

Electoral Reform and Trade-Offs in Representation

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Abstract

We examine the effect of electoral institutions on two important features of representation that are often studied separately: policy responsiveness and the quality of legislators. Theoretically, we show that while a proportional electoral system is better than a majoritarian one at representing popular preferences in some contexts, this advantage can come at the price of undermining the selection of good politicians. To empirically assess the relevance of this trade-off, we analyze an unusually controlled electoral reform in Switzerland early in the twentieth century. To account for endogeneity, we exploit variation in the intensive margin of the reform, which introduced proportional representation, based on administrative constraints and data on voter preferences. A difference-in-difference analysis finds that higher reform intensity increases the policy congruence between legislators and the electorate and reduces legislative effort. Contemporary evidence from the European Parliament supports this conclusion.

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One of the most sustained and controversial debates in political science concerns the effects of electoral systems on political representation (Htun and Powell, 2013). In a classical contribution, John Stuart Mill (1861, ch. 7) argues that electoral systems based on proportional representation (PR) perform better than majoritarian electoral systems on multiple dimensions of democratic governance. Apart from leading to a more proportional weight of minority groups in parliament, PR is also supposed to achieve two other crucial goals of democracy. First, a policy passed by parliament should usually not run against the wishes of a majority of the national electorate. Collective decision making requires choosing a single policy from a set of contested options, and recent research uses policy-based representation of the national median voter, henceforth called policy responsiveness, as one important criterion for evaluating electoral institutions (Cox 1997, 226; Powell and Vanberg 2000). Second, elections should help to select good politicians. Complementing the importance of electoral incentives, a large body of scholarship emphasizes that the quality of politicians is also crucial for representation (Besley, 2006; Mansbridge, 2009). Complete and binding contracts for legislators are unfeasible, and standard theories of accountability demonstrate that elections cannot prevent rent-seeking by purely extrinsically motivated politicians even if all citizens are informed, rational and vote (Ferejohn, 1986). More free-riding and more corruption occurs when legislators lack intrinsic motivation (or civic virtue) to do their job.

While it would be theoretically intriguing and extremely useful if, as Mill (1861) argues, one set of electoral rules promoted both policy representation and positive political selection, the large literature on the effects of electoral institutions of the last decades offers a contradictory and incomplete picture. It has produced impressive models and a wealth of data. Nonetheless, there remain deep disagreements as well as theoretical blind spots, and formidable empirical challenges limit scholars' ability to draw causal conclusions about the promise of electoral reform.

On the one hand, many theoretical accounts share the notion that the choice of electoral

institutions requires trade-offs between different goals. In particular, PR is often thought to favor broad-based social representation at the expense of government accountability (Carey and Hix, 2011; Persson and Tabellini, 2003; Powell, 2000), or collective at the expense of individual representation (Carey and Shugart, 1995).

On the other hand, the claim that PR leads to more policy responsiveness to the national electorate is fiercely contested. While it is clear that PR reduces votes-seats disproportionality, canonical spatial models suggest that high policy responsiveness can also occur under majoritarian systems (Cox 1997, 225-237; Downs 1957). Recent cross-national studies of the ideological congruence between citizen and elected policymakers under alternative electoral institutions have produced mixed findings (Blais and Bodet, 2006; Golder and Stramski, 2010; Powell, 2009; Powell and Vanberg, 2000) and they are explicitly not designed to identify causal effects of electoral reform (Powell, 2000, 43).

Moreover, we know fairly little about the effects of electoral rules on political selection. Despite the long-standing recognition that the quality of politicians matters, most theories of electoral institutions assume that politicians are perfectly exchangeable and their behavior is solely determined by electoral incentives. An emergent literature is addressing this topic (Beath et al., 2016; Galasso and Nannicini, 2017; Myerson, 1993; Shugart, Valdini and Suominen, 2005). While far from reaching a consensus, several theories are closer to the Millsian position that PR tends to select better politicians compared to its majoritarian alternatives.

In this paper, we jointly examine the effects of electoral institutions on policy responsiveness and political selection. While existing institutional theories tend to focus on one of these important dimensions of representation, we formalize a simple model to clarify how electoral institutions may influence both. In contrast to classical arguments and several recent theories, it highlights that, comparatively, PR is not necessarily good at supplying good politicians. At the same time, depending on electoral geography, it facilitates the election

of assemblies that enact policies in line with the median voter. We provide historical and contemporary evidence consistent with this fundamental trade-off based on fine-grained data on electoral reforms and the behavior of members of parliament (MPs).

We study two real-world electoral reforms that allow us to test micro-level implications of the argument in an unusually controlled fashion. Our research design exploits the reforms' intensive margin, focusing on exogenously varying changes in the magnitude of electoral districts within the introduction of PR in a single legislative body. Electoral institutions themselves are political choices (Benoit, 2007; Boix, 1999; Leemann and Mares, 2014). Hence, endogeneity, based on unobserved (by researchers) confounders or reverse causality, is a central empirical challenge. As electoral reforms are relatively rare, most research has relied on cross-national comparisons where finding credible sources of exogenous variation has proven frustratingly elusive. If they occur, reforms are often bundled with other major changes.

To overcome these well-known obstacles, our main case studies the introduction of PR in the Swiss canton of Zürich early in the twentieth century. This reform has several attractive features. First, it is not bundled with other institutional changes. While at the time many European countries debated whether to adopt PR, many reforms coincided with the expansion of voting rights, changes in the form of government, or revolution (Duverger, 1954, 377).¹ Second, the reform is introduced by referendum against the incumbent parliamentary majority. This generates municipality-level data on mass support for institutional change, capturing a key confounder omitted in most previous work. Third, the intensive margin of the reform varies across districts based on pre-determined administrative constraints. Specifically, there is heterogeneity in the increase of district magnitude (the number of legislators elected in a district). This creates plausible treatment and control groups and offers the opportunity to conduct a difference-in-difference analysis. Fourth, the institutional setting generates micro-level data on the congruence between legislators and voters, drawn from

¹Norway is another exception (Cox, Fiva and Smith, 2016).

legislative and popular votes on the same policy. Previous research mainly uses left-right scales of voter ideology and party positions, which are measured on different scales and do not capture policy behavior (Powell and Vanberg, 2000, 411). Or it studies fiscal policy and assumes that some spending categories better reflect mass preferences than others (Funk and Gathmann, 2013; Persson and Tabellini, 2003). To tap into politicians' quality understood as intrinsic motivation, we measure their legislative effort.

We find robust evidence that districts exposed to a larger dosage of the reform experienced a relative increase in the probability that MPs vote in line with the polity-wide median voter but suffered a relative decline in legislative participation and speech-making. The positive effect on policy responsiveness and the negative effect on the quality dimension are of comparable size, suggesting that the adoption of PR involved a significant trade-off. Moreover, we report results from an additional case showing that our argument is also relevant for contemporary debates about electoral system design and representation. Leveraging the introduction of PR for British members of the European Parliament, we find on a large scale that a higher intensity of the reform leads to lower legislative effort and higher shirking but a closer link between legislative votes and average citizen ideology.

Taken together, this paper communicates with several strands of scholarship on electoral institutions and representation. First, it contributes to the debate on whether electoral institutions matter for the substantive congruence between citizen preferences and policymakers. To surmount the lack of clear identification and measurement problems in cross-national studies highlighted in the literature, we focus on variation within major electoral reforms and provide credible evidence that PR can improve policy responsiveness, confirming a key advantage.

Second, our model helps to address an important conceptual blind spot and contributes to the nascent literature on constitutional design and political selection. In contrast to Mill (1861) and several recent contributions (Beath et al., 2016; Galasso and Nannicini,

2017; Myerson, 1993), our empirical analysis is consistent with the model's proposition that PR can reduce the quality of MPs. Altogether, reforms addressing the problem of biased policy responsiveness can come at the price of undermining the selection of good politicians, dashing the optimistic view painted by proponents of PR. Our model also identifies polity-level context conditions under which the trade-off is most likely to emerge.

Third, we provide a new empirical strategy to address the problem of endogenous electoral institutions. Researchers have turned to within-country variation in institutions to deal with this issue. For instance, studies examining economic policy, turnout or legislators have exploited variation in the adoption of PR across cantons (Funk and Gathmann, 2013), close elections in mixed-member electoral systems (Gagliarducci, Nannicini and Naticchioni, 2011) or population thresholds for municipal-level electoral systems (Eggers, 2015). Our strategy exploits both variation in reform intensity and a direct measure of voters' support for the reform. In that sense, our results are doubly robust to endogeneity concerns. The main methodological approach can also be applied to other electoral reforms and outcomes, like party systems or gender equality.

Finally, this article's focus is distinct from, and complementary to, personal vote theories of electoral rules, which highlight how electoral rules shape the trade-off between individual (local-level) and collective (party-based) representation. Most work in the voluminous literature focuses on constituency-oriented behavior (Carey and Shugart, 1995; Stratmann and Baur, 2002). Recent scholarship also examines attributes of candidates, especially local-level political experience and birthplace, that signal credibility as a local agent (Shugart, Valdini and Suominen, 2005). In contrast, the quality of politicians in our framework is not specifically local. This is reflected in our empirical measures, which capture general activities of MPs that are essential for parliament to fulfill its function but may even undermine efforts to build a personal vote (Høyland, Hobolt and Hix, 2017). Moreover, personal vote theories do not make clear predictions about policy responsiveness (as defined here).

Theoretical framework

Electoral institutions simultaneously influence the quality of MPs and the responsiveness of parliamentary decisions to the national electorate, and institutional design can entail a stark trade-off between these representational goals. Politicians in our framework are not exchangeable. As in Myerson (1993) and related work, they vary both in their ideology (or partisanship) and in their quality. While quality can have multiple interpretations, we emphasize the importance of intrinsic motivation to contribute to global parliamentary goods and refrain from corruption (e.g., “character” in Besley 2006, “internally motivated” in Mansbridge 2011, or “moral virtue” in Mill 1861). Complementing electoral incentives, the intrinsic motivation of politicians is important because essential functions of parliaments – deliberation, lawmaking, or effectively overseeing other branches of government – require collective efforts by MPs that are subject to free-riding problems and opportunities for shirking. Citizens cannot constantly monitor MPs and electoral rewards for individual contributions are usually low-powered.

As in standard spatial theories, there are disagreements between voters about policy (e.g., taxes or regulation). Additionally, voters have a shared interest in being represented by good politicians on a “valence” dimension. To voters, the quality of politicians matters for instrumental and non-instrumental reasons. It is an important input into the process of parliamentary representation as well as instrumental in shaping outcomes. For instance, input legitimacy and approval are higher when important collective decisions are taken after debate and with the participation of more than a fraction of MPs; public policies, whatever their ideological content, should be efficient; politicians should not misuse public funds or accept bribes. All of this requires integrity and the motivation to work hard, and high-quality (good) politicians exhibit more of that than low-quality ones.²

²Apart from local ties, quality thus defined is also distinct from other non-positional features, such as being a sports star or television celebrity.

To analyze potential trade-offs, we consider a society that consists of multiple groups of citizens (e.g., defined by class or ethnicity). For each group, there is a potential political party that can compete in the election by nominating candidates, drawing from a pool of politicians with heterogenous quality but the same party label. Our analytical focus is on comparing representation under two common electoral systems (Cox, 1997). First, a majoritarian system (MR) where MPs are elected in single-member (or low-magnitude) districts using an electoral formula such as plurality rule (MR). Second, a PR system in which MPs are elected on party lists in larger (but not necessarily country-wide) districts.

Our theory highlights two related problems that can undermine political representation and how they are addressed under alternative electoral rules. First, electoral geography can undermine policy responsiveness. Under MR, the distribution of voter preferences in space can lead to biased seats-votes representation and biased policy outcomes (Calvo and Rodden, 2015; Rodden, 2010). While electoral competition in majoritarian systems entails strong centripetal incentives for parties to compete for the support of the median voter (Downs, 1957), this logic applies most clearly to individual districts. In a multi-member legislature including faithful agents of the district median voters, the median party does not generally correspond to the national median voter (Morelli, 2004). Historically, the concentration of left voters in cities and industrial areas that emerged during the industrial revolution meant that left parties won their core districts with many surplus votes that could not be transferred to affect marginal districts, putting them at a competitive disadvantage, even in the absence of malapportionment or gerrymandering, and this electoral map often persists (Rodden, 2010). PR mitigates this problem by pooling votes for candidates of the same party in larger electoral districts. However, cross-national investigations have not settled whether PR, beyond mitigating seats-votes disproportionality, actually entails a stronger connection between policymakers and the national electorate (Golder and Stramski, 2010; Lupu, Selios and Warner, 2017; Powell, 2009). One reason for the mixed findings may be

that these studies do not – and usually cannot – compare the performance of alternative electoral institutions for the same electoral geography.

Second, partisan conflict about policy undermines the selection of good politicians. While general, the adverse effects of partisan polarization can be more consequential under PR. Political polarization is the separation of politics into different partisan camps (McCarty, Poole and Rosenthal, 2006, 3). This means that voters' political preferences are closely tied to a marker of their group, such as class, income, religion or ethnicity, and parties represent different groups. In the model, it is captured by the difference of policy preferences between groups. The strategic choices of politicians may leave voters with a hard choice between sacrificing either policy or quality. The underlying political problem is one of commitment and opportunism. Citizens would be better off if they could credibly commit to only supporting high-quality politicians, thereby inducing parties to nominate good politicians. When actually faced with a choice between a low-quality politician of their preferred partisan type and a high-quality politician of another party, this threat is not always credible. For cross-pressured voters, sacrificing quality is the lesser evil unless polarization is low or they are in no position to affect policy. In turn, this commitment problem generates bad incentives for parties to supply high-quality politicians. Parties become more reluctant to incur the cost of promoting high-quality candidates, and politicians with the power to influence nominations may block better candidates to advance their own careers. This logic does not imply that elections generally lead to the selection of low-quality politicians, as the potential entry of other parties can provide countervailing incentives, but this depends on the rules of the game.

Holding other things equal, PR may supply fewer good politicians. The reason is that the trade-off between policy and quality can apply to a larger number of voters, thus reducing parties' incentives to nominate high-quality politicians. Under MR, voters in the median district(s) are most susceptible to the quality-policy trade-off. For them, the cost of voting for the higher quality politician may be forsaking their preferred policy, by critically

changing the partisan balance in the assembly. Under PR, a broader number of people, beyond a potentially small number of single-member districts, can use their votes to affect the distribution of policymaking power. This resulting commitment problem entails lower-powered incentives to nominate good politicians. They are the flip side of higher policy responsiveness.

The ability of voters to rank candidates of a party, through open-list PR, does not necessarily solve this problem because nominations to the list are strategic and suffer from the same incentives. Of course, if there is no policy disagreement in society and the quality of politicians is the only salient electoral issue, both sets of institutions should tend to produce the same outcome as parties have undiluted incentives to compete on quality.

From existing work on electoral rules and political selection it is far from obvious why PR would perform worse in supplying good politicians. Mill (1861), for instance, suggests the opposite, arguing that lowering the barrier to entry for minority groups increases competition and thus the quality of politicians across the board. Capturing a similar intuition, the seminal model of Myerson (1993) highlights how PR increases the selection of intrinsically motivated politicians (non-corrupt in his terminology) because it reduces the probability of a coordination failure among voters with shared policy preferences. In his model, voters have the choice between a high-quality and a low-quality party for each discrete policy position. Under MR, voters may face a coordination problem that leads them to support a corrupt party because supporting the non-corrupt alternative with the same position would be a wasted vote potentially helping the opposed party to win.

Our framework shares the premise that political competition shapes representation through political selection on a partisan and a quality dimension, but it highlights a different institutional effect and mechanisms. In contrast to Myerson (1993), we do not assume that voters always have a choice of good politicians for a given policy position. We analyze when parties will supply them, and conclude that the interplay of commitment problems and opportunism

can affect selection differentially across electoral institutions, even if voters are well-informed and there is an equal pool of high-quality politicians.³

Formalization

There are three groups of voters, denoted by $i \in \{L, M, H\}$, with distinct ideal points x_L, x_M, x_H on a single policy dimension.⁴ We normalize $x_L = 0$ and let $x_H/2 > x_M > 0$. The total size of the (voting) population is unity and voters are distributed across three equally sized districts, indexed by d . For each group i , there is a party consisting of a pool of politicians who share the group's ideal point, x_i , and vary in their quality, which we interpret as intrinsic motivation or integrity. The quality of a politician is represented by ω . It suffices to distinguish between bad or low-quality types ($\omega = 0$) and good or high-quality types ($\omega = 1$). For simplicity, we assume that each party includes a good politician and a bad politician in each district.⁵ This means that parties can choose high-quality politicians, though they may not have incentives to do so.

The utility of a citizen i is represented by

$$V_i = u(|x^* - x_i|) + g \left(\sum_{MP=1}^3 \omega_{MP} \right) \quad (1)$$

where $u(|x^* - x_i|)$ is a standard spatial utility function. Utility increases as the distance between the equilibrium policy x^* and the citizen's ideal point x_i declines and achieves its unique maximum at x_i . The equilibrium policy x^* is determined by the median legislator in a three-member parliament. The function $g = g(\sum_{MP=1}^3 \omega_{MP})$ captures payoffs generated by

³In other closely related work, the strategic balancing model of Beath et al. (2016) demonstrates that increasing the magnitude of electoral districts can improve both policy responsiveness to the median voter and the quality of politicians in a party-free setting. Galasso and Nannicini (2017) study how electoral rules shape the selection of good politicians in a two-party system with probabilistic voting.

⁴The model extends the multi-district framework of Morelli (2004) by adding a quality dimension.

⁵While group membership and quality may be correlated in the population, each group has high-quality people that may enter politics (Dal Bó et al., 2017).

the quality of all elected MPs: g increases with each additional high-quality MP. Realistically, there is a minimal amount of policy conflict between citizens so that meaningful goal conflicts may exist. Operationally, this assumption means that voters of type i prefer a parliament that implements their ideal policy to a parliament that implements the ideal policy of the next closest group $j \neq i$ and includes one additional high-quality legislator.

As in related theories (Galasso and Nannicini, 2017; Myerson, 1993), we assume that party labels and politicians' quality are known to voters. While party labels are on the ballot, direct information about the quality of politicians is not. However, this does not mean that voters are invariably clueless. Politicians have a reputation, based on their pre-political career, track-record in previous political office and involvement in scandals.⁶ For instance, the media widely reported on the fraudulent reimbursement of parliamentary expenses in Britain, Germany or the European Union, and studies find that voters respond to this information by voting against corrupt politicians or the party list they are running on (Eggers, 2014; Rudolph and Däubler, 2016).⁷ The possibility that such information becomes salient shapes the incentives of parties to select good politicians ex-ante.⁸

Political parties do not select good politicians by default. While parties recognize the instrumental value of quality (voters like it), they do not fully internalize the societal benefits of selecting high-quality politicians. One reason is individual self-interest. Anticipating when they are able to exploit voters' trade-off between policy and quality, influential politicians may try to block the nomination of higher-quality competitors and get themselves elected instead (Besley et al., 2017). For party leaders or parties collectively, selecting high-quality politicians comes at a (potentially small) cost, which includes foregone rents and opportunity

⁶Directly observable to the party electorate.

⁷Punishment is conditional on the partisan stakes, consistent with the trade-off faced by voters in our framework. Moreover, Online Appendix S3.1 reports evidence that MPs' legislative behavior predicts reelection in multi-member districts.

⁸We only need a non-trivial probability that candidate quality is revealed before the election. Assuming that voters are less informed about candidates under PR does not alter our central hypothesis. This informational channel is complementary.

costs (Galasso and Nannicini, 2011, 2017). In the text, we focus on the role of individual self-interest. In an alternative formulation, we focus on the selection problem of the party leadership, which allocates candidates to influence policy and win parliamentary office, and show that it leads to the same institutional effect (Online Appendix S1.2).

Individual politicians care about policy and office. A politician of partisan type i receives spatial utility $u(|x^* - x_i|)$. The benefit of office is captured by π . While running for office is costly, captured by c , the benefits of winning a seat are larger than the cost of campaigning, $\pi/3 > c > 0$.⁹ To highlight the role of private incentives in a simple way, let us assume that low-quality politicians have an advantage in the candidate selection stage within their party. They are gatekeepers. This means that if a low-quality politician declares her candidacy, the party's high-quality type in that district is not able to run. If the low-quality type does not run, the high-quality type may run as the party's candidate.¹⁰ Note that this assumption does not imply that low-quality politicians generally have a higher chance of being elected than high-quality politicians. Because voters value quality as well a policy and are strategic, they are sometimes willing to vote for high-quality candidates from a party not representing their group, generating incentives for gatekeepers to allow high-quality politicians to enter.

Political competition consists of the interaction between candidacy decisions by politicians and vote choices by citizens. Electoral institutions define the formal rules of the game.

Majority rule Under MR, one MP is elected per electoral district d and the candidate with a plurality of votes wins. The timing of events is as follows. First, politicians simultaneously decide whether they want to run for office in their respective district d or not. A high-quality politician of an arbitrary partisan type in district d , denoted by i_d^1 , only gets to run if the party's low-quality politician in the district, i_d^0 , decides to stay out. Second, voters cast their

⁹Following Morelli (2004), this inequality is more stringent than needed but convenient to characterize politicians' behavior in the PR game, reducing ambiguity about who declares candidacy if a party expects to win at least one but less than three seats.

¹⁰For recent evidence, see Besley et al. (2017).

ballot for one of the candidates in their district. Third, payoffs are realized based on x^* and g^* and the game ends.

Proportional representation Under PR, each party draws up a list of up to three candidates and seats are allocated proportionally to the votes received by (non-empty) lists. Similar to many real-world systems, the mapping from votes to seats is calculated using a quota rule and the largest remainder method. A party that wins at least $1/3$ (or multiple thereof) of the votes wins one seat (or multiple thereof). Any remaining seats are allocated to the party with the largest share of votes after subtracting $1/3$ for any seat it has already obtained.

The sequence of events is as follows. First, parties simultaneously choose lists. As in the majoritarian system, low-quality politicians are gatekeepers in candidate selection within each party. In party with partisanship i , all low-quality types i_d^0 that declare their candidacy are put on the list, and their order is determined randomly. Remaining slots are filled by high-quality types i_d^1 if they declared their candidacy. Second, the election takes place and voters cast their ballot for a party list. Third, payoffs are realized and the game ends.

Voting Voting is strategic under both MR and PR and we allow voters to be strongly coordinated, potentially as the result of opinion polls, news media, social networks and political campaigns (Morelli, 2004). Voters have induced preferences over the composition of parliament in terms of ideology and quality. It is natural to think of players as being able to communicate about possible electoral coalitions during the campaign period without being able to credibly commit to a particular voting or entry strategy. Hence we solve each game for perfectly coalition-proof Nash equilibria, which means that voting strategies and candidacy decisions are robust to credible deviations by any coalition of players (Bernheim,

Peleg and Whinston, 1987).¹¹

Electoral geography Motivated by evidence about the distribution of voter preferences, we consider an electoral geography where one group is inefficiently concentrated in cities or industrial areas (Rodden, 2010). Suppose that the median voter in district $d = 1$ is of type L , the median voter in $d = 2$ is of type M and the median voter in $d = 3$ is of type H . At the same time, the median voter in the voter population at large is of type L . Technically, we also assume that the population share of group L minus $1/3$ is larger than the population share of the smallest group. This ensures that PR in fact leads to fairly proportional results if all voters vote for their preferred partisan types.

Comparing equilibrium outcomes

Table 1 summarizes the equilibrium outcomes under the two alternative electoral systems, MR and PR, in terms of the equilibrium policy (x^*) and the endogenous quality of elected MPs (g^*). Given the unequal electoral geography where the majority group L is inefficiently concentrated in its core district(s), the equilibrium policy under MR corresponds to the ideal point of the median voter in the median district (x_M) rather than that of the median voter in the population (x_L) and $2/3$ of all legislators are good types ($g = g(2)$). Under PR, the equilibrium policy corresponds to the ideal point of the median voter in the population (x_L). If political polarization, defined as the distance between ideal points x_M and x_L , is relatively high, only $1/3$ of all legislators elected in the PR election are good types ($g = g(1)$).¹² In this situation, there is a clear institutional trade-off. Compared to MR, PR leads to a closer representation of the electorate's policy preferences but performs less well in selecting high-

¹¹There are multiple Nash equilibria. The refinement rules out equilibria based on a complete failure of coordination, as they are less plausible in a setting of institutionalized party competition.

¹²In a multi-party setting polarization can be defined in various ways (e.g., studies such as Alt and Dreyer Lassen (2006) use the range or standard deviation of party positions). What matters in equilibrium is the minimal distance of ideal points between groups, which simplifies to $x_M - x_L$. While polarization is continuous, best-responding behavior implies a cutoff.

quality politicians ($g(1) < g(2)$). If polarization is relatively low, both electoral systems produce the same quality of MPs ($g = g(2)$).

Table 1: Equilibrium outcomes under alternative electoral systems

	Majority rule	PR
Low polarization	$x = x_M, g = g(2)$	$x = x_L, g = g(2)$
High polarization	$x = x_M, g = g(2)$	$x = x_L, g = g(1)$

Proposition 1 summarizes the qualitative comparison of equilibrium outcomes across electoral systems that will be tested in the empirical part. (A proof is in Online Appendix S1.) Given the electoral geography and polarized policy preferences, a clear-cut empirical implication is that replacing MR by PR should increase the policy congruence between politicians in parliament and the median voter in the population but reduce the average quality of MPs.

Proposition 1. *Assume the unequal electoral geography specified in the text. Compared to MR, equilibrium policy under PR is closer to the median voter in the population and, if political polarization is high, the average quality of elected politicians is strictly lower.*

Under MR, an equilibrium entails the election of a good L -type politician in district 1 (where L is the majority group), a good H -type politician in district 3 (where H is the median voter) and a bad M -type politician in district 2 (where M is the median). This parliament is denoted by $\{L_1^1, M_2^0, H_3^1\}$.¹³ A politician's partisan type is denoted by $i \in \{L, M, H\}$, and her quality is indicated by superscript $\omega = 1$ (high), $\omega = 0$ (low). Equilibrium policy, $x^* = x_M$, corresponds to the median MP, who represents the median voter in the median district rather than the population median. The bad M_2^0 -type in district 2 runs, blocking

¹³Outcome-equivalent parliament $\{M_1^1, M_2^0, M_3^1\}$ can also occur.

the entry of a good M_2^1 -type. This occurs because M voters in the district cannot credibly commit to vote against her given that this would swing equilibrium policy to either x_L or x_H . Hence, M_2^0 exploits the stark trade-off between policy and quality faced by her co-partisans. The same commitment problem does not exist in the two other districts. As neither of these districts can unilaterally change policy in a favorable direction, voters will punish bad politicians of their partisan type (off the equilibrium path) and so only good types enter and win. Thus, quality is relatively high because voters in most districts can focus on the quality dimension of the politicians competing in the district without affecting the policy outcome in the legislature. While all voters could be made better off by adding another high-quality politician without changing policy, a coalitional deviation to achieve this Pareto improvement is not self-enforcing.¹⁴

The selection of legislators plays out differently under PR because a larger segment of voters confronts a policy-quality trade-off. In particular, L voters face a hard choice: Do they support a parliament that implements their preferred policy but consists of up to 2/3 bad L candidates or do they support a parliament composed of more high-quality politicians from a different party? If policy disagreement is sufficiently high, gatekeepers are able to run bad types on the list without suffering a sufficient electoral penalty, and given their private incentives they prefer to do so. The resulting parliament is $\{L^0, L^0, K^1\}$, where the third seat is either claimed by a high-quality type of party M or H (and subscripts for districts are dropped). Compared to MR, a majority of voters faces the problem that voting based on the quality of politicians would adversely affect the policy outcome. This makes it more difficult to credibly commit to vote against “their” bad politicians.

As a result, given high polarization, the average quality of elected politicians is strictly

¹⁴Suppose L and M voters come to an agreement that district 1 elects M_1^1 to allow district 2 voters to vote against M_2^0 and support L_2^1 instead, thus inducing $x^* = x_M$ and $g(3)$. However, assuming M voters keep their side of the bargain, L voters in district 1 will be better off renegeing and voting for L_1^0 to change policy to x_L .

lower under PR than MR. If polarization is low, voters' commitment problem is mitigated and quality improves under PR to the level achieved by MR. The corresponding equilibrium parliament is $\{L^0, L^1, K^1\}$.

This logic does not imply that PR always improves policy responsiveness or reduces quality compared to MR. The model helps to clarify that the institutional effect may depend on the geographical distribution and polarization of voter preferences.¹⁵ Hence, the empirical tests of Proposition 1 presented below focus on polities where the argument suggests a trade-off is present.¹⁶

Evidence from the introduction of PR in Switzerland

To test the central implications of the model, we leverage an electoral reform introducing PR in the Swiss canton of Zürich in 1916. It provides an unusually controlled setting to study how variation on the *intensive margin* of a fundamental change of the electoral system affects political representation.

Historical context

At the time, electoral reform was a salient political issue in many of Europe's young democracies. The contested question was whether to replace the existing majoritarian electoral system with a variant of PR (Ahmed, 2013; Boix, 1999). In federal Switzerland, electoral reform was also an important topic at the canton (i.e., state) level, and proportional representation was introduced there first (Funk and Gathmann, 2013). Universal male suffrage was

¹⁵For instance, consider a different electoral geography and assume that the three groups are of equal size and each electoral district resembles the national distribution of voters. It follows that the policy outcome corresponds to the ideal point of group M in both electoral systems.

¹⁶Future work should test the relevance of these system-level context conditions. This requires a different, probably cross-national, research design.

already established in the nineteenth century and cantons were in charge of most domestic policies.¹⁷

In a referendum held in December 1916, 53 percent of voters supported the adoption of PR for the cantonal parliament (*Kantonsrat*) of Zürich. Three months earlier a narrow majority of the incumbent MPs had voted against the reform. The legislative vote was superseded by the popular vote. Under the old majoritarian electoral system, MPs were elected using absolute majority voting in districts of varying magnitude, single-member as well as multi-member districts.¹⁸ This system was common in Europe (Ahmed, 2013, 65). The electoral reform put in place PR with several larger multi-member districts. Importantly, other political institutions were not affected by the reform. Voting rights, instruments of direct democracy, and parliamentary institutions, including term duration and the compensation of MPs, remained stable.

A multiparty system had already emerged under the old system (Gruner, 1977, 66). Two bourgeois parties belonging to the liberal party family, the center-right Liberal Party (*Freisinn*) and the center-left Democratic Party, had dominated cantonal politics since the 1870s. They were confronted by the rising Social Democratic Party. The Farmers' Party was established in the wake of the electoral reform, with several politicians (including incumbent MPs) breaking off from the Liberals. Two small Christian conservative parties (one Catholic and one Protestant) also entered parliament under PR. After previous proposals to introduce PR had been defeated, the final push for electoral reform by referendum was supported uniformly by the Social Democrats, which expected to gain from a more proportional mapping from votes to seats (Kummer, 1969). As shown in Online Appendix Figure S2.1, support for electoral reform varied greatly across municipalities.

¹⁷Zürich was the second most populated canton and it had the largest cantonal parliament (222 members in 1914). While several smaller cantons introduced PR before (Funk and Gathmann, 2013, 1183), prior reforms do not generally share the same features. For instance, in Ticino, the first canton to switch to PR, the reform was imposed by the federal government in response to a civil war.

¹⁸A second round is held for seats without an absolute majority winner.

The reform took place in a context of electoral politics polarized by class antagonism and an uneven electoral geography, consistent with the two system-level conditions highlighted by the model. Support for the left was heavily concentrated in industrialized cities and towns, whereas support for the center-right parties was more evenly spread. As a consequence, the Social Democrats suffered from an inefficient votes-to-seats ratio and were underrepresented in parliament (Gruner, 1978, 242).¹⁹ Hence, the introduction of PR was one of their central political demands. Reflecting a deepening class conflict leading up to World War I and into the interwar years, the Social Democrats and the bourgeois parties represented starkly different policy positions and ideologies, with a radicalized left challenging the existing political and social order (Ahmed 2013, 61, 200-205; Gruner 1977, 55). The large variation in referendum results across districts also indicates significant polarization of policy preferences in the electorate.²⁰

Before and after the reform, candidates were chosen in district-level party meetings, where participation was limited to dues-paying party members. Consistent with the gatekeeping version of the model, this setting also provided party elites with formal and informal opportunities to shape nominations, such as setting the agenda and proposing candidates, and there is anecdotal evidence that elites dominated the meetings selecting candidates.²¹ More systematically, some studies of this period have shown that collective decision-making in public meetings, compared to elections with secret ballots, can be more prone to elite capture (Hinnerich and Pettersson-Lidbom, 2014).

¹⁹With an average votes-to-seats ratio of 1.87 in last five pre-reform elections, comparable to British Labour's ratio of 1.8 in 1910-1918.

²⁰See Appendix Table S2.3. As another indication of polarization, only two economic variables, industrial employment and foreign workers, predict 76% of the variation in left party support across districts.

²¹A newspaper report describes candidate selection in a district meeting of the Social Democrats: First, an incumbent MP gave an hour-long speech, then the meeting's president announced the list of candidates and the present rank-and-file members approved it "without discussion" (*Grütlianer* (Zürich), April 20, 1914, p. 2). While attendance data is not generally available, another newspaper report implies that a meeting nominating candidates for the bourgeois list in a competitive district assembled 70 members, which amounts to only 4.5% of their voters (*Grütlianer*, June 22, 1917, p. 3).

The reform's intensive margin

The reform had two main components. First, it changed the voting rule that defines how votes are translated into seats. Absolute majority rule was replaced by open-list PR.²² Second, it increased the magnitude of electoral districts. The existing 56 electoral districts were aggregated to 18 larger districts. The result was an increase, on average, in the number of MPs elected in a district from 4 to 12. Importantly, the increase in district magnitude was not uniform but varied across districts based on administrative constraints rather than partisan politics. Given the same proportional electoral formula, a larger increase in district magnitude implies a larger dosage of electoral proportionality. Our empirical strategy exploits this variation in the intensity of the reform using a difference-in-difference design.

To illustrate this within-reform variation, Table 2 depicts the mapping from electoral districts in the last pre-reform parliament (1914-1917) to electoral districts in the first post-reform parliament (1917-1920). The pre-reform electoral districts are nested within the larger post-reform electoral districts. Electoral districts were drawn to respect pre-existing community borders. The canton consisted of 187 municipalities (*Politische Gemeinden*) of varying size, which were grouped into 11 administrative districts (*Bezirke*). An electoral district is formed by several contiguous municipalities belonging to the same *Bezirk*.²³ In turn, the number of seats awarded to a district was a function of population size, mandated in the cantonal constitution.²⁴

Historical documents and research indicate that electoral districts for the cantonal parliament were not drawn in a partisan manner (Gruner 1978, 541; Kummer 1969, 17). The outlines of the pre-reform districts were drawn before the emergence of the modern party system (Kummer, 1969, 25). The consensual, largely non-political process of drawing districts

²²Most voters (83%) voted a straight party list despite the option to rank candidates.

²³The exception is pre-reform district 22, which combined adjacent municipalities from two different *Bezirke*, and was split in the reform at the *Bezirk* boundary, adding the largest part to new district 9.

²⁴One MP for 1800 citizens.

at the cantonal level stands in contrast with the more partisan districting (“*Wahlkreisgeometrie*”) at the national level (Gruner, 1978; Kummer, 1969). This is an important advantage of focusing on the cantonal level.

Table 2: Electoral reform and district magnitude in canton of Zürich

Electoral district	Majority rule (1914)			PR (1917)	
	Adm. district (<i>Bezirk</i>)	Seats	Average Seats in <i>Bezirk</i>	Electoral district	Seats
56 Niederhasli	Dielsdorf	2		18	8
55 Regensdorf	Dielsdorf	3		18	8
54 Schöftisdorf	Dielsdorf	1	1.75	18	8
53 Stadel	Dielsdorf	1		18	8
52 Kloten-Basserdorf	Bülach	4		17	12
51 Embrach	Bülach	3		17	12
50 Bülach	Bülach	3	3	17	12
49 Eglisau	Bülach	2		17	12
:	:	:		:	:
6 Zürich-Unterstrass	Zürich	11	11	3	11
:		:		:	:
2 Zürich-Enge	Zürich	6		1	15
1 Zürich-Altstadt	Zürich	9	7.5	1	15

Notes: Based on Official Compilation of Laws (Offizielle Sammlung) of canton Zürich Vol. 30 (pp. 58-65 and pp. 422-428).

The reform aggregated electoral districts to the larger administrative districts (*Bezirke*). For instance, as illustrated in Table 2, districts 53-56 were combined to form a new district corresponding to the *Bezirk* of Dielsdorf. As a result, average district magnitude increased more than four times from 1.75 to 8. Similarly, districts 49-52 were merged to form a district corresponding to the *Bezirk* of Bülach, and district magnitude increased from 3 to 12. Some urban districts, however, experienced no change in magnitude because there were already quite large (e.g., Zürich-Unterstrass). The reform respected the constraint that each pre-

existing *Bezirk* should be represented by (at least) one electoral district. Administrative borders constraining districting are the result of history, which we account for in the analysis using fixed effects, rather than contemporaneous political choices. They were defined by law in 1831 and changing them required majority support in a referendum, which made them remarkably stable. While parliament was divided on the overall merits of electoral reform, there was broad agreement on the question of electoral districts.²⁵

Figure 1 summarizes the resulting variation in the reform’s intensive margin, as captured by the ratio of post-reform district magnitude to average pre-reform district magnitude in the same unit. A ratio of 1 indicates no change and larger values indicate higher reform intensity. The variation ranges from no change up to a 6.6-fold increase of district magnitude.

It is instructive to note some differences between the electoral institutions analyzed in the theoretical model and their empirical counterparts, and explain why they do not alter the theoretical expectations. First, the model considers one-round elections in the majoritarian system, whereas the empirical case is based on absolute majority voting that may lead to a run-off. Adding a run-off stage to the model does not change the predictions. In fact, run-offs do not usually occur in equilibrium in this framework, consistent with reality in this case.²⁶ Second, the theoretical comparison is between single-member districts under MR and a polity-wide multimember district under PR. Empirically, district magnitude is heterogenous in each system. What matters is that the reform, on average, entailed a significant increase in district magnitude and magnitude never declined.²⁷ While the model has opted for parsimony and more generic institutional features, its predictions apply to this particular case.

²⁵On May 22, 1916, individual districts were agreed upon either unanimously or with supermajorities. Minutes from meetings of the Social Democratic parliamentary group also indicate that districts were not a salient issue (March 8 and March 22, 1916).

²⁶In the 1914 election 99% of all seats were decided in the first round, indicating a high degree of electoral coordination even though in most districts there were more candidates than seats.

²⁷Online Appendix S1.3 formally illustrates a comparison between MR with multi-member districts and PR.

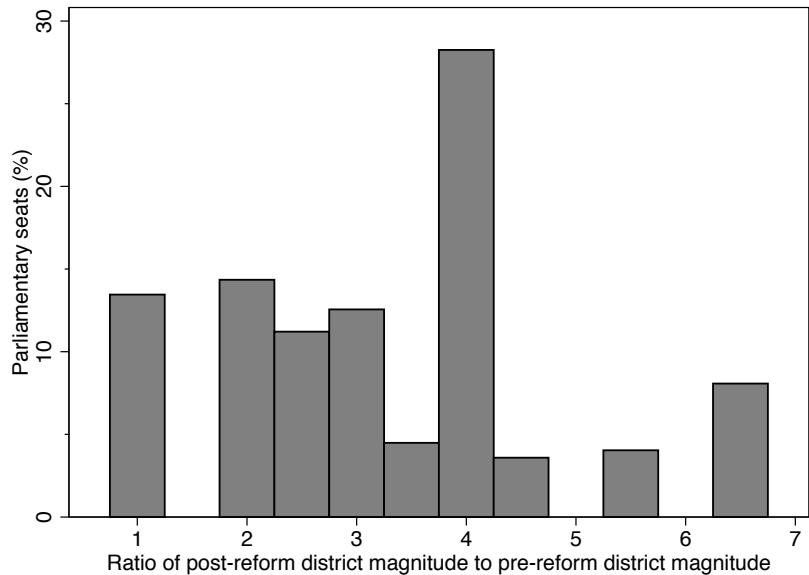


Figure 1: The electoral reform’s intensive margin

Data and measurement

We assembled an original data set that measures the legislative behavior and socio-demographic attributes of individual MPs in the canton and combines them with data on district characteristics and electoral institutions. It covers the last two parliaments elected before the reform (1911 and 1914) and the first post-reform parliament (elected in 1917). These three parliamentary terms belong to the same apportionment period based on the 1910 decennial federal census. This rules out population-based redistricting or other policy changes based on the census. Our main sources are parliamentary records, compilations of referendum results and the census. We also draw on newspapers to code party affiliations. Altogether, across all parliaments there are 723 MPs.²⁸

Measuring representation We consider two distinct aspects of representation. The first measure captures the policy responsiveness of MPs compared to the preferences of the elec-

²⁸Online Appendix S2 provides descriptive statistics and sources for all variables.

torate on salient issues. Following recent studies of contemporary Switzerland (Portmann, Stadelmann and Eichenberger, 2012), we exploit an institutional setting combining direct and representative democracy to measure whether an MP’s vote on a law proposal in parliament is congruent with the popular vote on the same proposal in a referendum. The cantonal constitution mandates referendums on major laws, constitutional changes and significant spending increases. In addition, an initiative referendum may put a topic on the agenda, based on the support of a minority of MPs or the collection of a sufficient number of signatures. This institutional setting provides an opportunity to observe the voting behavior of MPs and voters on the same policy proposals. We have compiled roll-call votes from the parliamentary records, available at the cantonal state archive, and matched them with the corresponding referendum results, retrieved from the canton’s referendum database. Following the theoretical conception of policy representation benchmarked to the median voter in the population (Cox 1997, 226; Powell and Vanberg 2000), an MP’s parliamentary vote is coded as congruent if it matches the cantonal majority in the corresponding referendum and is coded as dissonant otherwise (we report results using alternative operationalizations).

This approach captures political actions (rather than non-binding campaign statements or survey responses) on concrete and salient policies and it measures politicians and voters on a comparable scale. One complication is that roll-call votes only exist for a subset of all cantonal referendums (15.6%) for two terms (1914-17 and 1917-20).²⁹ Online Appendix S2 lists the matched votes and documents that referendums with corresponding roll-call votes are similar on observed features to those without roll-call votes.

Our second set of outcome variables taps into the willingness of MPs to contribute to activities that are collectively essential to make parliament work. Following our theoretical emphasis, regular legislative attendance is an important behavioral manifestation of quality related to intrinsic motivation. Høyland, Hobolt and Hix (2017, 5) argue that participation

²⁹A roll-call takes place if such a request is supported by at least 30 MPs.

is “a pivotal indicator of a legislator’s ‘valence’ (for example, his or her quality, commitment or diligence).” It is a key component of the parliamentary production function (Fisman et al., 2015; Gagliarducci, Nannicini and Naticchioni, 2011). Absent MPs are not able to introduce, defend, criticize or vote on policy proposals or interpellate the executive. In that sense, MPs’ “participation in legislative activities is a prerequisite for political influence” (Høyland, Hobolt and Hix, 2017, 17). This is certainly relevant for this parliament because the speaking agenda was open (every MP had the right to speak at least once before debate could be closed), the number of standing committees was limited and the floor extensively debated and amended legislation coming from the ad-hoc committee dealing with each major law. In line with this, Online Appendix S3.1 provides evidence that MPs’ attendance is a significant predictor of their reelection and contributions to parliamentary debates (as a robustness check, we directly use speeches as the dependent variable). Consistent with the notion of a public good, the parliamentary rules make attendance mandatory and penalize non-attendance, and any binding motion of parliament requires a quorum of at least one-half of all MPs. Party leaders also emphasize the importance of participation. For instance, in a meeting of Social Democratic MPs, documented in handwritten minutes, a party elder implores his colleagues to punctually attend the next parliamentary session because it will debate an important issue.³⁰ Not surprisingly, average attendance rates are high (0.86). We calculate each MP’s attendance rate in a term from the parliamentary records.

District characteristics The analysis controls for characteristics of electoral districts that may vary over time as a function of changing district boundaries. From the 1910 census, we calculate the employment share in the industrial sector (capturing the left’s mobilization potential), religious fractionalization, language fractionalization and the share of the foreign population in a given electoral district, using the pre-reform boundaries for

³⁰Hermann Greulich on August 11, 1916.

the parliaments elected in 1911 and 1914 and the larger post-reform boundaries for the parliament elected in 1917. While the canton was dominantly (i.e., 75%) Protestant, the Christian-Social Party appealed to “diaspora Catholics” (Gruner, 1977, 116). In industrial areas there was a relatively large number of foreign workers, mostly drawn from Germany, Italy and Austria-Hungary. They did not have the right to vote but were organized by trade unions (Gruner, 1977, 132). We calculate voter support for PR in the referendum, accounting for a variable omitted in most prior research.

MP characteristics MPs’ characteristics include their age, occupation, information on other political offices, education and party affiliation. They are derived from the biographical information in the parliamentary records.

Empirical strategy

To estimate the effect of the introduction of PR on representation, our empirical strategy takes advantage of variation in the intensity of the reform across electoral districts. The basic difference-in-difference regression model takes the following form:

$$Y_{idt} = \theta(\text{Reform intensity})_{d_p, 17-14} + \alpha_{d_p} + \lambda_t + \beta X_{dt} + \epsilon_{idt}. \quad (2)$$

The outcome variable Y_{idt} is a measure of legislative behavior of MP i in electoral district d and parliamentary term t : (i) an indicator for whether the MP’s vote on an issue is congruent with the majority in the popular vote, or (ii) parliamentary attendance in the term. The variable $(\text{Reform intensity})_{d_p, 17-14}$ captures the heterogeneous nature of the electoral reform. It is zero in the two pre-reform parliaments elected under the majoritarian system in 1911 and 1914. In the first election held under PR in 1917, reform intensity in a post-reform electoral district d_p (nesting the smaller pre-reform districts) is measured as the ratio of the

district magnitude in the post-reform district d_p to the average pre-reform district magnitude (in the 1914 election) in pre-reform districts nested in d_p (plotted in Figure 1). We take the natural log of this ratio as this normalizes no change in district magnitude to zero and is equivalent to analyzing the differences in the logged levels of district magnitude. It also captures declining marginal returns to increasing district magnitude.³¹

The specification includes fixed effects at the level of post-electoral districts, α_{d_p} . They strip out the cross-sectional institutional variation and account for time-invariant unobservables, such as historical determinants of administrative borders, urbanization or distance to the parliament. Hence, identification comes from the arguably exogenous change in district magnitude based on pre-determined administrative units. Indicators for the parliamentary term λ_t capture common shocks across all districts (the pre-reform term serves as the baseline). District controls discussed above are represented by X_{dt} . The analysis of legislative votes also includes a set of dummies for the different votes.

In this specification, θ captures the causal effect of electoral reform on the behavior of MPs as long as the difference-in-difference assumption holds, and we find evidence supporting it. The varying treatment intensity allows us to control for other potentially relevant changes in the political environment of legislators. Following prior research on the effects of political reform on legislative behavior (Fisman et al., 2015, 896), the baseline specification excludes MP characteristics, as political selection is part of the conjectured mechanism. Nonetheless, it is appropriate to control for characteristics of MPs to the extent that they capture fixed variation in the pool of candidates across parties (assumed away in the theoretical model). Hence, we also present results controlling for party affiliation, age, indicators for working-class occupations and farmers, membership in national parliament, and exit due to death (see Gagliarducci, Nannicini and Naticchioni, 2011; Høyland, Hobolt and Hix, 2017).

³¹Equivalently, one may write $(\text{Reform intensity})_{d_p, 17-14} = \log(\frac{DM_{d_p, 17}}{DM_{d_p, 14}})\lambda_{17}$ where λ_{17} is a dummy for the reform election. District fixed effects make it redundant to include the time-invariant component of the interaction.

Standard errors for the regression parameters are clustered at the level of post-reform electoral districts. They accommodate heteroscedasticity and within-cluster correlation. In addition to asymptotic standard errors, we also use the resampling procedure proposed by Cameron, Gelbach and Miller (2008) to avoid over-confident confidence intervals, as the number of clusters (18) is relatively small.

Results

Table 3 reports the estimated effect of reform intensity on how well elected politicians represent the electorate. In columns 1-3, the dependent variable is an indicator measuring whether there is congruence between the parliamentary vote of an individual MP and the popular majority in the referendum on the issue. All models include district characteristics and fixed effects for votes. Column 2 adds district fixed effects and column 3 adds MP characteristics. In all models, the estimates suggest that a higher intensity of the electoral reform leads to a larger increase in policy responsiveness by MPs to the cantonal electorate. The effect is substantively and statistically significant and changes little across specifications. Model 2 implies that going from zero to median reform intensity (1.1) increases the congruence of legislative and popular votes by approximately 21 percentage points on average, which corresponds to 0.43 standard deviations of the dependent variable.³²

Column 4 reports results from an aggregate-level analysis of congruence conducted at the level of post-reform districts. The dependent variable for this analysis is an indicator (1=yes, 0=no) of whether a majority of MPs in the district is congruent with the popular majority on the binary policy question. This captures that policy responsiveness does not require that

³²For the analysis of congruence, there are 1,108 potential observations if all MPs vote, excluding the non-voting president. We observe 898 votes as there are 17 abstentions, 189 cases of non-attendance and 4 cases where a vacant seat had not yet been filled. Controlling for MP characteristics, 34 cases are dropped due to missing data. For attendance, the analysis includes all MPs who serve in a parliament, including those who enter during the term to replace dropouts; this means that the number of observations per parliament is somewhat larger than the total number of seats (223 and 222, respectively).

all MPs vote the same way. The statistical specification is the same as before except that we cannot control for individual MP characteristics. Clearly, higher reform intensity leads to a significantly higher probability of congruence (also see Online Appendix Table S3.7).

Models 5-7 in Table 3 show the effect of reform intensity on attendance. For comparability, the analysis focuses on the pre-reform parliament and the post-reform parliament (for results including the 1911-1914 parliament and pre-treatment trends, see Online Appendix Table S3.6). The coefficient on reform intensity varies little across specifications and is statistically significant at the 5 percent level. Higher reform intensity entails a relative decline in attendance. Model 6 implies that going from zero to median reform intensity decreases parliamentary attendance by 5 percentage points on average, which corresponds to 0.41 standard deviations of attendance.

The magnitude of the effects of reform intensity on the two outcome variables is nearly identical, after standardizing, given the variation in the outcome variables (see Figure 2). The direction and size of the effects are consistent with a central implication of our theory. A larger dosage of proportionality improves the responsiveness of MPs to the electorate but it also decreases MPs' participation. The research design rules out that these effects are driven by district characteristics that are fixed in the short time span we consider, changes in the socio-economic composition of districts, including voter preferences concerning electoral reform, common shocks (e.g., World War I) or other political institutions.

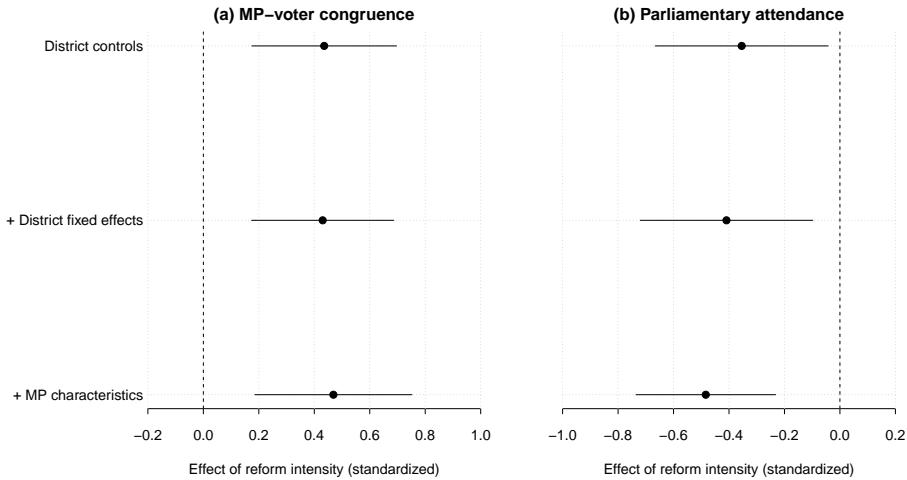
Further sensitivity checks show that these results are robust to numerous alternative specifications (Table S3.6). Moreover, using speeches and education as outcomes yields qualitatively similar results to attendance (Table S3.3 and S3.4). The results are also robust to dropping the city of Zürich, which introduced PR for the municipal assembly in 1913 (Table S3.8). While fixed effects capture this heterogeneity across units, exploring the heterogeneity of the effect shows that the capital does not drive the result. Evidence that the reform effect varies with pre-reform district magnitude, higher in more urban areas, is mixed (Table S3.9).

Table 3: Effect of electoral reform on political representation

	Congruence MP-median voter			Parliamentary attendance		
	(1)	(2)	(3)	(4)	(5)	(6)
Reform intensity	0.19 (0.057) [0.002]	0.19 (0.058) [0.002]	0.21 (0.065) [0.004]	0.44 (0.142) [0.02]	-0.042 (0.019) [0.062]	-0.048 (0.019) [0.036]
District controls	✓	✓	✓	✓	✓	✓
District FE	✓	✓	✓	✓	✓	✓
MP characteristics	✓					✓
Vote FE	✓	✓	✓	✓	n/a	n/a
Observations	898	898	864	90	471	471
						450

Notes: Dependent variable: congruence (models 1-3) is a dummy variable indicating whether an MP's parliamentary vote on an issue is congruent with the canton majority in the corresponding referendum (available for parliaments elected 1914 and 1917); model 4 is estimated at level of post-reform districts, and the dependent variable is an indicator for whether a majority of MPs in the district votes with public opinion on each issue; parliamentary attendance (models 5-7) is an MP's average attendance rate in a given parliament (parliaments elected 1914 and 1917). Reform intensity is zero in the pre-reform parliaments and after the reform it measures the logged ratio of district magnitude in 1917 (the first election under PR) to the average district magnitude in 1914 (the last pre-reform election) at the level of post-reform districts. Estimation is by OLS. All models include a period dummy. Standard errors in parentheses are clustered at level of post-reform electoral districts. Brackets report *p*-values adjusted for clustering based on wild bootstrap. District controls: voter support for electoral reform (incl. second-order polynomial), language fractionalization, religious fractionalization, foreign population, employment share in industry. MP characteristics: age, worker, farmer, member of national parliament, exit due to death, party affiliation (Social Democrats, Farmer's Party, bourgeois parties are reference).

Figure 2: Standardized effects of reform intensity



Note: The figure displays the effect of increasing reform intensity from 0 to median reform intensity on (a) MP-median voter congruence and (b) parliamentary attendance, relative to the standard deviation of each dependent variable. It shows that the effects on the two outcome variables are of comparable magnitude. The underlying coefficient estimates are reported in Table 3. The horizontal bars indicate 95% confidence intervals based on clustered standard errors.

What alternative explanations may account for the effects of the reform? One possibility is that the effect on attendance is purely mechanical, reflecting varying occupational bases of political recruitment across parties. The introduction of PR went hand in hand with a change in the party system (consistent with our theory), most noticeably an increase in the Social Democratic party group and the entry of the Farmer's Party. In particular, farmers face a seasonal work schedule that may make it more costly to attend parliament during harvest season. Thus, the reform intensity effect may reflect fixed differences in politicians across parties rather than strategic nominations. While plausible, we have largely ruled out this possibility by controlling for MPs' party affiliation (Table 3). Moreover, it is not the case that participation was lower among MPs from the Farmer's Party (Figure S3.2). Relatedly, one may suspect that the two parties that gained most seats through the reform faced binding supply constraints and were not able to find enough good candidates. This

seems unlikely, because the Social Democrats could draw on a large pool of politicians with local-level experience and the Farmer’s Party was new in name but not in personnel (as other parties pointed out during the campaign). In line with this, the results are robust to controlling for MPs’ previous local political experience or parliamentary seniority (Table S3.10).³³

The effects are not easily explained by seminal personal vote theories of electoral institutions (Carey and Shugart, 1995). Participation, while a crucial input to lawmaking, is not generally seen as an electoral asset specific to local representation. It may actually hurt the ability to build a personal vote by reducing the time available for activities in the district (Høyland, Hobolt and Hix, 2017). Local political experience or birthplace have been used as measures of credible candidate ties to their district (Nemoto and Shugart, 2013; Shugart, Valdini and Suominen, 2005). While we do not have data on birthplace, additional analyses find no statistically significant effect of the reform on the selection of MPs with local political experience (Table S3.5). Emphasizing a trade-off between local and party-based representation, this line of theorizing also suggests that reform intensity may lead to more cohesive parties. However, party cohesion on its own does not necessarily lead to higher policy responsiveness to the median voter.

Finally, theories of electoral systems based on swing-voter models of electoral competition with exchangeable politicians do not provide a straightforward explanation either (Persson and Tabellini, 2000, ch. 8). In contrast to our model, they do not imply that PR improves policy responsiveness to the median voter. Instead, policy should become more responsive to a weighted mean of citizen preferences, where weights are inversely proportional to groups’ ideological biases, and all parties converge to this platform. In this framework, it is also not clear whether the legislative effort of individual politicians will be lower in PR. While electoral incentives for individual politicians to avoid shirking are highest in competitive

³³Online Appendix S3.4 further explores the mechanisms.

seats in majoritarian systems, the incentives in non-competitive seats can be significantly lower than under PR, leaving the overall effect ambiguous.³⁴

Contemporary Evidence

Theoretically, our argument applies to historical as well as contemporary democracies. To empirically explore the external validity of our historical evidence, we provide some evidence from a recent reform of electoral institutions in the European Parliament. It confirms the existence of a significant institutional trade-off on a large scale.

The research design builds on our previous analysis in that it also exploits the intensive margin of introducing PR. We leverage the adoption of PR for European elections in the United Kingdom. For the first time in British history, the European Parliamentary Elections Act of 1999 introduced PR on a nation-wide basis, for the election of members of the European Parliament (MEPs). While the country-specific electoral rules for the European Parliament remained the same elsewhere, in Britain the reform replaced the traditional method of plurality voting in 84 single-member constituencies with closed-list proportional representation in larger multi-member districts drawn at the level of pre-existing regions (9 English regions, Scotland and Wales)³⁵, where the new districts contain the smaller old districts. This large-scale reform is characterized by considerable within-reform variation: electoral rules in other member countries were not affected and the dosage of the reform varies within Great Britain, ranging from an increase in district magnitude from 1 to 4 up to an increase from 1 to 11.³⁶

Given these institutional features, we use a difference-in-difference approach to estimate the effect of reform intensity on the behavior of MEPs. We focus on the last parliament

³⁴This argument has been applied to turnout (Cox, Fiva and Smith, 2016).

³⁵The Single Transferable Vote system was retained for Northern Ireland.

³⁶Previous research on the effects of electoral institutions on MEPs' performance does not leverage this reform (Fisman et al., 2015; Høyland, Hobolt and Hix, 2017).

elected under the old rules (1994-1999) and the first post-reform parliament (1999-2004). The study of Hix, Noury and Roland (2007) allows us to calculate two behavioral measures capturing MEPs' motivation and integrity, which helps to mitigate concerns about data limitations in the historical case. The first measure is an MEP's participation rate in roll-call votes. The second measure is the fraction of times during which an MEP signed the attendance register, which is linked to a substantial daily stipend (around 200 euros in 1994), but did not participate in a single roll-call vote that day. This more explicit form of rent-seeking behavior has at times drawn strong media scrutiny and is used in previous work as a measure of shirking (Fisman et al., 2015, 877).³⁷

Measuring policy responsiveness is more difficult because there are no directly comparable data on mass policy preferences for most legislative votes. However, we can test whether the electoral reform affects the link between citizens' general political orientation, captured by left-right placements in representative surveys, and MEPs' general voting patterns in parliament, estimated from scaling models based on thousands of roll-call votes. For the latter, we use the first-dimension NOMINATE scores estimated by Hix, Noury and Roland (2007), which corresponds to classical left-right issues and explains an "overwhelming proportion in the European Parliament" (Hix, Noury and Roland, 2007, 181). As popular ideology and legislative ideology are not measured on the same scale, we do not calculate a measure of congruence and instead use a relatively more flexible interactive statistical specification.

Table 4 presents the estimation results. Reform intensity is measured exactly as in our previous case: It is zero before the reform and throughout for all MEPs not elected in Great Britain. After the introduction of PR in Great Britain, reform intensity in the British constituencies is the logged ratio of post-reform district magnitude to pre-reform district magnitude. All models include fixed effects for electoral districts, which capture heterogeneity across countries as well as, in multi-district countries like Britain, regions

³⁷Descriptive statistics and sources for all variables are in Online Appendix S4.

Table 4: Evidence from an Electoral Reform in the European Parliament

	Attendance (1)	Shirking (2)	NOMINATE (3)
Reform intensity	-0.045 (0.012) [0.01]	0.028 (0.007) [0.01]	
Reform intensity × Mean citizen ideology			0.053 (0.014) [0.01]
Mean citizen ideology			0.321 (0.279) [0.60]
District FE	✓	✓	✓
Observations	1,302	1,302	1,302

Notes: Dependent variables: attendance (model 1) is an MEP's participation rate in roll-call votes during the parliamentary term; shirking (model 2) measures the fraction of parliamentary sitting in which an MEP signed the attendance register but cast zero roll-call votes; NOMINATE (model 3) is the first dimension legislative 'ideal point' estimated scaled from roll-call votes by Hix, Noury and Roland (2007). Estimation is by OLS. All models include a period dummy. Standard errors in parentheses are clustered at level of post-reform electoral districts. Brackets report *p*-values adjusted for clustering based on wild bootstrap. In the 4th parliament, MEPs from Austria, Finland and Sweden are excluded as they are not covered by the election survey used to calculate citizen ideology (102 cases); MEPs who participated in less than 20 roll-call votes are also dropped because of missing ideal-point estimates (22 additional cases).

within a country. A dummy for the 5th parliament captures common shocks.

Columns 1 and 2 in Table 4 show that higher reform intensity leads to lower participation and higher shirking. The results are statistically and substantively relevant. For instance, model 2 suggests that going from zero to median reform intensity in Britain (2.1) increases shirking by 5.9 percentage points, a large effect given that shirking is not very common (the mean rate is 0.08). Strikingly, the coefficient estimate in the attendance model in the contemporary case is nearly identical to the estimate from our historical case. Model 3 turns to assessing the effect of the reform on policy responsiveness. The dependent variable is the first-dimension NOMINATE score (varying from left to right on a scale from -1 to 1)

and the specification includes mean citizen ideology, which is measured on a left-right scale from 1 to 10 using the 1994 and 1999 European Election Surveys, and its multiplicative interaction with reform intensity. The interaction coefficient suggests that reform intensity significantly increases the rather loose link between citizen left-right ideology and legislative voting. Altogether, the contemporary evidence is remarkably consistent with the historical evidence from the more controlled Swiss case.³⁸

Conclusion

Electoral institutions are a crucial feature of representative democracy. Based on a new theory and fine-grained evidence from the intensive margin of two major electoral reforms, we have argued that making electoral systems more proportional can have conflicting effects on political representation. Improving the policy responsiveness of the legislature to the population at large can come at the cost of reducing the quality of politicians. In the context of an uneven electoral geography, adopting a form of PR may still make a majority of voters better off. But the benefit of the reform is smaller than suggested by pure spatial theories that abstract from the quality dimensions of representation. The theory also implies that rising political polarization increases the trade-off between policy responsiveness and quality required by different electoral institutions. Investigating this sobering possibility is a relevant task for future research.

³⁸Unfortunately, neither case allows us to examine long-run effects due to subsequent institutional change.

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Online Appendix for article “Electoral Reform and Trade-Offs in Representation”

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S1 Theoretical model

S1.1 Proof of Proposition 1

We will show that the outcomes in Table 1 are the only equilibrium outcomes given the electoral geography. Proposition 1 directly follows from this. Recall that a perfectly coalition-proof equilibrium is robust to any coalitional deviation by voters and politicians that is self-enforcing. As is discussed by Bernheim, Peleg and Whinston (1987), it is natural to think of players being able to communicate about possible coalitions during the electoral campaign but not being able to commit to a particular voting or entry strategy. In the MR model, this means that each partisan group i in each district d and all 18 politicians can be treated as the relevant players. In the PR model, each group of voters i can be analyzed as a single player that may distribute its votes arbitrarily across lists.

Preliminaries Without loss of generality, let us normalize $u(|0|) = 0$ to reduce notation. The text states the assumption that voters prefer a parliament that implements their ideal policy to any parliament that implements the ideal policy of the next closest group in the policy space and includes one additional high-quality legislator. Formally, this minimal polarization condition requires that

$$-u(|x_L - x_M|) > \max\{(g(3) - g(2), g(2) - g(1), g(1) - g(0)\}.$$

We refer to it as assumption **A1** below. Moreover, given A1, high polarization is formally defined as

$$-u(|x_L - x_M|) > g(3) - g(1)$$

which we refer to as assumption **A2**.

For the PR game, let $\sigma_P = \{P^\omega, P^\omega, P^\omega\}$ denote party P 's list of candidates, characterized

by fixed partisan type $P \in \{L, M, H\}$ and endogenous quality $\omega \in \{0, 1\}$.

Majority rule First, verify that the following two parliaments are equilibrium outcomes: $\{L_1^1, M_2^0, H_3^1\}$, $\{M_1^1, M_2^0, M_3^1\}$. Consider $\{L_1^1, M_2^0, H_3^1\}$. By A1, M voters in d=2 cannot commit to vote against M_2^0 as this would change policy to x_L or x_H . So M_2^0 enters, blocking the candidacy of M_2^1 , and wins. M_2^0 prefers the parliament $\{L_1^1, M_2^0, H_3^1\}$ to $\{L_1^1, M_2^1, H_3^1\}$ as she obtains private benefits from office $\pi > c$ and disregards externalities of her behavior on g . In contrast, good types L_1^1 (H_3^1) in the other districts are able to run because L_1 (H_3) voters off the equilibrium path are willing to vote against bad types and support any M type instead, as this does not change $x^* = x_M$ given what everybody else is doing. There is no credible coalitional deviation to a Pareto-efficient parliament $g(3)$. Any such deviation has to ensure that M remains the median party in parliament so that M voters in d=2 are willing to vote against M_2^0 . Clearly, either L or H voters will be better off renegeing from the coalition to obtain their ideal policy. Next, consider $\{M_1^1, M_2^0, M_3^1\}$. This equilibrium requires that L voters in d=1 vote for any L_1^ω that declares candidacy in their district unless M_1^1 enters and no other district is electing a L -candidate. Symmetrically, H voters in d=3 vote for any H_3^ω that declares candidacy in their district unless M_3^1 enters and no other district is electing a H -candidate. Given these strategies, M voters in d=2 do not vote against M_2^0 , as doing so would adversely change policy to x_L or x_H . Hence, politicians M_1^1, M_2^0, M_3^1 enter and get elected, and there are no self-enforcing coalitional deviations to induce a Pareto-efficient parliament $g(3)$.

Second, there are no other equilibria. There can be no equilibrium that entails $x^* \neq x_M$. Suppose otherwise, so that at least two L or two H legislators are elected. By A1, any of the above equilibria provide a credible coalitional deviation to such an outcome. For instance, consider $\{L_1^1, L_2^1, i_3^1\}$. Then M and H voters and candidates will jointly defect to induce $\{L_1^1, M_2^0, H_3^1\}$. Moreover, there is no equilibrium where $g^* < g(2)$ and $x^* = x_M$. Again, a

self-enforcing coalition of voters can at least induce parliament $\{L_1^1, M_2^0, H_3^1\}$. Furthermore, subgame perfection rules out the existence of a Pareto-efficient equilibrium where $g^* = g(3)$. Suppose otherwise and let $\{M_1^1, M_2^1, M_3^1\}$ be an equilibrium parliament. The entry of M_2^1 requires that, off the equilibrium path, M voters in $d = 2$ to vote against M_2^0 and for any L (or H) candidate instead. This is not credible, as the best-response of L voters in $d = 1$ dictates that they will drop their support for M_2^0 to secure a parliamentary majority for their preferred policy. The same logic applies to $\{L_1^1, M_2^1, M_3^1\}$ and $\{M_1^1, M_2^1, H_3^1\}$. Finally, it is easy to verify that there are no other equilibria that produce the same x^* and g^* .

Proportional representation There are two cases. First, suppose A2 holds (high polarization). The following two outcome-equivalent parliaments exist in equilibrium: $\{L^0, L^0, M^1\}$ or $\{L^0, L^0, H^1\}$ (we leave out subscripts for districts as there is only one polity-wide district under PR). The equilibrium party lists corresponding to the first parliament $\{L^0, L^0, M^1\}$ are as follows: $\sigma_L = \{L^0, L^0, L^0\}$, $\sigma_M = \{M^1, M^1, M^1\}$, and $\sigma_H = \emptyset$. By A2, the majority of L voters prefer the induced outcomes $x^* = x_L$ and $g^* = g(1)$ to any outcome $x^* \neq x_L$. Hence they cannot credibly commit to vote against list σ_L in which the two top spots are taken by bad types. As a consequence, all three bad types L^0 declare their candidacy, as the chance of winning office is sufficiently high by assumption ($\pi/3 > c$). The third parliamentary seat, by contrast, will be taken by a good type of party M . Concerning this last seat, M and H voters can commit to voting against a list with low-quality candidates as this will not change the median type in the legislature. As a result, gate keepers in party M allow the good types to declare candidacy, and by assumption $\pi/3 > c$ all of them will enter. The logic for outcome-equivalent parliament $\{L^0, L^0, H^1\}$ is symmetric, and the corresponding party lists are: $\sigma_L = \{L^0, L^0, L^0\}$, $\sigma_M = \emptyset$, and $\sigma_H = \{H^1, H^1, H^1\}$. There are no other equilibria. A2 rules out any parliament that leads to $x^* \neq x_L$. A self-enforcing coalition of voters and politicians can always achieve $\{L^0, L^0, M^1\}$ or $\{L^0, L^0, H^1\}$.

Second, suppose A2 does not hold (low polarization). Then the equilibrium parliament is $\{L^0, L^1, M^1\}$ or $\{L^0, L^1, H^1\}$. In equilibrium, party L runs the list $\sigma_L = \{L^0, L^1, L^1\}$, and one of the two remaining parties enters with a list full of good types (by $\pi/3 > c$) and the other stays out. (Mixed strategies are excluded.) By A1, left voters prefer σ_L , which leads to $x^* = x_L$ and $g^* = g(2)$, to any other parliament where L has no majority. As A2 does not hold, off the equilibrium path they vote against party L with two bad types on the top of the list, supporting the alternative list with high quality candidates instead. As a result, exactly one bad type L^0 declares candidacy, allowing two good types L^1 to enter and compete for the chance to win the second seat. The second party that enters has incentives to let the good types run as voters can credibly commit to vote for σ_L otherwise. It is straightforward to verify that there are no other equilibria. This completes the proof. \square

S1.2 Alternative formalization

The model presented in the text assumes that politicians in a political party make costly entry decisions and low-quality types are gatekeepers that may block the entry of high-quality types in the election. An alternative approach to model political recruitment within parties is to assume that parties – whether a leadership or rank-and-file members – select candidates subject to the constraint that high quality candidates are costlier, reflecting foregone rents or opportunity costs to the party or better outside options of the candidates (Galasso and Nannicini, 2011, 2017). This approach focuses on the allocation decision of the party rather than the entry decisions of individual politicians and it does not give any special influence to low-quality politicians. In this section, we show that adopting this alternative formulation of party organization leads to the same institutional trade-off.

Specifically, let us suppose that each party $P \in \{L, M, H\}$ selects a slate of candidates for the parliament, denoted by $\sigma_P = \{P_1^\omega, P_2^\omega, P_3^\omega\}$, where $\omega = 0$ denotes a low-quality and $\omega = 1$ a high-quality type. Subscripts denote the electoral district under MR and the list

position under PR. As before, candidate selection takes place simultaneously in all three parties. Parties care about the policy outcome as well as office and they suffer a cost from selecting high-quality politicians, which need not be very large. Formally, a party's utility function is

$$U_P = u(|x^* - x_P|) + s \left(\sum_{d=1}^3 P_d \right) - c \left(\sum_{d=1}^3 P_d^1 \right).$$

The first-term on the right-hand side captures policy motivations, the s -term captures the benefits of winning parliamentary seats beyond the ability to shape policy and the c -term captures the cost of recruiting high-quality politicians. The cost for nominating a bad politician is normalized to zero and there are positive marginal costs of selecting a high-quality type: $c(3) > c(2) > c(1) > c(0) = 0$. Consistent with evidence that parties do select high-quality politicians in some contests (Besley et al., 2017; Galasso and Nannicini, 2011), we assume that the costs are not prohibitive. In particular, assume that the gains of winning an additional parliamentary seat for sure outweigh the costs of selecting an additional high-quality candidate. As we will see, in equilibrium this can nonetheless lead to an undersupply of high-quality politicians.

Proposition 2 states that the equilibrium policy and valence outcome under majority rule are the same as with the assumption about party organization (i.e., gatekeeping) used in the main text.

Proposition 2. *Assuming the alternative model of party organization, the equilibrium policy and quality under majority rule are $x^* = x_M$ and quality is $g^* = g(2)$.*

Proof. First, verify that the following parliaments are equilibrium outcomes: $\{L_1^1, M_2^0, H_3^1\}$, $\{M_1^1, M_2^0, M_3^1\}$. Consider the first parliament, $\{L_1^1, M_2^0, H_3^1\}$. It is the result of the following party nomination decisions: $\sigma_L = \{L_1^1, L_2^0, L_3^0\}$, $\sigma_M = \{M_1^0, M_2^0, M_3^0\}$, and $\sigma_H = \{H_1^0, H_2^0, H_3^1\}$. The median voter in $d=1$ votes for L^1 , the median voter in $d=2$ votes for M^0

and the median voter in $d=3$ votes for H^1 . Given the nominated candidates, no group of voters can benefit from a deviation. By A1, M voters in $d=2$ cannot commit to vote against M_2^0 as this would change policy to x_L . The best response of party M is to select a low-quality candidate in the district. In the remaining two districts, however, party L or H nominates a high-quality candidate because voters are willing to vote against bad types of their party (off the equilibrium path) and support M^0 instead. This threat is subgame perfect as implementing it does not change the policy outcome given what everybody else is doing. Given the assumed benefits of office outweigh the cost of recruitment, party L (H) in $d=1$ ($d=3$) has incentives to select a high type. There is also no credible coalitional deviation to a Pareto-efficient parliament $g(3)$, because any feasible coalition is not self-enforcing. Next, consider the equilibrium generating parliament $\{M_1^1, M_2^0, M_3^1\}$. Voter best responses are identical to the model with endogenous entry and party nomination decisions are $\sigma_L = \{L_1^0, L_2^0, L_3^0\}$, $\sigma_M = \{M_1^1, M_2^0, M_3^1\}$, and $\sigma_H = \{H_1^0, H_2^0, H_3^0\}$. Given voters' strategies and what the other parties are doing, there are no beneficial deviations in the candidate selection stage. Finally, it can easily be verified that there are no other equilibria. The logic is nearly identical to the baseline model. \square

Proposition 3 summarizes the outcome under PR under the alternative formalization if polarization is high. (There is no pure strategy equilibrium if A2 does not hold.) Taken together, Proposition 3 and Proposition 2 imply the same trade-off as in Proposition 1.

Proposition 3. *Suppose A2 holds. Assuming the alternative model of party organization, under proportional representation the equilibrium policy is $x^* = x_M$ and $g^* = g(1)$.*

Proof. Suppose A2 holds (high polarization). The following three outcome-equivalent parliaments exist in equilibrium: $\{L^0, L^0, M^1\}$, $\{L^0, L^0, H^1\}$, $\{L^0, L^0, L^1\}$. The equilibrium party lists corresponding to the first parliament $\{L^0, L^0, M^1\}$ are as follows: $\sigma_L = \{L^0, L^0, L^0\}$, $\sigma_M = \{M^1, M^0, M^0\}$, and $\sigma_H = \{H^0, H^0, H^0\}$. L voters vote for σ_L and the other voters support σ_M . By A2, the majority of L voters prefer the induced outcomes

$x^* = x_L$ and $g^* = g(1)$ to any outcome $x^* \neq x_L$. Because they cannot credibly commit to vote against list σ_L and given what the other voters are doing, party L has no incentive to nominate high-quality types. The third parliamentary seat, by contrast, will be taken by a good type of party M . Voters can commit to voting against a list $\sigma'_M = \{M^0, M^0, M^0\}$ as this will not change the median type in the legislature. The logic for outcome-equivalent parliaments $\{L^0, L^0, H^1\}$ and $\{L^0, L^0, L^1\}$ is symmetric. As in the baseline PR model, there are no other equilibria. \square

S1.3 Majority rule with multi-member districts

In the main text we argue that the theory also applies to majority rule with multi-member electoral districts, such as the Swiss case we study in the empirical part of the paper. To illustrate how the institutional logic works in this situation, consider a 7-member parliament. As depicted in Table S1.1, let us assume that there are seven different municipalities of equal population size, denoted by letters a to g . In the majoritarian system, there are two multi-member districts (consisting of three and two municipalities, respectively) and two single-member districts (each comprising a single municipality). This means that a majority of seats under MR is allocated in multi-member districts. As in the baseline model, electoral geography is unequal such that the median in the population (L) is not the median in the median district. L voters are heavily concentrated in three-member district $d = 1$, H voters are concentrated in single-member districts $d= 3, 4$ and M voters are the median in the remaining two-member district. The specific distribution of voters within and across districts in Table S1.1 is for concreteness but not required for the argument. Under MR, a voter casts a vote for each seat to be filled in her district. There is no cumulation of votes and a candidate with at least the support of half the voters wins. If fewer candidates than there are seats obtain an absolute majority, the winner for any outstanding seat is determined in a second round using first-past-the post among the top candidates who did not obtain a seat

Table S1.1: Example with multi-member districts under majority rule

Municipality	Electoral district	Voters (fraction in each district)		
		L	M	H
a	1	0.9	0.1	0.0
b	1	0.9	0.1	0.0
c	1	0.9	0.1	0.0
d	2	0.45	0.4	0.15
e	2	0.45	0.4	0.15
f	3	0.2	0.2	0.6
g	4	0.0	0.15	0.85
Population size		0.54	0.21	0.25

in the first round. Under PR, there is a polity-wide district. While not necessary for the argument, it simplifies the analysis to assume that voters who are indifferent over outcomes simply support the ideologically closest candidate(s) or party list.

Consider a situation with high polarization (A2).¹ Given the equilibrium concept, the outcome under majority rule is $x^* = x_M$ and $g^* = g(6)$ and the outcome under PR is $x^* = x_L$ and $g^* = g(3)$. Qualitatively, this implies the same institutional effect captured by the simpler model (Proposition 1): Compared to PR, majority rule is worse at representing the policy preferences of the population at large but better at selecting good politicians.

In the MR game, it is easy to verify that the following political behavior constitutes an equilibrium: in district 1, three type- L^1 politicians enter and win; in district 2, one M^0 and one M^1 candidate enters and wins; in districts 3 and 4, H^1 politicians enter and win. As a result, the median legislator will be from the M party, leading to $x = x_M$ and $g = g(6)$.

¹Given the increased size of the parliament compared to the baseline model, the equivalent high polarization assumption is that $-u(|x_L - x_M|) > g(7) - g(3)$.

As in the baseline model, M voters in $d=2$ cannot credibly commit to vote against two M^0 -candidates as this would change policy to x_L or x_H given what voters in the other districts are doing. However, they can coordinate to credibly vote for one high quality candidate of party H as this will not change the legislative median but improve policy, thus providing incentives for the entry of one M^1 -candidate. In the other districts, good types are selected because voters can vote on quality without changing the partisan identity of the median legislator. Entry decisions follow and all MPs are elected in the first round. As in the baseline model, there is no credible coalitional deviation to a Pareto-efficient parliament $g(7)$. Other outcomes $x \neq x_M$ or $g < g(6)$ cannot occur in equilibrium, as a self-enforcing coalition of voters can always induce $x = x_M$ and $g = g(6)$.

In the PR game, the equilibrium parliament will consist of four L^0 MPs and three high-quality MPs from at least one other party. If indifferent voters support the list of the ideologically closest party and given group sizes in Table S1.1, the unique equilibrium parliament is $\{L^0, L^0, L^0, L^0, M^1, H_1, H_1\}$. A2 implies that L voters prefer the induced outcomes $x^* = x_L$ and $g^* = g(3)$ to any outcome $x^* \neq x_L$ and so politicians of the L party have no incentives to compete on good politicians, in contrast to the other parties.

S2 Data

This appendix provides additional information on the data used in the Swiss case. Table S2.2 reports summary statistics and sources for the variables used in the main analysis reported in Table 3. Recall that the unit of analysis varies with the dependent variable. It is MP-vote in columns 1-3, district-vote in column 4, and MP-parliament in columns 5-7. Descriptive statistics in Table S2.2 are based on the MP-parliament dataset except for the congruence variables.

Note that descriptives for reform intensity cover both the pre-reform and the post-reform parliament. However, between districts in the post-reform parliament median reform intensity is 1.1 (mentioned in the text and underlying Figure 2) and mean reform intensity is 1.07.

Table S2.3 lists the cantonal referendums matched to roll-call votes for the analysis of congruence, including a short description of each issue and summary statistics for district-level referendum outcomes.² Referendum results were retrieved from the cantonal database on election and referendums available at http://www.wahlen-abstimmungen.zh.ch/internet/justiz_inneres/wahlen-abstimmungen/de/abstimmungen/abstimmungsarchiv.html Parliamentary votes are coded from the parliamentary records (Kantonsrat, 1917, 1920). It is noteworthy that the analysis includes key economic issues (tax reform or working time regulation) and constitutional issues (electoral reform or reform of legislative institutions) before and after the reform. The mean level of support varies considerably across policies. Moreover, there is large variation in policy preferences across districts, which is a strong indication of political polarization. The cross-sectional range in the yes-vote share is always larger than 30 percentage points and on several key issues it is twice as large. As indicated in the table, there are large differences between rural and urban districts. But there also is considerable

²The mean support across districts does not correspond to the overall yes-vote (%) in the population because districts, the unit of analysis, vary in size.

variation between urban districts (e.g., there is 31-point gap between Zürich 1 and Zürich 2 on electoral reform or a 16-point gap between Winterthur and Zürich 2 on working time regulation).

Table S2.4 compares referenda with matched to roll-call votes, listed in Table S2.3, with referenda for which there is no roll-call vote. This reveals that referenda with corresponding roll-call votes are fairly similar on key observational features – whether the referendum is mandatory, turnout and the yes-vote share – to those without roll-call votes. Matched referenda are somewhat more contested, though the difference is not statistically significant, and have a slightly higher (by three percentage points) turnout.

Finally, Figure S2.1 plots the municipality-level vote share in the referendum to adopt PR. At a more fine-grained level, it illustrates the large variation in mass support for the reform.

Table S2.2: Descriptive statistics and sources for variables used in analysis in Table 3

	Mean	SD	Min	Max	Source
District					
Reform intensity	0.55	0.65	0.00	1.89	Official compilation of laws (<i>Offizielle Sammlung</i>) of canton Zürich Vol. 30
Support reform (share yes vote)	0.53	0.19	0.06	0.93	Cantonal referendum database ¹ , Statistical Yearbook City of Zürich 1916
Language fractionalization	0.11	0.06	0.01	0.27	Decennial federal census (1910), Statistical Yearbook City of Zürich 1910-11
Religious fractionalization	0.34	0.13	0.04	0.55	Same as above
Foreign population (share)	0.19	0.11	0.02	0.38	Same as above
Employment in industry and crafts	0.52	0.12	0.16	0.75	Decennial federal census (1920)
Members of parliament					
Congruence (MP-canton median)	0.60	0.49	0.00	1.00	Calculated from referendum database and parliamentary records; see text
Congruence (majority of MPs)	0.61	0.49	0.00	1.00	Same as above
Attendance	0.86	0.14	0.18	1.00	Parliamentary records (Kantonsrat, 1917, 1920)
Age (in years)	52.04	10.46	25	79	Same as above
Death	0.04	0.20	0.00	1.00	Same as above
Worker	0.12	0.33	0.00	1.00	Same as above
Farmer	0.09	0.29	0.00	1.00	Same as above
Nationalrat	0.06	0.24	0.00	1.00	Same as above
Left Party	0.29	0.46	0.00	1.00	Parliamentary records, newspapers (<i>Der Grüttianer; Neue Zürcher Zeitung; Das Volksrecht</i>)
Farmer's Party	0.07	0.26	0.00	1.00	Same as above

Notes: ¹ Retrieved from http://www.wahlen-abstimmungen.zh.ch/internet/justiz_innere/wahlen-abstimmungen/de/abstimmungen/abstimmungsarchiv.html

Table S2.3: Cantonal referendums matched to roll-call votes in parliament

Vote ID	Issue	Referendum yes-vote (%)			
		Mean	SD	Min (district)	Max (district)
17427	Introduction of PR for cantonal parliament.	49.9	18.2	24.5 (Dielsdorf)	85.5 (Zürich 2)
17460	Comprehensive tax reform.	55.2	14.9	26.6 (Dielsdorf)	82.2 (Winterthur)
18431	Territorial reform: merger of municipality of Winterthur with 5 suburbs.	82.7	9.5	65.0 (Affoltern)	96.9 (Zürich 2)
18511	Law concerning organization and rules for cantonal parliament.	44.0	10.9	24.4 (Bülach)	66.3 (Zürich 4)
18615	Working time regulation (8-hour day and 48-hour week).	26.1	8.5	12.7 (Dielsdorf)	44.0 (Winterthur)

Notes: Each observation is a post-reform electoral district. Given variation in district size, the mean across districts does not correspond to the overall yes-vote (%) in population.

Table S2.4: Comparing matched to non-matched referendums

	No roll call Mean	Roll call Mean	Difference (<i>p</i> value)
Mandatory referendum	0.74	0.80	0.06 (0.80)
Turnout referendum	0.72	0.75	-0.03 (0.04)
Yes vote referendum	0.68	0.54	0.14 (0.22)
<i>N</i>	27	5	

Notes: Referendum data are from the Abstimmungsarchiv of the canton Zürich and information on roll calls is from the parliamentary records of the Kantonsrat.

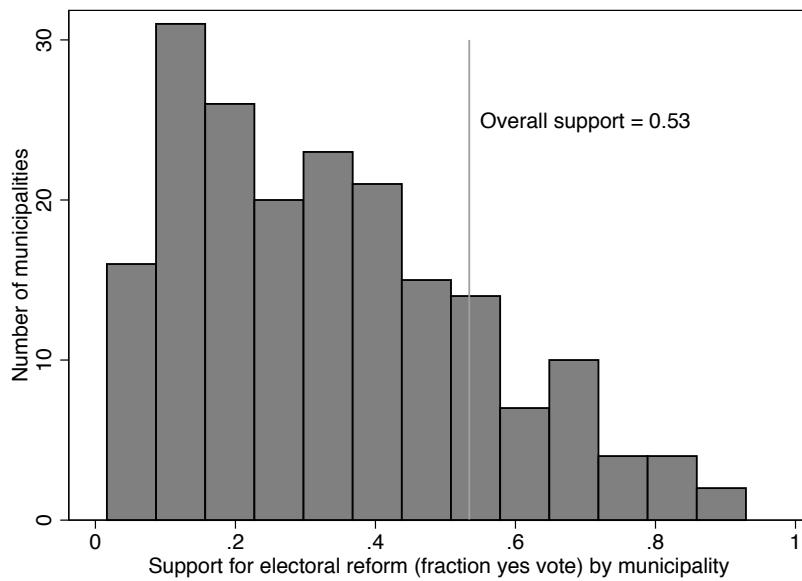


Figure S2.1: Referendum on introduction of PR in December 1916

Notes: Each observation is a municipality (*politische Gemeinde*). There are 187 municipalities in the canton. They vary in population size. The city of Zürich, which is one municipality, is split up into its contemporaneous electoral districts. Data are from the cantonal referendum database (*Abstimmungsarchiv*) and the Statistical Yearbook of the city of Zürich for 1916.

S3 Additional empirical results

S3.1 Measuring the quality of politicians

In the paper, we explain why regular attendance taps into the quality of politicians concerning their integrity or internal motivation (also see Fisman et al., 2015; Gagliarducci, Nannicini and Naticchioni, 2011; Høyland, Hobolt and Hix, 2017). In this section, we provide supporting evidence for this claim showing that attendance is positively related to MPs' reelection rate as well their speechmaking. Moreover, we report results using speeches and education as the dependent variable. The latter taps into a separate aspect of quality relating to competence. These analyses confirm the findings based on attendance. Finally, we consider local political experience as an attribute that features prominently in personal vote theories of electoral institutions.

Reelection. As previewed in the measurement section of the paper, Appendix Table S3.1 shows that MPs' attendance is a statistically and substantively relevant predictor of whether they are reelected. This auxiliary analysis focuses on the two pre-reform parliaments elected under majority rule (1911-1914 and 1914-1917) to avoid confounding the relationship with the subsequent electoral reform. The dependent variable is a dummy equal to 1 if an incumbent MP from the 1911-1914 parliament (Kantonsrat) is reelected in the 1914 election and 0 otherwise, and we estimate linear probability models. The sample includes all MPs that did not exit parliament before the end of the term. For ease of interpretation, attendance has been z-standardized (i.e., mean 0 and unit standard deviation).

The specifications reported in Appendix Table S3.1 start with a simple regression model that only includes attendance and subsequently adds electoral district fixed effects for the 53 electoral districts in the majoritarian system and a vector of MP characteristics (local political experience, education, member of national parliament, age, worker, farmer). As in

the main analysis, adding MP characteristics leads to a small decline in sample size due to missing biographical information for replacement MPs. The sign and size of the coefficient on attendance is robust across specifications and statistically significant at the five percent level except in model 2, where $p = 0.05$. Substantively, the estimate from column (3) in Table S3.1 suggests that one standard deviation increase in attendance is related to a 10 percentage point increase, on average, in the probability of reelection. This corresponds to a 12 percent increase relative to the mean reelection rate of 0.83. This finding is robust to excluding politicians aged 68 and above (model 4), who may be more likely to attend less and seek reelection due to health reasons or retirement.

These results support the claim that attendance is a signal of valence that mattered to parties at the time. They are consistent with partisan selection based on quality, though from the data we cannot verify this directly. It can also be that MPs planning to exit parliament slack off systematically. Either way, attendance is clearly linked to parliamentary careers.

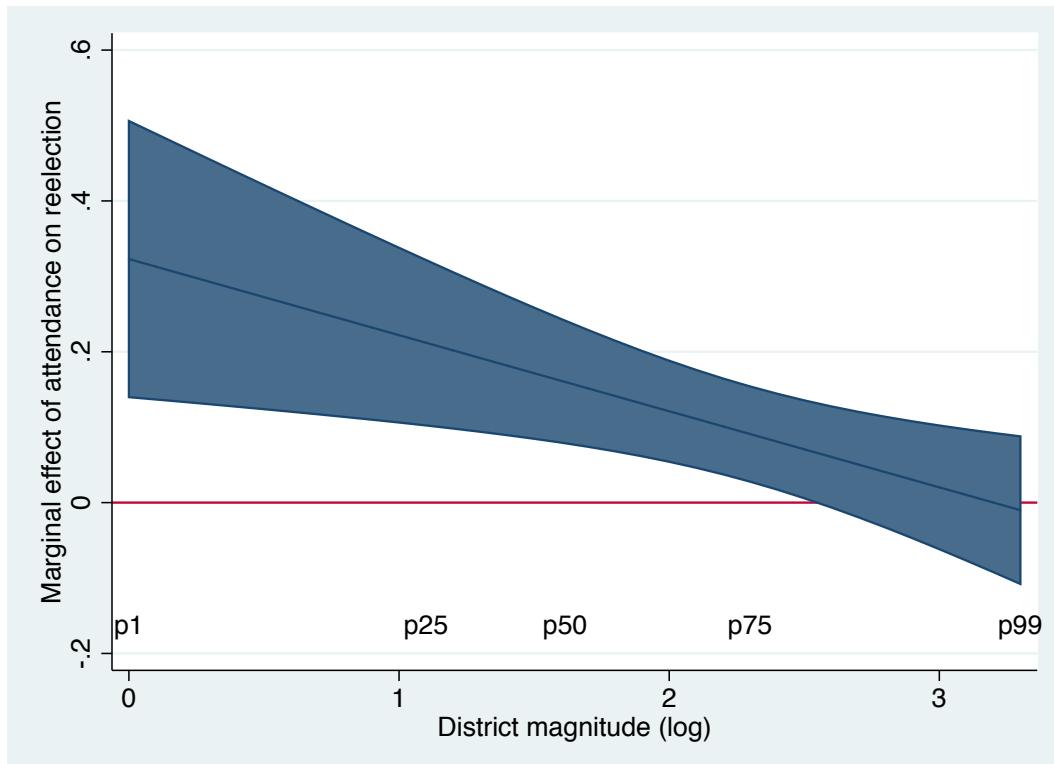
It is also noteworthy that the positive relationship between attendance and reelection is not restricted to single-member or low-magnitude districts. Model (5) excludes single-member and binomial districts. It produces a virtually identical coefficient estimate. Furthermore, Model 6 includes a multiplicative interaction term between attendance and (log of) district magnitude. Estimates based on this interactive specification indicate that while the relationship is most pronounced in small districts and becomes weaker as district magnitude increases, the slope of the interaction term is not very steep. As is illustrated by the marginal effects plot in Figure S3.1, there is a positive and statistically significant relationship between attendance and reelection even in large districts with a magnitude up to about 14. To put this in perspective, in the post-reform districted PR system the median district magnitude is 10. We interpret this as indirect evidence that informational issues do not rule out selection based on quality in multi-member districts.

Table S3.1: Parliamentary participation and reelection

	(1)	(2)	(3)	(4)	(5)	(6)
Attendance	0.07 (0.03)	0.07 (0.04)	0.10 (0.04)	0.10 (0.04)	0.10 (0.04)	0.32 (0.09)
Attendance × District magn. (log)					-0.10 (0.04)	
District FE	✓	✓	✓	✓	✓	✓
MP characteristics		✓	✓	✓	✓	✓
Observations	221	221	208	190	177	208

Notes: Dependent variable: a dummy equal to 1 if an MP from 1911-1914 cantonal parliament is reelected in 1914 election and 0 otherwise. Estimation is by OLS. Standard errors in parentheses are clustered by electoral district (53 clusters). The sample includes all MPs that did not exit parliament before the end of the term. Mean reelection rate: 0.83. For ease of interpretation, attendance has been z-standardized. Model (4) excludes MPs aged 67 and above. Model (5) excludes all districts with a district magnitude of 1 or 2. Note that in the interactive specification of model (6), the constituent term for district magnitude is absorbed by the district fixed effects. MP characteristics: local political experience, education, member of national parliament, age, worker, farmer.

Figure S3.1: Parliamentary attendance and reelection



Note: The figure displays the marginal effect of (standardized) parliamentary attendance on the reelection probability conditional on logged district magnitude from Table S3.1, model 3, with 95% confidence intervals. In the bottom, markers p1,p25,...,p99 indicate percentiles of the empirical distribution of the conditioning variable.

Speeches. Appendix Table S3.2 reports additional results about the conditional relationship between parliamentary attendance and speeches. A negative count model finds a positive and significant relationship. This is consistent with evidence from other settings cited in the paper and further bolsters the argument that attendance is a useful proxy for MPs' parliamentary effort.

Appendix Table S3.3 presents results from an analysis using the number of legislative speeches in key debates as the outcome variable. Key debates concern the votes used in the congruence analysis. While speeches have been used before in the literature as a proxy for legislative effort, one may be concerned that agenda control limits their usefulness (e.g., Proksch and Slapin, 2012; Schwarz, Traber and Benoit, 2017). However, this concern is minimized in the cantonal parliament we study. The speaking agenda is open. Any member of parliament may take the floor in a particular debate. The parliamentary rules guarantee that even if a majority votes to end a debate, any member who has not yet spoken on the issue has the right to take the floor. Given the nature of the dependent variable, we estimate a negative-binomial count model that allows for overdispersion in the speech counts. To capture heterogeneity across debates, the model allows for random variation in the dispersion parameter by debate. In addition to the usual co-variates, the model includes a dummy for the rapporteur in a given debate. The estimation results indicate a significant negative effect of reform intensity.

Table S3.2: Parliamentary attendance and speeches

	(1)	(2)	(3)
Parliamentary attendance	2.17 (0.97)	2.88 (1.13)	4.02 (1.37)
Education			0.86 (0.60)
District controls	✓	✓	✓
MP characteristics		✓	✓
Observations	204	203	203

Notes: Dependent variable: number of speeches given by MP in key debates in the pre-reform parliamentary term (Kantonsrat 1914-1917). Key debates concern the votes used in the congruence analysis. The table shows the results from a negative-binomial count model, which allows for overdispersion, estimating the relationship between parliamentary attendance and parliamentary speeches. Standard errors are in parentheses. MPs exiting early or entering late and the president of parliament, who does not participate in debates, are excluded. District controls and MP characteristics are the same as in the main analysis. Education is a dummy for PhD.

Table S3.3: Electoral reform and parliamentary speeches

	(1)	(2)	(3)
Reform intensity	-0.44 (0.21)	-0.48 (0.22)	-0.50 (0.23)
District controls	✓	✓	✓
District FE		✓	✓
MP characteristics			✓
Observations	1,053	1,053	1,051

Notes: Dependent variable: total number of speeches given by MP in a key debate. The table shows the results from a negative-binomial count model that allows for random variation in the dispersion parameter by debate. Standard errors are in parentheses. MPs exiting early or entering late are excluded. District controls and MP characteristics are the same as in the main analysis plus a dummy for the rapporteur. In addition, model (3) includes a dummy for the rapporteur.

Education. Appendix Table S3.4 repeats the analysis with educational attainment as the dependent variable. While our focus is on politicians' motivation and integrity, education taps into the competence dimension of politicians' quality that has been the subject of several existing studies of institutions and selection (Besley and Reynal-Querol, 2011; Galasso and Nannicini, 2011). Ultimately, both aspects of quality are important for representation. Theoretical models typically assume that quality is one dimensional and they can be interpreted as either competence or integrity, though in the real-world these aspects may not go hand in hand and the effects of electoral institutions may vary across different dimensions of quality. One concern with education in the literature is that it confounds social background with competence, which may be especially relevant before the mass expansion of tertiary education after World War II in Europe, and the assumption that politicians with more formal education are more competent leaders is subject to empirical controversy (Carnes and Lupu, 2016). However, the recruitment of highly educated politicians was not a strategy exclusive to established parties. Social Democrats also recruited politicians with high formal education. As a result, one can argue that education is a meaningful proxy in this historical setting as well that can shed light on the logic of political recruitment under alternative institutions.

Given our biographical data, we code whether an MP has a doctoral degree (most frequently in law or medicine, but also in arts and sciences). This is the case for 14.7% of MPs in the pre-reform parliament. Using this binary variable for educational attainment as the dependent variable, we find evidence that the electoral reform tends to be linked to decline in the selection of highly educated MPs, though the effect is not statistically significant in all specifications. To the extent that these types have higher opportunity costs, this is broadly consistent with the theoretical logic.

Table S3.4: Electoral reform and education of MPs

	(1)	(2)	(3)	(4)	(5)
Reform intensity	-0.06 (0.02)	-0.04 (0.02)	-0.06 (0.02)	-0.04 (0.02)	-0.05 (0.05)
District controls	✓	✓	✓	✓	✓
District FE		✓		✓	✓
Varying trends					✓
Observations	491	491	723	723	723

Notes: Dependent variable: a dummy variable indicating if MP has a doctoral degree (14.7 % in pre-reform parliament). Models 3-5 adds the 1911-1914 parliamentary term. Estimation is by OLS. Standard errors in parentheses are clustered at level of post-reform electoral districts. District controls are the same as in main specification.

Local experience. Building on earlier personal vote theories of electoral institutions, recent contributions in this literature focus on how electoral rules shape the political selection of candidates with local attributes through strategic decisions by parties and candidates. Previous local political experience or birthplace have been used in recent studies (Nemoto and Shugart, 2013; Shugart, Valdini and Suominen, 2005). As discussed in the main text, we think of these theories as complementary to our theoretical argument. Quality construed in our framework as motivation to contribute to broader parliamentary activities does not inherently favor local over national projects. Our main behavioral measures reflect this focus. It is nonetheless useful to examine local attributes of MPs. While data on birthplace is not available for most of our MPs, we have calculated a dummy variable indicating if an MP has political experience at the local level (e.g., council member or elected administrative office). The theoretical expectation here is more ambiguous than that for attendance, speechmaking or congruence. Our model does not predict that reform intensity is related to the localness of MPs. Theories of the personal vote suggest that a higher dosage of PR should lead to reduced incentives to rely on local attributes if voters do not choose between candidates of the same party (Carey and Shugart, 1995; Shugart, Valdini and Suominen, 2005). De facto, most but not all voters cast straight party votes in the open-list PR election we study. However, there are some preference voters, which muddies the prediction - but from this perspective the same should be true for our other outcome variables. Table S3.5 reports the estimation results. They show that while the sign of reform intensity is consistently negative, the effect is imprecisely estimated (i.e., never significant at the 5 percent level). This strengthens the interpretation that our findings do not simply reflect the local vs. national trade-off discussed in the personal vote literature.

Table S3.5: Electoral reform and local political experience

	(1)	(2)	(3)
Reform intensity	-0.06 (0.04)	-0.05 (0.04)	-0.06 (0.03)
District controls	✓	✓	✓
District FE		✓	✓
MP characteristics			✓
Observations	491	491	462

Notes: Dependent variable: a dummy variable indicating if MP has local-level political experience. Estimation is by OLS. Standard errors in parentheses are clustered at level of post-reform electoral districts. District controls are the same as in main specification.

S3.2 Further robustness checks

As discussed in the robustness section of the paper, Appendix Table S3.6 shows that the results reported in the main text are robust to alternative ways of operationalizing the outcome variables or electoral institutions as well as to relaxing the parallel trends assumption. Concerning the analysis of MP-voter congruence, one may ask how accounting for abstentions and absent MPs changes the results. So far, the analysis has excluded these cases. One may be concerned that the positive effect of reform intensity masks strategic non-decisions by MPs in districts that were exposed to a larger increase in district magnitude, thus overstating policy responsiveness. To assess this possibility in a straightforward way, column 1 codes all MPs that abstained or were absent on the day of the vote as having cast a vote dissonant with the popular vote. If the problem is relevant, this re-coding should produce a significantly diminished effect. To also allow for the opposite possibility, column 2 codes abstainers or absentees as having cast a congruent vote. In either case, the procedure increases the number of observations, but it does not meaningfully alter the results. The coefficient on reform intensity remains large and significant in each specification.

Furthermore, column 3 takes an alternative approach to capture the institutional environment faced by a particular MP. In this specification, the reform intensity variable is dropped. Instead, the model includes the (log) district magnitude in a given district d and electoral term t . Given the inclusion of post-reform district fixed effects, the main variation also comes from varying exposure to the electoral reform across districts, and hence the interpretation is similar to our main specification. A difference is that this alternative specification measures the pre-reform district magnitude at a lower level of pre-reform districts rather than using the average at the level of post-reform districts. A drawback is that it makes a separability assumption concerning the effect of district magnitude and the introduction of the PR voting rule, and the latter cannot be distinguished from a general time trend. Reassuringly, the results from this alternative specification confirm our main results.

Turning to the analysis of parliamentary attendance, one issue is that both selection based on integrity and reelection incentives may shape MPs' attendance behavior. If reelection motives are dominant, the effect of reform intensity should be less pronounced when the dependent variable excludes the latter part of the term leading up to the next election. Studies of retrospective voting based on the economy suggest that voters' evaluation are heavily skewed toward the last 2-4 quarters before the election (Achen and Bartels 2016, ch. 6; Healy and Lenz 2014). Following this logic, column 4 excludes the last year before the election in the calculation of MPs' attendance rate. Qualitatively, the results are unchanged. Though the effect of reform intensity is about one-third larger. This bolsters the interpretation that parliamentary attendance captures variation in quality of MPs rather than reelection incentives. Column 5 employs the alternative institutional measure, (log) district magnitude, in the attendance regression. Again, this check confirms the main results.

Finally, column 6 includes attendance data from the 1911-14 parliamentary term and so the analysis covers three terms. This allows us to control for varying time trends and to test for the existence of pre-treatment trends (Angrist and Pischke, 2009), and doing so confirms our previous results. (Recall that data limitations restrict this test to parliamentary attendance.) The specification includes time trends that vary by the subsequent exposure to the reform. Specifically, four dummy variables based on the ratio of post-reform to pre-reform district magnitude, approximately corresponding to the four quartiles of the distribution, are interacted with a linear time trend. In addition, column 7 adds a variable that switches on reform intensity during the 1911-14 parliamentary term and sets it to zero otherwise. This is a natural way to assess the existence of pre-treatments trends. The resulting coefficient is small and not statistically significant. This bolsters the validity of our empirical strategy. In contrast, the reform intensity coefficient is substantively and statistically significant. It is about one-third larger than in the baseline specification.

Table S3.6: Effect of electoral reform in alternative specifications

	Congruence			Attendance		
	Abstaining or absent: dissonant	Abstaining or absent: congruent	Alternative reform measure	Excluding 4 pre-election quarters	Alternative reform measure	All three terms, varying trends
(1)			(3)	(4)	(5)	(6)
Reform intensity	0.171 (0.057)	0.195 (0.049)		-0.059 (0.024)		-0.071 (0.024)
Log(District magnitude)			0.132 (0.051)		-0.037 (0.014)	
Reform intensity, pre-treatment					-0.009 (0.023)	
Observations	1,104	1,104	898	463	471	699

Notes: The table shows results from alternative specifications. All models include district fixed effects and the same (time-varying) district controls included in Table 3. Models with congruence as the dependent variable also include vote fixed effects. In model 1 (model 2), all abstainers and absentees are coded as casting a dissonant (congruent) vote. In model 4, the measure of attendance excludes the last year before the election. Models 3 and 5 replace the reform intensity variable with the natural log of the district magnitude in a given electoral district. Model 6 adds data on the 1911-14 parliamentary term. It includes time trends varying by treatment exposure and tests for pre-treatment trends by including a reform intensity variable that is switched on in the 1911-14 term and is zero otherwise. Estimation is by OLS. Standard errors in parentheses are clustered at level of post-reform electoral districts.

Additional aggregate level results. Going beyond the district-level results reported in column 4 of Table 3 in the main text, Table S3.7 reports additional aggregate-level results base on other district-level measures of policy representation. They confirm the results on the congruence dimension of representation. Columns 1-3 of Table S3.7 use the average congruence of MPs in the district on a given issue. This is simply the aggregate version of the dependent variable in the micro-level specification. This serves to show that the main findings from the individual-level analysis are not sensitive to the level of analysis. Following a suggestion from an anonymous reviewer, specifications 4-6 use an alternative measure defined as the average popular support minus the average legislative support on a given issue in a district. We take the absolute value of this difference, creating something approximating a distance measure. Given the scale of the dependent variable, we should observe a negative effect of the reform (i.e., a declining gap between voters and politicians on average). This is what we find and the reform intensity coefficient is significant at the 10 percent level in column 6 ($p = 0.068$). Note that a previous version of this table mistakenly reported results in columns 4-6 that measured % Voters - % MPs without taking the absolute value.

Table S3.7: Additional aggregate-level results: effect of reform intensity on other district-level measures of policy representation

	Average Congruence			Absolute difference: % Voters - % MPs		
	(1)	(2)	(3)	(4)	(5)	(6)
Reform intensity	0.22 (0.084)	0.22 (0.080)	0.17 (0.099)	-0.02 (0.022)	-0.022 (0.020)	-0.065 (0.033)
District FE		✓	✓		✓	✓
District controls	✓		✓	✓		✓
Observations	90	90	90	90	90	90

Notes: All models include vote fixed effects. District controls are the same as in Table 3. Estimation is by OLS. Standard errors in parentheses are clustered at level of post-reform electoral districts.

S3.3 Heterogeneity

Excluding the city of Zürich. At the local level, the city of Zürich had adopted PR in 1913, four years before it was introduced at the cantonal level. This means that some voters and some politicians in the canton were more familiar with the new system than others. (During the campaign to introduce PR at the cantonal level, the recent city-level reform was cited by proponents as proof that PR works.) Moreover, the city of Zürich was also characterized by the highest population density in the canton (1469 per square km compared to the canton average of 291). While district fixed effects pick up such heterogeneity across *Bezirke* in the main analysis, one may ask whether the results are driven by the city with its (slightly) longer experience with PR or its dense population. While this considerably reduces the size of the sample, we can exclude the city of Zürich from the analysis to address this point. Results are reported in Table S3.8. They show that the estimates are very similar to the ones using the full sample.

Pre-reform district magnitude. Table S3.9 examines whether the effect of reform intensity varies by the pre-reform level of district magnitude. Following canonical arguments about the declining marginal effect of district magnitude on seats-votes disproportionality (e.g., Rae, 1967), one may conjecture that the effects of the reform on representation are less pronounced for districts with a larger pre-reform district magnitude (mostly urban areas in this case). To assess this possibility, Appendix Table S3.9 reports results from OLS models that interact reform intensity with the (average) level of pre-reform district magnitude. The results are mixed. For MP-voter congruence as the dependent variable, there is some evidence that the impact of reform intensity is less pronounced where district magnitude was already quite high. In all models, the interaction term is significant at the 10 percent level. For attendance as the dependent variable, there is no evidence of a varying effect of reform intensity. The slope on the multiplicative interaction term has the “wrong” sign, is

substantively small and not significant at any conventional level.

As an additional check, columns (4) and (8) exclude the smallest electoral districts, which does not change the results. This precludes the possibility that the effects are driven only by the low-magnitude districts.

One explanation for these patterns may be that while there is considerable variation in reform intensity, district magnitude increased by at least six seats in the smallest pre-reform electoral districts, effectively smoothing over the steepest part of the seats-votes curve.

Table S3.8: Results excluding the city of Zürich

	Congruence MP-median voter			Parliamentary attendance		
	(1)	(2)	(3)	(4)	(5)	(7)
Reform intensity	0.17 (0.064)	0.17 (0.060)	0.16 (0.054)	0.48 (0.086)	-0.033 (0.022)	-0.032 (0.019)
District controls	✓	✓	✓	✓	✓	✓
District FE		✓	✓	✓	✓	✓
MP characteristics			✓			✓
Vote FE		✓	✓	✓	n/a	n/a
Observations	564	564	543	60	287	287
						276

Notes: All specifications are the same as in Table 3 but excluding all MPs from districts within the city of Zürich.

Table S3.9: Heterogeneity: pre-reform district magnitude and the effect of reform intensity

	Congruence				Attendance			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reform intensity	0.244 (0.061)	0.258 (0.066)	0.236 (0.085)	0.189 (0.050)	-0.039 (0.020)	-0.045 (0.021)	-0.060 (0.018)	-0.053 (0.025)
Reform intensity × Pre-reform district magnitude	-0.020 (0.009)	-0.025 (0.011)	-0.009 (0.016)	-0.014 (0.008)	-0.001 (0.004)	-0.001 (0.003)	0.001 (0.004)	-0.000 (0.004)
District controls	✓	✓	✓	✓	✓	✓	✓	✓
District FE		✓	✓	✓	✓	✓	✓	✓
MP characteristics			✓			✓		✓
Vote FE		✓	✓	✓	n/a	n/a	n/a	n/a
Observations	898	898	864	829	471	471	450	439

Notes: District controls are the same as in Table 3. In models without district fixed effects, the constituent term Pre-reform district magnitude is included. Otherwise, it is absorbed by the fixed effects. Models (4) and (8) exclude districts with pre-reform district magnitude < 2. Estimation is by OLS. Standard errors in parentheses are clustered at level of post-reform electoral districts.

S3.4 Exploring mechanisms

The analysis reported in Appendix Table S3.10 shows that the effects are robust to controlling for political experience. We control for two aspects of MPs' prior political experience: (i) A dummy variable indicating if an MP has political experience at the local level (e.g., council member or elected administrative office). (ii) The number of years the MP has served in the cantonal parliament until the beginning of the current term (seniority). Clearly, adding either or both variables does not affect the results. The results are also robust to allowing seniority to have a curve-linear effect (not shown). Consistent with the finding that higher reform intensity does not lead to a consistent decline in the selection of MPs with previous political experience, these findings rule out that the effect of the reform is mechanically driven by supply-constrained parties that cannot find enough high-quality candidates.

Combined with the use of party fixed effects in extended specifications in the paper, these additional results also rule out the explanation that the reform effect on attendance is driven by fixed differences across parties, such as lower attendance of farmers due their occupational demands during harvest. To bolster this point descriptively, Figure S3.2 provides boxplots for parliamentary attendance by political party for the 1917-1920 term. It shows that average attendance is very similar for members of bourgeois parties, Social Democrats or the Farmer's Party. Mean attendance is highest among the Farmer's Party, though this small difference is not statistically significant at the five percent level.

Beyond ruling out these alternative channels, note that the evidence is broadly consistent with the implication of the argument that political selection of politicians based on partisanship and quality constitute an important channel through which electoral institutions influence representation. Given the geographic concentration of left voters in industrialized areas, the introduction of PR went hand in hand with a nearly twofold increase of the seats won by Social Democrats from 20.7% to 38.1%. The left saw a moderate increase in its overall vote share from 34.2% to 39.8%, which stems in part from an extension of competi-

tion to districts previously not contested. Overall, the increase in seats was mainly due to a more proportional translation of votes into seats. Both channels occur in the model. With the reform, the left's votes-seats-ratio drops from 1.65 to 1.04 – changing from significant underrepresentation to near-perfect proportionality. This is in line with the theoretical logic and it reflects the hopes and fears of contemporary politicians. For instance, a leading Social Democratic party newspaper saw in the disproportional votes-seats translation in the 1914 election a “cry for proportional representation,” and it calculated that, even holding the number of candidates and distribution of votes constant, the party would increase its seat share by more than 50%.³ A regression analysis reported in Appendix Table S3.11 shows that left MPs are more congruent, on average, with the cantonal median voter than other MPs before and after the reform. This suggests that changing the partisan color of parliament matters substantively, not just descriptively. In addition to the increasing representation of the Social Democrats, the new Farmers' Party won 11% of the seats.

Appendix Table S3.11 reports the results of an additional implication of the model concerning the institution-varying relationship between political parties and the quality of their MPs. The theory posits that the quality of politicians is not inherently different across political parties. Electoral institutions shape the incentives of parties to select good politicians. The argument implies that there is an institution-varying correlation between the partisan color and quality of politicians. Under MR elected L types have higher quality than the average. Recall that relevant equilibrium parliament is $\{L_1^1, M_2^0, H_3^1\}$. Under PR, this is no longer the case and the reverse can occur. The reason is not limited supply of good politicians. All parties could in principle run a full list of good types. Rather, it reflects the varying abilities of voters to credibly commit to vote against bad politicians of their most-preferred party. In line with this auxiliary implication we find that, on average, left MPs have significantly better attendance records than other MPs before the reform, controlling

³ *Grütlianer* (Zürich), April 27, 1914, p. 1.

for MPs' socio-demographic characteristics. This attendance premium disappears after the reform.

Table S3.10: Effect of electoral reform on political representation controlling for local political experience and seniority in cantonal parliament

	Congruence			Attendance		
	(1)	(2)	(3)	(4)	(5)	(6)
Reform intensity	0.21 (0.066)	0.21 (0.065)	0.21 (0.066)	-0.057 (0.015)	-0.057 (0.015)	-0.057 (0.015)
Local political experience	-0.34 (0.021)		-0.04 (0.020)	-0.002 (0.021)		-0.002 (0.021)
Parl. seniority (years)		0.001 (0.001)	0.002 (0.001)		-0.000 (0.001)	-0.000 (0.001)
District controls	✓	✓	✓	✓	✓	✓
District FE	✓	✓	✓	✓	✓	✓
MP char.	✓	✓	✓	✓	✓	✓
Observations	864	864	864	450	450	450

Notes: Dependent variable: congruence between MP and cantonal median voter (models 1-3); parliamentary attendance (models 4-6). Estimation is by OLS. Standard errors in parentheses are clustered at level of post-reform electoral districts. All congruence models include vote fixed effects. District controls and MP characteristics are the same as in main specification (Table 3).

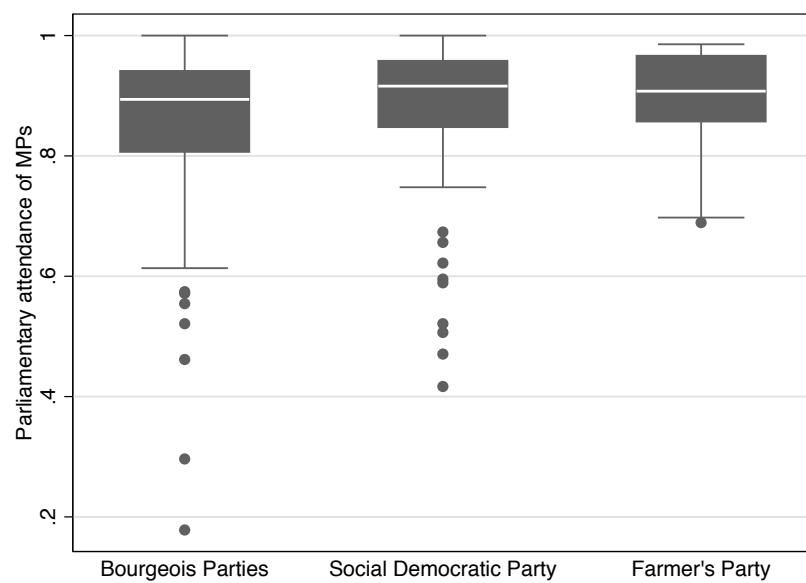


Figure S3.2: Attendance in 1917-1920 parliament by party affiliation

Notes: Boxplots by party. Mean attendance is 0.87.

Table S3.11: Left MPs, policy responsiveness and parliamentary attendance

	Congruence MP-median voter				Parliamentary attendance			
	Pre-reform		Post-reform		Pre-reform		Post-reform	
	(1914-17)	(1914-17)	(1917-20)	(1917-20)	(1914-17)	(1914-17)	(1917-20)	(1917-20)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Left MP	0.26 (0.08)	0.25 (0.07)	0.40 (0.03)	0.37 (0.05)	0.08 (0.03)	0.10 (0.03)	0.02 (0.02)	0.03 (0.02)
District control	✓	✓	✓	✓	✓	✓	✓	✓
MP characteristics		✓		✓		✓		✓
Observations	386	375	512	489	228	222	243	228

Notes: Dependent variable: congruence (models 1-4) is a dummy variable indicating whether an MP's parliamentary vote on an issue is congruent with the canton majority in the corresponding referendum (available for parliaments elected 1914 and 1917); parliamentary attendance (models 5-8) is an MP's average attendance rate in a given parliament (parliaments elected 1914 and 1917). Estimation is by OLS. Standard errors in parentheses are clustered at level of electoral districts. District controls: voter support for electoral reform (incl. second-order polynomial), language fractionalization, religious fractionalization, foreign population, employment share in industry. MP characteristics: age, worker, farmer, member of national parliament, exit due to death.

S4 Contemporary Analysis

Table S4.1 summarizes the variables and their sources for the analysis of electoral reform in the European Parliament. As noted in the text, the analysis focuses on the last parliament elected under the old rules (1994-1999) and the first post-reform parliament (1999-2004). The reason is that in 1994 many British districts were redrawn and in 2004 enlargement significantly altered the composition of the European Parliament. Note that 91% of all pre-reform districts are perfectly nested in post-reform districts, and the remaining cases are allocated mostly to one post-reform district, with the exception of Staffordshire East and Derby, which is dropped from the analysis.

Electoral rules are coded based on the European Parliamentary Elections Act of 1999 (UK) and comparative reports (European Parliament Directorate General for Research, 1997, 1999). As explained in the paper and listed in Table S4.1, all three outcome variables are calculated from Hix, Noury and Roland (2007), which provide data on all recorded legislative votes. Their database does not include identifiers for electoral districts, which are needed for our analysis. We matched MEPs to their districts based on election data.

Table S4.1: Descriptive statistics for analysis of electoral reform in European Parliament

	Mean	SD	Min	Max	Source
Reform intensity	0.13	0.50	0	2.40	Coded based on European Parliamentary Elections Act of 1999 (UK), available at http://www.legislation.gov.uk/ukpga/1999/1/pdfs/ukpga_19990001_en.pdf , and comparative reports from European Parliament Directorate General for Research (1997, 1999).
Attendance	0.69	0.21	0.00	1.00	Calculated from data compiled by Hix, Noury and Roland (2007), available at http://personal.lse.ac.uk/hix/HixNouryRolandEPdata.HTM
Shirking	0.08	0.09	0.00	0.67	Same as above.
NOMINATE (first dimension)	0.10	0.50	-0.92	0.93	Same as above.
Mean citizen ideology	5.14	0.28	4.72	5.98	European Election Study 1994 and 1999 (Schmitt et al., 1997; Eijk et al., 1999).

Notes: includes MEPs in the 4th and 5th European Parliament ($N=1,426$). In the 4th term, there is no survey data on citizen ideology for Austria, Finland and Sweden (102 cases). When estimating NOMINATE scores, Hix, Noury and Roland (2007) dropped MEPs who participated in less than 20 roll-call votes (25 cases, 3 without survey data).

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