a full change in vulnerability leads to a 0.1 percentage point decrease in vulnerability. Note that the standard errors are estimated very precisely, which further strengthens the credibility of the null result. Thus, just as in the UK data, the results imply that electorally vulnerable legislators do not dissent

	Pr(Dissent from Party Line) [0, 1]						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Vulnerability (Polling)	0.0026*	0.0026*	−0.0012	−0.0011			
	(0.0012)	(0.0013)	(0.0009)	(0.0009)			
Vulnerability (Fixed)					0.0083**	−0.0011	
					(0.0030)	(0.0017)	
Proxy (List Pos.)							−0.0003
							(0.0002)
Division Type		−0.0016***		−0.0015***	−0.0016***	−0.0015***	−0.0015***
		(0.0002)		(0.0002)	(0.0002)	(0.0002)	(0.0002)
Frontbench		−0.0023*		0.0032***	−0.0022*	0.0031***	0.0030***
		(0.0009)		(0.0007)	(0.0009)	(0.0007)	(0.0007)
Time left		−0.0000		−0.0000***	−0.0000	−0.0000***	−0.0000***
		(0.0000)		(0.0000)	(0.0000)	(0.0000)	(0.0000)
MP Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Term Fixed Effects	✓	✓			✓		
Term × Party FEs			✓	✓		✓	✓
No of legislators	199	199	199	199	199	199	199
No of leg. votes	10508	10508	10508	10508	10508	10508	10508
R^2 (full model)	0.0018	0.0019	0.0031	0.0032	0.0020	0.0032	0.0032
R^2 (proj model)	0.0000	0.0001	0.0000	0.0001	0.0002	0.0001	0.0001

Standard errors clustered by MP.

Table 2: Estimates for Dissent in Polish Sejm, 2011-2017

more or less frequently than their colleagues in safe seats.

The results from time-invariant vulnerability scores (Models 5 and 6) offer slightly different results: when using two-way fixed effects, there is a positive and significant coefficient; however, once term-by-party fixed effects are included, the estimate turns negative (to -0.1 percentage points) and statistically insignificant. When using the list position proxy instead of the vulnerability measurement, we obtain a very small and negative coefficient (0.03 percentage points) that is precisely estimated. Although this result is similar to the one obtained with polling-sensitive scores, the lack of conceptual validity in using list positions renders this estimate much less credible.

Jointly, the polling-sensitive scores offer credible evidence that there is no causal effect of electoral vulnerability on legislative dissent: legislators dissent at a similar rate in safe and vulnerable electoral environments. The new measurement offers a way to estimate the key treatment with greater conceptual validity; the sensitivity to polls over time also allows

more precision in estimating the relationships and be more confident in the null results when compared to extant proxy measures. Finally, the use of the new vulnerability scores allows us to compare effect sizes across countries and electoral systems. It is unclear how a jump by one list position in the Polish open-list PR system compares to a one percentage point margin increase in the UK. Using the new vulnerability measure we can see that an equivalent change in electoral vulnerability leads to changes in dissent behaviour of a similar magnitude.

Here, too, the estimates using time-invariant vulnerability scores are negative and statistically insignificant – the standard errors are almost twice as big as the coefficent estimates. Similarly, the term-by-party fixed effects are meaningful and important controls that avoid confounding any effect for a change in party status. I obtain an even smaller (and still statistically insignificant) coefficient when using the time-invariant proxy measure (list rank) instead. Again, these results suggest that the time-invariant vulnerability measures are unable to uncover any effect on legislative dissent.

5.2 Month By Month Results

In order to reduce noise and check robustness, I report additional results from models run on data that is aggregated by month. This set of results has the advantage that the level at which the treatment varies corresponds with the unit of observation. The results lend further support to the null finding.

Results from the preferred specification on aggregated UK data suggest that there is no meaningful effect of vulnerability on legislative dissent. Table 3 reports results from a number of specifications fitted to the aggregated data in the UK. Models 1 to 3 use the polling-sensitive vulnerability score. Model 1 is a simple two-way fixed effects model (with MP and month FE). Here, the estimate suggests that a switch from a safe to a vulnerable seat increases the share of dissenting votes by 1.35 percentage points on average (which would more than double the share of dissenting votes for the average legislator). However, when

	Proportion of Dissenting Votes (0 - 1)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Vulnerability (Polling)	0.0135***	0.0005	0.0005				
	(0.0041)	(0.0043)	(0.0054)				
Vulnerability (Fixed)				−0.0071	−0.0071		
				(0.0108)	(0.0109)		
Proxy (Margin)						−0.0331	−0.0326
						(0.0301)	(0.0303)
MP Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Month Fixed Effects	✓						
Term × Party FEs		✓		✓		✓	
Month × Party FEs			✓		✓		✓
No of legislators	367	367	367	367	367	367	367
No of months	101	101	101	101	101	101	101
R^2 (full model)	0.2339	0.2391	0.2810	0.2391	0.2811	0.2392	0.2812
R^2 (proj model)	0.0010	0.0000	0.0000	0.0001	0.0001	0.0002	0.0002

Standard errors clustered by MP.

Table 3: Estimates for Dissent in UK House of Commons, 2005-2015. Data aggregated by Month.

including term-by-party or even month-by-party fixed effects in the preferred specification, this effect disappears; the coefficient remains positive but shrinks to an insignificant 0.05 percentage points.

Results from time-invariant vulnerability measurements yield very different results with far bigger uncertainty surrounding them. Models 4 and 5 report results from election-only vulnerability scores. The coefficients suggest a 0.7 percentage point *decrease* in dissent for a full switch from safe to vulnerable. Similarly, models relying on the margin to the runner-up (Models 6 and 7) as a vulnerability proxy report a greater than 3 percentage point decrease. These magnitudes are multiples of the average legislator's dissent rate, and the associated standard errors are as wide as the average legislator's dissent rate. This further underlines the importance of getting our measurement right: the polling-sensitive vulnerability scores yield much more precise estimates that strengthen confidence in the null result.

Again, the aggregated data from Poland reported in Table 4 further strengthen this conclusion. The two-way fixed effects estimates on the polling-sensitive scores (Model 1) imply that a change from very safe to fully vulnerable leads to a 0.1 percentage point decrease

	Proportion of Dissenting Votes (0 - 1)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Vulnerability (Polling)	−0.0013	−0.0027*	−0.0006				
	(0.0014)	(0.0011)	(0.0012)				
Vulnerability (Fixed)				−0.0011	−0.0011		
				(0.0016)	(0.0016)		
Proxy (List Pos.)						−0.0004	−0.0004
						(0.0002)	(0.0002)
MP Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Month Fixed Effects	✓						
Term × Party FEs		✓		✓		✓	
Month × Party FEs			✓		✓		✓
No of legislators	199	199	199	199	199	199	199
No of months	72	72	72	72	72	72	72
R^2 (full model)	0.2205	0.2505	0.3106	0.2496	0.3106	0.2499	0.3109
R^2 (proj model)	0.0003	0.0012	0.0001	0.0001	0.0001	0.0005	0.0005

Standard errors clustered by MP.

Table 4: Estimates for Dissent in Polish Sejm, 2011-2017. Data aggregated by Month.

in dissent rates. Applying term-by-party fixed effects (Model 2) doubles the magnitude of the effect (to 0.2 percentage points) but also decreases the standard error. However, when applying party-by-month fixed effects instead, the magnitude drops (to 0.06 percentage points) and significance disappears. In light of this more rigorous fixed-effects specification, the overall conclusion of no effect on legislative dissent still holds.

Although, as in the UK, estimates relying on alternative vulnerability measurements have a negative sign, their magnitude and standard errors are not widely different. Models 4 and 5 report results for the time-invariant, election-only vulnerability measure with different fixed-effects specifications. Both of these models suggest a full-scale increase in vulnerability leads to a 0.1 percentage point decrease in dissenting votes. When using legislators' list position as a proxy measure instead, the estimates yield a decrease of 0.04 percentage points for an increase in one list position (though with very precise standard errors). As before, it is difficult to reconcile the magnitude on the list position coefficient with that on the continuous vulnerability measurement. Even though the results do not differ by much in this case, the conceptual validity coupled with more precise estimates in the previous section are good reasons to prefer the polling-sensitive vulnerability measurement over existing proxies.

In summary, the results from the aggregated-data models further strengthen the conclusion that no meaningful relationship between electoral vulnerability and legislative dissent exists. The findings also highlight the importance of an accurate and valid measurement: the use of polling-sensitive vulnerability scores allows for an intuitively more valid operationalisation, strengthens the credibility of causal inference strategies in this context, and overall improves precision of estimates such that we can be more confident in the null result. These conclusions, in turn, imply that voters do not have greater leverage over legislators in more competitive environments, even when the electoral system allows them to reward individual candidates.

6 Conclusion

The estimates presented in this section lead to a clear conclusion: legislators do not dissent more when they are electorally vulnerable. The application of the new measurement of vulnerability yields several advantages that greatly improve confidence in this null result and highlight the utility of the new method. This is especially important when we work with small changes in dissent patterns (due to the low baseline frequency) that can nevertheless prove consequential for policy outcomes. Finally, while this evidence implies the absence of any causal effect on legislative dissent, more work remains to be done on the effect of other dimensions of legislative activity (e.g., speeches, constituency effort).

Estimates from nearly all preferred specifications offered no credible evidence in support of a causal effect of electoral vulnerability on legislative dissent. The measurement of vulnerability in these preferred specifications takes into account national-level polling, and thus factors in a plausibly exogenous shock to legislators' vulnerability. I also included party-by-term fixed effects which accounted for differences in the average propensity to dissent across parties and their government status. The results hold true across two parliamentary democracies – Poland and the UK – with very different electoral systems that allow for a

degree of personalistic voting.

Jointly, these results throw doubt on the proposition that voters have more leverage when the battle for re-election is competitive. The competing principals model suggests that legislators cater more towards voters (vis-a-vis the party) when they can be rewarded with personal votes, thus improving their chances for re-election. A key implication of the model is that vulnerable legislators – those in most need of additional votes – should cater most towards their constituents. However, at least as far as parliamentary voting is concerned, no evidence for this theoretical implication can be found.

The results also underscore the utility of the new vulnerability measurement. This is especially salient in comparison to existing proxy measurements such as vote margin or list position. First, it exhibits greater conceptual validity than previous proxy measures – it models the probability of re-election as a function of the expected distribution of vote shares at the next election. Second, is the first measurement of electoral vulnerability that is time-variant and sensitive to swings in national public opinion. Third, it is comparable across countries – the measurement is bounded between 0 and 1 and offers an estimate of the re-election probability. Finally, the vulnerability scores lead to more precisely estimated quantities, which increases the confidence in the null results presented. While this paper applies the vulnerability scores to measure the relationship with legislative dissent, the method can be widely applied to examine effects on other legislative outcomes, too.

In this paper, I focussed on dissent as a measure of legislative behaviour because it has the most implications for future policy outcomes. Where the parliamentary arithmetic is tight, and just a handful of votes can swing the outcome of a parliamentary vote, even small dissent rates of 1 per cent or less can make a large difference, especially when there are thousands of votes every year. It is important to know whether a government with a large number of vulnerable legislators might face very different chances of passing their policy agenda compared to one with very safe legislators. Furthermore, dissent in favour of the voting principal is valuable where it enhances local responsiveness and aligns with

the preferences of the local constituents. Of course, further work should examine whether vulnerable legislators instead cater towards voters through other actions, such as speeches or funding. The method for measuring vulnerability in this paper provides a first stepping stone towards this research agenda.

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Appendix

Table of Contents

A Summary statistics

Table 5: Summary statistics of data

	Poland *2011-15*	Poland *2015-17*	UK *2005-10*	UK *2010-15*
Dissent				
Mean	0.008	0.009	0.016	0.014
SD	(0.089)	(0.096)	(0.126)	(0.117)
Vulnerability (Polling)				
Mean	0.105	0.195	0.150	0.095
SD	(0.203)	(0.320)	(0.235)	(0.212)
Vulnerability (Fixed)				
Mean	0.167	0.157	0.087	0.075
SD	(0.190)	(0.199)	(0.128)	(0.112)
No. of MPs	199	199	367	367
No. of leg. votes				

B Vulnerability Toy Examples

C Poland and United Kingdom Vulnerability Scores Implementation

C.1 Poland

C.2 United Kingdom

D Robustness checks

D.1 Logit estimates

D.2 Robustness to Parameter choices