

# Electoral Competition, Control and Learning\*

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**Abstract.** We study an agency model that incorporates three world elements: voters learn about an incumbent's competence from his record in office, and about his opponent via a campaign; the former is more informative than the latter; but it can be costly for the voter to learn about the incumbent when policies he implements are risky and go wrong. In our two period model an incumbent chooses between implementing a risky reform policy or a safe option in each period. The former is successful only if the incumbent is competent. After the first period policy has been implemented an opponent can choose whether to inform the voter of his competence. The first best level of reform balances the associated costs/benefits with optimal learning. The voter has a simple retention rule that she uses to control the incumbent by aligning his incentives with her own and to learn about his competence. In the absence of an informative campaign by the opponent the voter can attain first best, though not in its presence: then the degree of reform is too high from the voter's perspective; this can have negative consequences on welfare. These inefficiencies arise due to the different communication technologies available to the incumbent and his opponent. Our central results are robust to subtle changes in our core model specification.

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## 1. INTRODUCTION

Most formal models of electoral competition assume perfect symmetry between candidates and so do not consider the different roles played by an incumbent and his opponent, or systematically ignore the latter: in the standard spatial model, prospective voters compare the policy programmes of candidates but do not account for the incumbent’s past performance; in agency models, voters form expectations based on the incumbent’s past performance though do not learn about his opponent.<sup>1</sup> We build a new agency model that incorporates three critical aspects of the asymmetric relationship between the incumbent and his opponent found in the real world.

The first and central aspect of our model is that voters learn about an opponent who can take actions revealing his competence. An example concerns the impact of the 2010 UK General Election campaign. As illustrated in Figure 1, voters’ perceptions as to which party leader would make the best choice of Prime Minister were stable until the dissolution of Parliament and the start of the campaign on April 12th. Thereafter there was a sharp increase in the percentage of voters supporting Nick Clegg (leader of the Liberal Democrats and current Deputy Prime Minister) and a corresponding decrease in the percentage of “don’t knows”. This perception continued through the time of the first televised debate between the party leaders: 27% of voters believed that Clegg would make the best Prime Minister two days after the first televised debate, up from 12% in the same poll taken five days earlier (again corresponding with a sharp decline in the percentage of “don’t knows”). Clegg had no executive experience, yet his campaign influenced respondents. By the time of the second televised debate more people thought him to be a better choice than the incumbent Gordon Brown.

The fact that the campaign appeared to shift undecided voters toward the Liberal Democrats whilst having no apparent effect on the incumbent government’s evaluation speaks to the second aspect of our model. Voters learn about the incumbent and his opponent using role-specific technologies. The point is nicely made with respect to party competition in a recent article by Bawn and Somer-Topcu (2012); they argue that “voters can evaluate government parties on the basis of recent performance, but they must judge opposition parties on the basis of rhetoric and conjecture.”<sup>2</sup> Similarly we suppose that voters learn about an incumbent from his track record and about his opponent from his campaign: the former is more informative than the latter.

<sup>1</sup>See recent articles by Dewan and Shepsle (2011) and Ashworth (2012) for a review of the agency and spatial modeling approach to elections.

<sup>2</sup>The difference in the technology available to an incumbent and his opponent has been used to explain the empirical regularity that campaign resources translate into higher vote shares for the latter but not the former (see Jacobson (1978) amongst others).

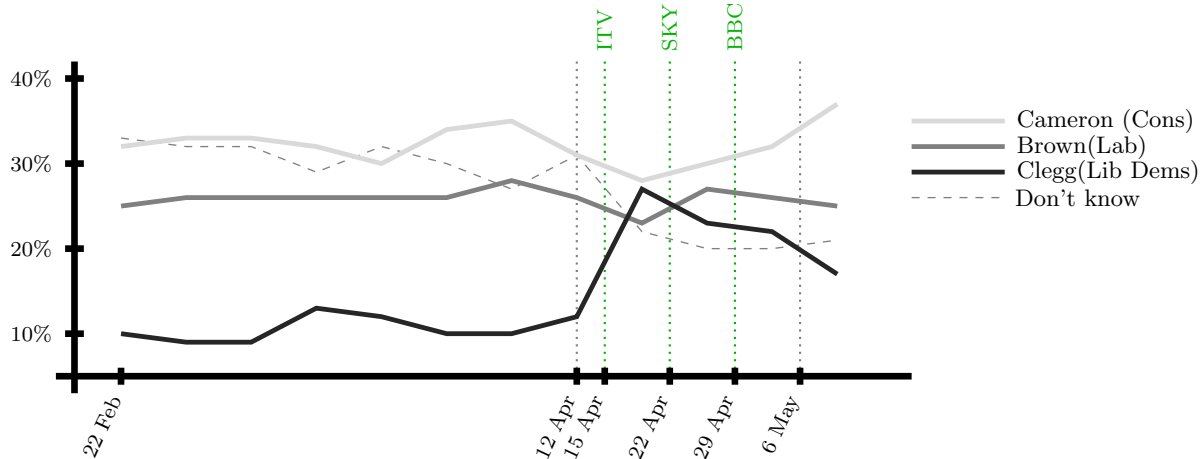


FIGURE 1. Voters Perceptions on Best Choice of PM, UK General Election 2010.

The third factor we incorporate is the difference in costs associated with these different technologies. Policies implemented by the incumbent may be beneficial, though can also harm the voter. For example the implementation of an ill-thought-out health-care reform can have negative consequences even though the voter learns (about the incumbent’s ability) from such a failed experiment. By contrast an ill-thought-out health care proposal on which the opponent campaigns, but that is never implemented, provides opportunity for learning without negative consequences. So there are welfare consequences associated with different learning technologies.

We study the impact of asymmetric electoral competition on voter choice, learning, and welfare. In our model, learning depends upon the endogenous choice of policy/campaign: some policies are harder to design and implement well than others and so better reflect a politician’s competence. Specifically, we analyze strategic interaction between an incumbent, his opponent, and a representative voter. We deploy a variant of the multi-armed bandit model in which, in each of two periods, the incumbent chooses a different policy: a “safe” option exists providing voters with a known payoff; the payoff from a “risky” option depends on the politicians (unknown) competence. The skills required for success when implementing the risky choice in periods one and two need not coincide but are positively correlated. After outcomes of the incumbent’s policy are observed his opponent chooses his campaign strategy that can be more or less revealing of his competence: a risky campaign reveals aspects of his competence that are correlated with his executive ability; a safe one reveals nothing. The voter then chooses between them.<sup>3</sup>

<sup>3</sup>We conform to convention concerning the use of gendered pronouns; the principal (voter) is female and her agents (the incumbent and his opponent) are male.

Our setup admits several interpretations. One is where in the first period the pressing policy issue is whether to implement budget reforms, while in the second the possible reforms are constitutional. In each case the reform option is “risky” as the outcome depends upon the incumbent’s ability. Successful implementation of the first period reform allows the incumbent to build a reputation for competence. Failure is costly to him and to the voter. Maintaining the status quo is the “safe” option, since doing nothing reveals little about an incumbent’s competence nor is it costly.

Similarly a “risky” campaign allows voters to infer aspects of the opponent’s competence. For example, a campaign that is developed around detailed policy themes and prescriptions allows her to learn about the opponent’s ability; this is risky, as doing so may reveal him to be inadequately prepared for holding office. For example, arguably Rick Perry lost his chance to become the Republican nominee for President precisely when he forgot the third US government agency he would eliminate if elected. Alternatively, the opponent can run a safe campaign, by perhaps highlighting his patriotism or other commonly held values, which does not allow the voter to learn much about his competence.

Our model highlights two ways that an incumbent may distort his policy choice away from the first-best when anticipating the voter’s reaction. First there is an incentive for an office-seeking incumbent to shy away from implementing reform when the (prior) probability that he is competent is low. Even though in the voter’s interest, he fears that implementing reform will reveal his incompetence: we label this *fear of failure*. Conversely, when the prior probability that he is competent is high then a politician may be *too* willing to take the risky option: anticipating success he implements reforms that on balance do not benefit the voter. We label this *gambling on success*.

These problems arise due to the stark nature of the voter’s retention choice: she cannot reelect an incumbent when reform is unsuccessful; nor remove one when the policy has been successful. Building on reasoning akin to that in Barro (1973) and Ferejohn (1986) we assume that the voter is sequentially rational and, in the presence of multiple equilibria, we focus on the one that maximizes voters utility. We show that with an optimal retention rule the voter does not treat the incumbent and his opponent equally though she perceives them as equally competent. In fact a critical element of her incentive scheme is that she favors the incumbent whenever gambling on success is her dominant concern and the opponent otherwise. So an incumbency advantage or disadvantage is optimal under different circumstances. In a world where there is no active opponent (alternatively the campaign technology is underdeveloped so that the voter does not learn about his competence), the voter’s optimal scheme attains the first-best level of reform.

Our key results relate to the impact of an opponent and strength of the campaign technology available to him. In the first-best, the level of policy reform is lower than in the case with no opponent. However, the level of reform implemented in the voter’s optimal equilibrium is too high. The intuition for this result is that the voter cannot simultaneously provide incentives for the incumbent not to implement reform and commit to ignoring information revealed by the opponent via his campaign. Anticipating this the incumbent “gambles on success”. When the voter learns about both the incumbent and his opponent there is a trade-off between electoral control and learning: although she can make a more informed choice this weakens the incentives she can provide the incumbent and induces a degree of risk that is inefficiently high. This is more likely when the prior competence of the incumbent and the expected costs of reform are high and the additional information gleaned about the opponent is low.

What is the source of this welfare loss? Does it arise due to competition or as a consequence of the different information technology available to the incumbent and his opponent. We show that it is the latter and that in its absence the optimal retention rule recovers the first best. This highlights the interaction between competition and the form of communication. Ideally the voter would operate her optimal retention rule combined with a campaign technology that is as informative as if the challenger had directly implemented policy. Our model highlights why real world elections, that incorporate our three main elements, will fall short of this benchmark.

Our results rely on the assumption that the voter can adopt a retrospective voting strategy in cases where she is indifferent between reelecting the incumbent or not. The notion that voters can adopt such strategies has been criticised: if voters have intrinsic pro or anti-incumbency biases they would be unable to commit to using such strategies even though they may be optimal ex-ante Fearon (1999). Allowing for such biases, nevertheless, our main predictions survive. In particular, the introduction of an opponent who can choose to run a campaign that informs the voter of his ability leads to excessive risk-taking by the incumbent.

## 2. RELATED LITERATURE

Our model highlights three key features of elections within the context of an agency model of elections. Its most salient feature is the role played by an opponent. This aspect relates our work to Ashworth and Shotts (2011) where an incumbent engages in costly information acquisition before choosing a policy. The role of the challenger is to assess and criticize the incumbent’s platform that also depends on information acquisition. When the opponent’s claims are verifiable, the incumbent

exerts more effort and so challengers improve welfare. Our focus is on adverse selection where voters learn about the incumbent’s type (competence) rather than the correctness of his decision.<sup>4</sup>

A second aspect of our model is that the incumbent and opponent have access to different technologies by which they convince voters of their competence. The assumption builds on a vast literature that highlights that the translation of campaign resources into votes is much higher for opponents than incumbents. In a related model, Daley and Snowberg (2011) look at the constrained choice of an incumbent between these two options in a multi-task model. They show that the optimal allocation of resources by a high quality incumbent does not maximize voter welfare (campaigning is too high), though voters cannot commit to disregard the information that campaigns convey. Our contribution is in modeling the interaction between competing politicians with different technologies.<sup>5</sup> In our model voters cannot commit to ignoring information from the opponent’s campaign and this induces a higher than optimal level of reform by the incumbent. Over-reform due to competitive interaction in a campaign between politicians is also a feature in ?.

The third key aspect of our model is that the incumbent can choose policies that are costly to the voter and thereby enhance his electoral prospects. This relates our model to the literature on “pandering” where informed politicians implement populist choices that are not in voters’ interests (Canes-Wrone, Herron, and Shotts, 2001; Maskin and Tirole, 2004). Extensions of this framework have looked at different aspects of elections and constitutional design (Fox, 2007; Fox and Stephenson, 2011). While these models build in policy differences, office-seeking concerns and asymmetric information, one of our contributions is in showing that similar inefficiencies arise even with symmetric information and shared preferences: the career concerns of the incumbent are sufficient for him to implement an inefficient level of reform.

Although our model is one of adverse selection, we analyze the optimal voter retention rule that balances policy reform and learning. This relates our work to the classic models of electoral accountability by Barro (1973) and Ferejohn (1986). There voters have no information (other than their prior) about the opponent and are always indifferent between their options going forward. In our model voters are indifferent only under a relatively small set of circumstances; this suffices for them to obtain the first best only when the campaign of the opponent is uninformative. We study

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<sup>4</sup>More generally our model contributes to the analysis of accountability where voters have access to multiple information sources. In Ashworth and Shotts (2010) the media introduces a commentary on the incumbent’s policy record before an election is held. The authors show that whilst this can sometimes attenuate populist pandering, it can also exaggerate such behavior. Relatedly Besley, Persson, and Sturm (2010) show that incumbency retention depends on electoral competition and information.

<sup>5</sup>Relatedly ? analyze electoral competition with asymmetric access to campaign funds.

policy implications with respect to a general set of reforms. Related recent work by ? uses the electoral reform model to explore aspects of privatisation.

We explore learning within the context of the multi-armed bandit model, used in policy analysis by Aghion, Bolton, Harris, and Julien (1991), developed further by Banks and Sundaram (1993) and Banks and Sundaram (1998), and adapted by Strumpf (2002) to look at policy innovation and its relation to government decentralization, and by Strulovici (2010) to analyze experimentation by groups of decision-makers. Our focus on electoral competition within this context relates our paper to Banks and Sundaram (1990); they analyze an infinite armed bandit problem where a principal selects a candidate with a single action that yields a reward (to the principal) according to the agent's type. In a recent contribution Hirsch (2011) analyzes learning where the principal and agent share the same intrinsic motivation but may differ with respect to their preferred policy instrument. The policy environment in our model is closest to that used by Lizzeri and Persico (2009) who study the impact of different electoral systems on risk control.

In our model elections allow for learning about an incumbent's type via his policy choice. Others focus on learning about policy: Volden, Ting, and Carpenter (2008) analyze a situation where governments learn from their experiences and those of other governments; Callander (2011a) analyzes learning by trial and error in a business environment and Callander (2011b) in a spatial model of elections; and Callander (2008) analyzes learning in a bureaucratic-sponsor relationship.

Our work offers new insights to incumbency advantage, studied by Ansolabehere and Snyder (2002) and Zaller (1998) amongst others. In existing studies this advantage refers to any increase in vote share due to the status of incumbency— perhaps due to campaign spending (see Ashworth (2006) and Erikson and Palfrey (2006)), or uncertainty over candidate quality (Samuelson, 1987; Gordon, Huber, and Landa, 2007). In our model an incumbency advantage arises as part of the incentive mechanism that exists once all uncertainty over type is resolved and voters are indifferent between their options. An incumbency disadvantage arises for the same reasons and when incumbents are on average of high competence. Relatedly, Gordon and Landa (2009) show that common sources of incumbency advantage, such as perceived competence, may in fact work in a challenger's favor.

### 3. A MODEL OF LEARNING AND ELECTIONS

We develop an agency model in which an incumbent politician of an unknown type takes one of two possible actions in each of two periods. As in the standard agency model a voter can learn about the incumbent's type by his first period action and has the option of either retaining him or replacing him with an alternative. Our key innovation is in modeling the strategic interaction between the first period incumbent and her opponent. Specifically we model the strategic interaction between two politicians  $j \in \{i, o\}$ , where  $i$  is the incumbent at the beginning of the game and  $o$  her opponent; and a representative voter who chooses between them according to their perceived ability. Neither the voter nor the politician know the ability of the latter prior to any actions taken.

In each of two periods, one of two policies can be adopted: the first is a "safe" policy; whilst the second is "risky". To illustrate we can think of the risky policy as being the implementation of a type of reform, whilst the safe policy involves sticking with the status quo. One example, mentioned in our introduction, is where the first period salient issue is whether to implement budget reforms or not. In the second, it is whether to implement constitutional reform. The absence of reform entails the current budget and constitutional arrangements remaining in place. The outcome from implementation of the risky policy can either be a success or a failure. The determining factor in this outcome is the competence of the politician at implementing such a policy. The first period policy reform is successful if the incumbent has the requisite skills to execute it. And the same is true of the second period reform. A successful outcome of a risky policy is always beneficial to the voter and the politician implementing it, relative to the payoff from the status quo.

The innovation in our model is the introduction of an active opponent in the first period. After the incumbent has taken her first period action and the outcome is revealed, the opponent launches a campaign that has no direct cost attached. As with the policy choice of the incumbent, a campaign can be either safe or risky. An example of a safe campaign is where the opponent emphasizes values, such as patriotism or the need for a strong economy, that are broadly shared, though does not provide detailed policy prescriptions. We think of such a campaign as safe as it is unlikely to have a strong impact, either positive or negative, on how the voter perceives his competence for office. A risky campaign, by contrast, is one where the opponent provides detailed policy alternatives or a strong criticism of the incumbent's record. Such a campaign is more revealing in that it showcases his ability to plan policy effectively and to communicate clearly. A risky campaign is successful in that the opponent is able to make the case for reform or launch a successful attack on the incumbent, otherwise it ends in failure. As with the incumbent, the determining factor in



## TIMELINE OF GAME PLAYED BETWEEN INCUMBENT &amp; OPPONENT

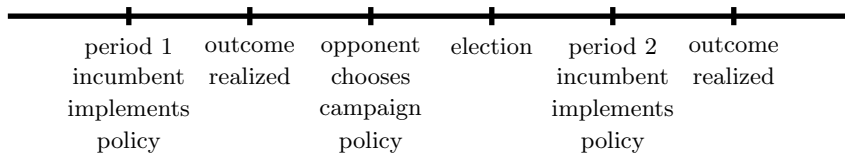


FIGURE 2. Timeline

a successful campaign is the competence of the politician. After the outcome of the opponent's campaign is revealed the voter chooses whether to retain the incumbent or not. Figure 2. describes the time-line for our game. After the incumbent's policy is chosen and outcomes are revealed she is challenged by an opponent during the campaign. Voters then evaluate the type of both incumbent and challenger before electing one or other in a winner-take-all contest. The winner of that contest implements the second period policy and the game ends.

After the voter has observed the politicians actions she chooses between them. In doing so, a sequentially rational voter cares about her expected second period payoff. She benefits from implementation of the second period reform only if it is implemented by a competent politician. Her posterior beliefs, based on her first period observations in each of the relevant subgames, determine her optimal retention rule. The voter's concern is the correlation between successful first period performance and the successful implementation of the second period reform. Whilst some skills, such as the effective consultation, communication, and orchestration of a bill through the legislative chamber, are required for successful implementation of all reforms, others require specific skills. This observation suggests a positive though imperfect correlation between the incumbent's competence in both periods. Similarly, successful campaigning by the opponent also involves skills, such as effective policy planning and communication, that are relevant though imperfectly correlated with the ability to successfully implement reform in period 2.

To formalize the idea of task/period specific qualities, we assume that the type of a politician  $j$  in period  $t$  is  $\theta_j^t \in \{0, 1\}$ . When  $\theta_j^t = 1$ , the politician is competent and so successful when taking the risky action in period  $t$ . When  $\theta_j^t = 0$  he is not. For notational simplicity, but without loss of generality, we assume that the politician's competence is perfectly correlated with the outcome of the risky action.<sup>6</sup> The prior probability that a politician is competent on any task is  $p$ .

<sup>6</sup>For our results to hold we simply need to assume that the probability of a successful risky policy is strictly greater when  $\theta^t = 1$  than when  $\theta^t = 0$ .

Our assumption that the incumbent's competence across periods is positively correlated then leads to the following specification for the voter's beliefs

$$\begin{aligned} Pr\{\theta_i^2 = 1 \mid \theta_i^1 = 1\} &= p^H > p = Pr\{\theta_i^2 = 1\} \\ Pr\{\theta_i^2 = 1 \mid \theta_i^1 = 0\} &= p^L < p = Pr\{\theta_i^2 = 1\}. \end{aligned}$$

If the incumbent implements the safe policy then the prior on his competence with respect to the second period task is unaffected. The posterior probability that the incumbent is competent in the implementation of the second period reform is greater when running on a successful record of implementing reform ( $p^H > p$ ). It is smaller when he runs on a record of previous failure ( $p^L < p$ ). A successful campaign shows that the opponent can plan and communicate policy. As discussed above this also makes it more likely that he will successfully deliver the reform policy should he be elected and choose to do so. Incorporating this assumption we then have that

$$\begin{aligned} Pr\{\theta_o^2 = 1 \mid \theta_o^1 = 1\} &= p^h > p = Pr\{\theta_o^2 = 1\} \\ Pr\{\theta_o^2 = 1 \mid \theta_o^1 = 0\} &= p^l < p = Pr\{\theta_o^2 = 1\}. \end{aligned}$$

When running a safe campaign the voter's prior is unaffected. The posterior probability that the opponent is competent to implement the reform is higher when he has showcased his ability in the campaign. And lower when he was unsuccessful at running the risky campaign. Our setup draws attention to an interesting aspect of electoral competition, namely the ability of the opponent to influence the voter's perception of his ability –via his endogenous choice of campaign. We assume that information revealed during the course of the campaign is less informative than the one obtained from observing the incumbent's track-record: formally,  $p^L < p^l < p < p^h < p^H$ .<sup>7</sup>

Given these beliefs it is straightforward to describe the sequentially rational actions of a voter in each of the relevant subgames. In several subgames the action of the opponent is irrelevant: the voter always retains an incumbent who successfully implements reform irrespective of the opponents action; and she never retains one who fails when implementing reform.<sup>8</sup> In the remaining subgames, however, the actions of the opponent will influence her decision. When the incumbent plays safe, a risky campaign can determine the election outcome: if the opponent succeeds then he replaces the incumbent; if he fails then he does not. Moreover when both play safe then the voter is strictly

<sup>7</sup>In the Appendix we derive these inequalities from the fact that the voter learns more from the track-record than the campaigns.

<sup>8</sup>For simplicity in our presentation we assume that the voter elects the candidate with highest posterior of being competent in period 2's policy task. Note that this is the optimal course of action for a sequentially rational voter yet in some circumstances such voter would be indifferent between the incumbent or the opponent (e.g. when opponent plays safe and incumbent has been unsuccessful, the voter always gets a payoff of 1 in period 2). All our results are robust to relaxing this convenient assumption.

indifferent between retaining the incumbent or not. Then she can choose any retention probability  $x \in [0, 1]$ . As we shall see, the way in which the voter breaks this indifference has important consequences on politicians' actions and voter welfare.

Table 1 summarizes the sequentially rational retention rule that is implemented by the voter in each of the subgames where she takes an action. Our design is one in which the role of the opponent is limited due to the relatively weak technology available to him. Nevertheless, as we shall see, outcomes are markedly different in a world where the opponent can reveal information about himself via his campaign strategy.

<b>Incumbent</b>	<b>Opposition</b>		
	<i>safe campaign</i>	<i>success in risky campaign</i>	<i>failure in risky campaign</i>
<i>safe policy</i>	$x$	0	1
<i>success in risky policy</i>	1	1	1
<i>failure in risky policy</i>	0	0	0

TABLE 1. Probability of reelecting the incumbent

Finally we complete the specification of payoffs. Implementation of the status quo yields a payoff of 1 to the politician implementing it and to the voter. A successful reform yields payoff  $r > 1$  to both. A failed reform, however, yields a payoff of 0. The key difference between the politicians and the voter is that the former obtain a positive payoff only when they implement the policy. Thus the second period payoff of a former incumbent removed from office, or that of an opponent who is not elected is zero.

#### 4. NONINFORMATIVE CAMPAIGNS

We begin our analysis by focusing on the case where the opponent's action is not relevant to the voter's retention rule. This is so when the outcome of a risky campaign provides no information about his competence for office. So we analyze the actions of the incumbent and the voter's retention choice given an alternative who is competent with prior probability  $p$ .

It is useful to first establish the efficient outcome from the voter's perspective. This combines the policy choices of the incumbent and the retention rule that maximizes voter utility. The tension arises in our model due to the politician's desire to retain office, so in the second period the incentives of the incumbent and voter are perfectly aligned under any circumstances. In order to

evaluate the first best we then simply ask what first period incumbent actions and retention rule maximize voter utility.

If the incumbent chooses safe then he learns nothing and so implements safe again in the next period, yielding a total payoff of 2. Playing risky allows him to learn his competence on the period 1 reform and so update his beliefs that he is competent in implementing the second period reform. An incumbent who maximizes voter welfare plays:

$$\text{risky in period 1} \Leftrightarrow p(r + \max\{1, p^H r\}) + (1 - p) > 2 \quad (1)$$

which gives the following result:

**Lemma 1.** *In the first best the incumbent implements the risky policy in period 1 when  $pr > \frac{1+p}{1+p^H}$  and  $p^H r > 1$  and plays safe otherwise.*

When  $pr > 1$  the voter always wants implementation of the risky policy in the first period; when  $pr < 1$  she wants first-period implementation of the risky policy only when  $p^H r > 1$ , that is a success in the risky policy ensures the implementation of the risky policy in period 2.

The voter's objective is to see the successful implementation of reform and to learn about the competence of the incumbent. The first-best balances these objectives. We observe that the efficient outcome involves the implementation of the risky policy even if its expected payoff is less than that obtained when playing safe ( $pr < 1$ ). This highlights the importance of learning. An incumbent who chooses the risky policy in the first period and is successful will do so again in the second period. In choosing the risky option the voter learns about the incumbent's type and this improves her expected payoff.

The comparative statics are straightforward. An increase in the correlation in task-specific competencies increases the value of first period learning: fixing  $r$  then a welfare maximizing incumbent engages in more first period risk-taking for larger  $p^H$ . Fixing  $p^H$ , then the incumbent engages in more risk-taking when the policy payoff conditional on success is larger. So beneficial reforms (large  $r$ ) are implemented more often.

What can be achieved when the incumbent is concerned with retaining office instead of maximizing voter welfare? The rents from office may lead the incumbent to distort his behavior, but the voter can use her retention rule to realign his incentives. Given her beliefs, the voter retains an incumbent who successfully implements first period reform and replaces one who tries but fails to do so. When

the incumbent plays safe the voter is strictly indifferent between her strategies. Then, as we see in Table 1, she can reelect the incumbent with any probability  $x \in [0, 1]$ . Given the voter's retention rule, an incumbent who cares about maintaining office plays

$$\text{risky in period 1} \Leftrightarrow p(r + \max\{1, p^H r\}) > 1 + x. \quad (2)$$

Since (in the subgame) following safe play by both the incumbent and his opponent, the voter believes each to be equally competent, a very plausible equilibrium is one where she elects each with equal probability ( $x = 1/2$ ). Figure 3 provides a graphical illustration of this strategy.<sup>9</sup> The 45° (dotted) line defines  $pr = 1$  where expected returns from safe and risky are equal. Above this line first period expected payoffs from choosing risky are lower than those from choosing safe. Two more curves are depicted. The dashed curve illustrates the efficient level of risk taking described above: to its right the incumbent takes (efficient) risks and to its left he plays safe. The solid curve separates the parameter space according to the incumbent's optimal actions—to its right she chooses risky, to its left she plays safe—and cuts the efficiency curve from below and just once. The level of risk is either too high (at *highp*) or too low (at low  $p$ ) relative to the efficient benchmark.

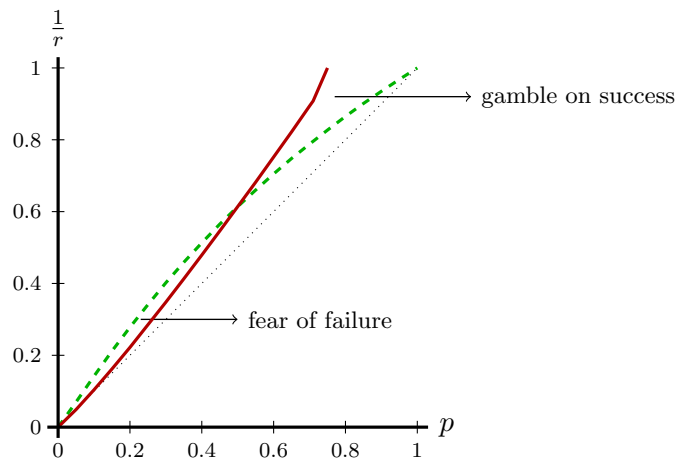


FIGURE 3. Equilibrium with a Noninformative Campaign and  $x = 1/2$ .

At low levels of competence the politician under invests in the reform policy. He fears that the risky action will result in failure and loss of reputation compounded by loss of office. We refer to this effect as a “fear of failure” that may lead to inefficiently low levels of reform. At high levels of competence, by contrast, the politician over invests in the risky policy relative to the efficient

<sup>9</sup>In the figure we consider  $p^H = p^{0.3}$ .

benchmark. In these situations, although on average the incumbent's competence is high, the value of the risky option is relatively low. Whilst voters would rather he play safe, the incumbent anticipates success and reelection when implementing reform and thus provides an incentive to do so. We refer to this as "gambling on success". These effects are labeled in the appropriate parameter regions in Figure 3.

Note that both these effects stem from the incumbent's career concern: his probability of retaining office following implementation of reform depends upon the voters posterior beliefs; when successfully implementing reform, these jump from  $p$  to  $p^H$  and the incumbent is sure to be elected; the incumbent places too much weight on the impact of the policy outcome on his reelection probability and insufficient weight on the benefits of policy. Such inefficiencies can arise in equilibrium due to the bluntness of the retention rule at the voter's disposal. Building on reasoning akin to that in Barro (1973) and Ferejohn (1986) we next ask what is the best the voter can achieve.

**Proposition 1.** *When campaigns are non informative ( $p^h = p$ ) about the opponent's competence, the voter can achieve the first best by optimally choosing the reelection probability of the incumbent. She does so by setting  $x = p$  in all circumstances where she is indifferent.*

To provide intuition for this result note that where the incumbent's risk-taking is excessive relative to the efficient benchmark, the voter would prefer that he plays safe and so should reward him when doing so. In the subgame following safe play by the incumbent the voter is indifferent, so she can choose any  $x$ . For example choosing  $x = 1$  eliminates his incentive to gamble by engaging in excessive first-period reform. Following the same logic, whenever the incumbent has an incentive to shy away from implementation of reforms (because of his fear of failure) then it is optimal for the voter to punish him when doing so. Choosing  $x$  optimally she provides incentives for the incumbent to reform. For example choosing  $x = 0$  when the incumbent fails to implement reforms helps him overcome his fear of failure: such punishments (exercised off the equilibrium path) ensure that he implements desired first-period reforms. The voter can provide the correct incentives via her retrospective voting strategy.

We also observe that the voter can achieve better outcomes when she does not treat the incumbent and his opponent equally *although she perceives them as equally competent*. In fact proposition 1 states that, despite the bluntness of her retention rule, she can obtain the first best. This is achieved by either discriminating in favour or against the incumbent when indifferent. The key element in the voter's optimal scheme is that she needs to eliminate the desire of the incumbent to prove

himself at high levels of  $p$ , whilst encouraging him to do so at lower levels of  $p$ . She can achieve this by advantaging the incumbent in the former circumstance, whilst disadvantaging him in the other. In doing so she provides the correct incentives so that the first period reforms correspond to those implemented in the efficient benchmark. This notion of incumbency advantage/disadvantage distinguishes the role of incentives from any intrinsic voter preference.

Next we ask how, if at all, our results change once we allow for an informative campaign by a political opponent.

## 5. INFORMATIVE CAMPAIGNS

We consider what happens in (a politically more realistic) model in which an opponent can influence the voter's perceptions via a campaign. We begin as before by analyzing the first best. This is the combination of first and second period reform by the incumbent, the campaign choice of the opponent, and a retention rule that maximizes the voter's utility. As before, the efficient outcome balances the voter's objectives, namely the successful implementation of reforms and learning about the incumbent's competence. The key difference is that now she may also learn about the competence of the opponent and so is able to make a more informed choice.

**Lemma 2.** *When campaigns are informative ( $p^h > p$ ) about the opponent's competence but less so than the incumbent's track record ( $p^h < p^H$ ), the opponent's first best action is to run a risky campaign whenever  $p^h r > 1$  and (1) the incumbent plays safe or (2) the incumbent plays risky and is unsuccessful. The first best action of the incumbent in period 1 involves choosing the risky action whenever  $pr > \frac{1+p}{1+p^H}$  and  $p^h r < 1$  or whenever  $pr > \frac{1+p-p^2}{1+p^H-pp^h}$  and  $p^h r > 1$ .*

The key insight obtained by comparing Lemmas 1 and 2 is that the set of circumstances under which it is efficient for the incumbent to implement reform is smaller when the opponent has access to an informative campaign technology. This result follows from the fact that, when information gleaned from the campaign is large relative to the value of reform, the campaign of the opponent provides a relatively good and cheap source of information. It is cheap because the voter can make a more informed choice without bearing potential costs of failed reform; so the marginal benefit of reform declines when the campaign is informative. An implication is that competition can be good for the voter as she benefits when utilizing two different information sources.

Having shown that the first best involves a lower degree of reform by the incumbent than was previously the case, we next look at the policy choice and campaign strategy that are compatible

with the voter's optimal retention rule. Can the first best be achieved in a competitive environment where the voter learns about the prospective performance of both incumbent and opponent?

**Proposition 2.** *When campaigns are informative ( $p^h > p$ ) about the opponent's competence but less so than the incumbent's track record ( $p^h < p^H$ ) and  $p$  is small, the voter achieves the first best outcome when choosing her optimal retention rule  $x$ . When  $p$  is large, there is (non-empty) range of values of  $r$  for which the incumbent over invests in the risky policy relative to the efficient benchmark.*

The result shows that competitive interaction can lead to unintended policy consequences in that it induces a level of first period reform that is not first-best. In particular, with an informative campaign the level of first period reform is too high from the voter's perspective. To understand why recall that in its absence the voter exercises an incumbency advantage at higher levels of  $p$  in order to align his incentives with her own. In particular she sets  $x = 1$  and so avoids gambling on success. This is because she thereby removes the requirement for the incumbent to implement costly reforms to prove his ability.

Now consider the impact of an incumbency advantage on actions taken by a rational opponent. He runs a risky campaign when the expected payoff from doing so exceeds that of playing safe. This is so whenever  $p \cdot p^hr > 1 - x$ . So we see that a higher incumbency advantage provides an incentive for the opponent to run a risky campaign. Indeed as  $x \rightarrow 1$  he will always do so as this is the only way that he can convince the voter to elect him. Thus we observe that reducing the incumbent's desire to prove himself, has the opposite effect on his opponent.

This, in turn, has a second order effect on the incumbent's policy choice. In the parameter region where gambling on success is a problem (that is where  $p$  is high and so  $x = 1$  was optimal when campaigns were uninformative) safe play is not a best response to the anticipated risky campaign by the opponent. So the voter's retention rule does not provide the correct incentives. And there is a higher than desirable level of reform.<sup>10</sup>

In sum, when career concerns distort the incumbent's policy choice, incentives can counteract his desire to prove himself by implementing reform. When there is no opponent then the voter can provide such incentives by rewarding (reelecting) the incumbent for not implementing reform. This is because she has no information, other than her prior, about the opponent's competence. But

<sup>10</sup>When  $p^hr < 1$  the voter's expected payoff does not depend on who is elected. Our assumption (see footnote 8) that she prefers a more competent politician (one with better posterior) implies she will nevertheless elect a successful opponent over an incumbent who plays safe.



when the opponent uses his campaign to provide relevant information about his competence then the voter cannot commit to electing the incumbent and ignoring such information. Anticipating this, and the fact that should he be successful when implementing reform then he will always be elected, the incumbent gambles on success.

Our model illustrates a trade-off between incentives and learning: electoral competition is desirable from a learning prospective but it weakens the voter's control over the incumbent. This implies that the welfare effects of competition are (a priori) ambiguous: on the one hand, when the incumbent gambles on success the level of reform is higher than desired; on the other, under the same set of circumstances the voter makes a more informed choice. Our next result resolves this ambiguity.

**Proposition 3.** *There exists a threshold  $t \geq 1$  such that when the level of reform is too high (there is gambling on success) and  $p^h r < t$  the introduction of informative campaigns unambiguously reduces welfare relative to non informative ones. When reform is too high and  $p^h r > t$ , the introduction of informative campaigns unambiguously increases welfare relative to non informative ones. The threshold  $t$  takes the value  $\frac{2-(1-p)^2-pr(1+p^H)}{p(1-p)}$ .*

Starting from a position where there is no relevant information in the opponent's campaign about his anticipated policy performance then the introduction of even a small amount of information can be detrimental. Of course this is immediate whenever  $p^h r < 1$ : then (even when  $x = 1$ ) information about the opponent can be enough to induce the incumbent to gamble on success without providing information relevant to the voter's expected payoffs. Our result shows that the impact of introducing informative campaigns can be more far reaching. Indeed the implication of our finding is that introducing informative campaigns is welfare improving only when the information is highly correlated with policy performance. Otherwise the negative impact on welfare that is due to increased policy activism by the incumbent outweighs the benefits of more information.

A related question concerns the improvement in the informativeness of opposition campaigns once introduced.

**Proposition 4.** *Improving the informativeness of an already informative campaign (weakly) increases welfare.*

Once we account for the second order impact of the introduction of an informative campaign on the incumbent's policy choice then increasing the informativeness of the campaign can only benefit

the voter. This increase no longer modifies the incumbent's actions yet improves the information available to the voter.

Our model focuses on the asymmetric competition between an incumbent who stands on a policy record and an opponent who campaigns. The policy implemented by the incumbent provides a rich source of information but may be costly to the voter. The opponent's campaign yields less information but at no cost. Do the welfare effects arise because of competition or the asymmetry in learning due to the differential technology available to the incumbent and opponent? We can explore this by evaluating the case where the informational technologies are equally informative ( $p^h = p^H$ ) so that the second aspect of party competition is absent.

**Proposition 5.** *When campaigns are as informative about the opponent's competence as the incumbent's track record ( $p^h = p^H$ ) then the voter can achieve the first best by optimally choosing the reelection probability of the incumbent when indifferent.*

To see why we recover the first best, note that when the available technologies are equally informative of second period competence then the incumbent is no longer guaranteed election when reforming and successful. This has two implications.

First it diminishes the second order effect already discussed. When competition is asymmetric, due to the incumbent having access to a stronger technology, then an incumbent who anticipates an aggressive campaign by the opponent knows that a successful record of policy implementation will always trump the achievements of his rival. So he gambles on success. This is no longer the case when politicians have the same technological advantage.

More important, however, is that when  $p^h = p^H$  and both politicians take risks that are successful the voter is strictly indifferent between them. This means she can operate incentives. Revising the earlier Table 1 we see that there are a wider set of circumstances under which the voter is indifferent: in particular this is so when both play safe, when both take risks and are successful, and when both take risks and are unsuccessful. Then the voter can choose any  $x \in [0, 1]$ . By exercising discretion in a way that punishes the incumbent (ie. choosing  $x = 0$  whenever both politicians are successful, or both are unsuccessful) she eliminates the incumbent's incentive to gamble on success.

The result establishes that competition per se is not detrimental to welfare. Rather it is the interaction between competition and communication via different technologies that leads to a welfare loss. Two implications follow. First voter welfare is improved when campaigns are as informative

about the opponent's competence *as if* he had directly implemented policy. Second, under such circumstances, voter welfare is higher than in the case with a noninformative campaign: the voter has two equally valuable information sources and there is no restriction on her electoral control.

Further to our normative enquiry we ask what electoral institutions should be chosen to maximize welfare and accountability. As we have seen in our discussion of proposition 2 above, inefficiencies arise due to the fact that the voter has a single instrument to control the actions of two competing politicians with different communication technologies. In the absence of this technological difference, the voter's retention rule allows her to obtain the first best.

**Corollary to Propositions 4 and 5.** *Suppose that a planner could choose the strength of the campaign technology  $p^h$ , then the optimal electoral design is given by a campaign technology that is as informative as the incumbent's track record in office,  $p^h = p^H$ .*

As a final point, in concluding this section we note that if the opponent could be restricted to strategies that revealed information about his opponent, while not his own abilities, then straightforward calculations will show that the first best can be obtained. In short, our model suggests reasons why real world campaigns will fall short of the efficient benchmark.

## 6. PLAYING A SUBOPTIMAL EQUILIBRIUM

Our central result highlights the trade-off between electoral control and learning in a model where the voter can both select competent politicians and provide incentives. Incentives arise in our model due to the discretion a voter has when her posterior beliefs (with respect to the second period competence of the incumbent and opponent) coincide. We have seen that in the optimal voter retention scheme the voter advantages ( $x = 1$ ) or disadvantages ( $x = 0$ ) the incumbent according to the circumstances.

It is possible, however, that voters do not exercise such discretion owing to an intrinsic bias that has them select a particular candidate when unable to distinguish between them. In such situations the voter cannot choose her optimal retention rule and is restricted to the play of suboptimal equilibria. By definition these will produce lower welfare due to the voter's lack of control. Nevertheless it is interesting to explore how the first period policy choice responds to the play of such equilibria and thereby the impact of voter bias on risk-taking and learning.

**Proposition 6.** *When there is a pro-incumbency bias ( $x = 1$ ) and campaigns are noninformative ( $p^h = p$ ) about the opponent's competence then (i) the incumbent under invests in reform relative to the first best; and (ii) introducing informative campaigns ( $p^h > p$ ) increases risk taking by the incumbent and improves information revelation by his opponent. When there is an anti-incumbency bias ( $x = 0$ ) and campaigns are non informative ( $p^h = p$ ) then (iii) the incumbent overinvests in reform relative to the first best for all values of  $p$ ; and (iv) introducing informative campaigns does not modify his actions but improves information.*

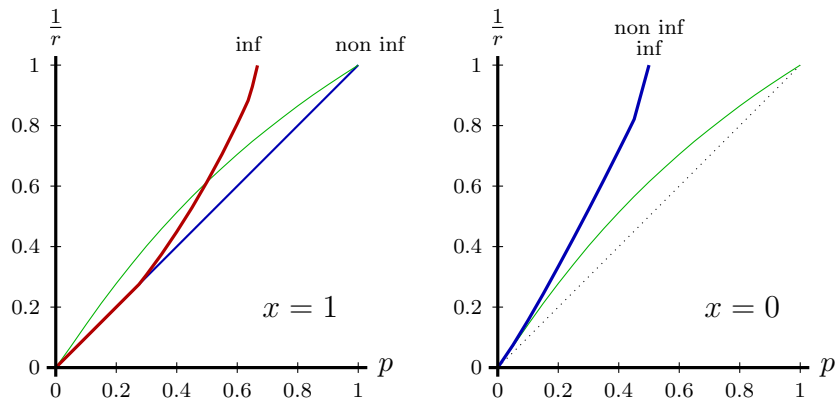


FIGURE 4. Suboptimal Equilibria with Informative Campaigns. The left hand figure shows outcomes where there is a pro-incumbency bias ( $x = 1$ ). The right hand figure shows outcomes where there is an anti-incumbency bias ( $x = 0$ ).

When campaigns are noninformative and the voter is biased towards the incumbent, has no need to prove himself and so long as  $pr < 1$  does not expose himself to risk –the voter neither exerts control nor learns about the incumbent when  $pr < 1$ . The level of first period reform falls short of the desired level. Consider a change to the institutional environment so that campaigns are informative. The opponent will now always choose the risky campaign as this is the only way he can be elected. Anticipating this the incumbent invests more in reform. Indeed, competition induces risk-taking that sometimes exceeds the desired level. In this case, an analogous result to Proposition 3 can be proved: there exists parameter values for which the introduction of informative campaigns unambiguously reduces voter welfare.

If the voter favors the opponent ( $x = 0$ ), by contrast, then in the absence of an informative campaign the incumbent has a desire to prove himself at all values of  $p$  as this is the only way he can be elected. As the incumbent chooses reform irrespective of the anticipated reaction of the opponent, the introduction of an informative campaign has a small effect. Nevertheless, since the voter learns from the campaign of the opponent, welfare improves.

In sum, we see that the choice of equilibrium modifies the incumbent’s choice of policy in the first period and that this depends upon whether there is an informative campaign or not. Figure 4 illustrates these effects.<sup>11</sup> To the right of the respective curves (labeled *inf.* and *noninf.* respectively) are the set of parameters under which the incumbent chooses first period reform. In the left hand panel with  $x = 1$  we observe that the introduction of an informative campaign induces greater reform. In the right hand panel with  $x = 0$  the curves coincide and we always observe more reform than when  $x = 1$ . A general observation is that as we increase the bias toward the incumbent (as  $x$  increases) then there is greater conservatism in his actions. The exercise of voter bias reduces the incumbent’s accountability and voter welfare.<sup>12</sup>

Our contribution in this section is in studying the policy consequences of the interaction between equilibrium selection and informative campaigns by the opponent. We have focused on differences in first period policy that arise due to the choice of equilibrium. Of course there are other subtle differences to our specification that might have an impact on first period choices. Next we show that policy outcomes stemming from such differences are analogous to those discussed here.

## 7. ROBUSTNESS CHECKS

In this section we explore whether our results are robust to slightly different specifications of our model. An obvious concern is that they hinge upon a non-robust indifference from the voter’s perspective with respect to the second period policies. This core feature of the Barro (1973) and Ferejohn (1986) models, in which the voter is strictly indifferent between her actions under all circumstances, has been subject to criticism. Indeed both Fearon (1999) and Besley (2006) have shown that a small difference to voter payoffs will lead the incumbent’s incentive scheme to unravel. Such indifferences also arise in our model in the case when both politicians play safe and so the voter cannot distinguish them with respect to their competence. Nevertheless our central insights hold. Quite straightforwardly, such a small change to the primitives of our model involving a higher (lower) payoff to the voter when the incumbent (opponent) implements the safe policy in

<sup>11</sup>In the figure we consider  $p^H = p^{0.3}$  and  $p^h = p^{0.7}$ .

<sup>12</sup>Our findings resonate with those in a recent paper by Ashworth, Bueno de Mesquita, and Friedenber (2013) who define a concept of an accountability trap that has a “low level of effective accountability relative to some other equilibrium within the same institutional environment” and where “the equilibrium with higher effective accountability has a higher level of voter welfare.” They define the necessary and sufficient conditions for such traps to exist in a canonical agency model in which voters learn via the policy choice of incumbents. These conditions are satisfied by our core modeling ingredients: two periods, heterogeneous politicians, and symmetric information between voters and politicians.

the second period has the same first period policy consequences as an incumbency bias ( $x = 0, 1$ ) in equilibrium selection.

Qualitatively similar results emerge with other subtle changes to the primitives of our model. Consider the case where the prior probability of being competent in the second period task differs between the incumbent and the opponent. Assuming that any revelation of information overrides these initial differences, then the analysis of these cases is analogous to that of equilibrium selection discussed above: when the incumbent has higher priors than the opponent,  $x$  is equal to 1; when the opponent has higher priors than the incumbent,  $x$  is equal to 0.

We have assumed that the prior probability of executive competence when implementing the period specific tasks coincides with that of successfully running a risky campaign. Of course these qualities may be very different. A simple extension relaxes this assumption by considering, for example, a situation where the prior probability that the opponent is successful in running a risky campaign is large relative to that of the incumbent successfully implementing reform. It is then very likely that the opponent will run a successful campaign. Anticipating this induces higher first period reform by the incumbent; so the case is similar to one where  $x = 0$ . Similarly when the situation is reversed –so that the prior that the opponent successfully implements a risky campaign is relatively low– the opponent will avoid risky campaigns; this is similar to the case where campaigns are non-informative.

A further extension involves our informational environment. As we have seen in the optimal equilibrium both with and without an informative campaign the voter conditions her choice of  $x$  on knowledge of  $p$  and  $r$ . Relaxing the assumption of full knowledge of these parameters implies that the voter must make a choice of equilibrium that involves a trade off between the cost of over-investment in reform (due to gambling on success) and under-investment (due to fear of failure). And so the optimal choice of  $x$  depends on the likelihood of these different scenarios.

Moving to the timing of our game we consider whether our central findings are robust to different sequencing of moves. In particular, suppose that the ordering were reversed so that the opponent campaigns *before* the incumbent chooses policy. Then it is straightforward to prove that we will still observe gambling on success by an incumbent for high values of  $p$ .<sup>13</sup>

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<sup>13</sup>Imagine there exists an equilibrium (with  $x \in [0, 1]$ ) where the incumbent plays safe for high enough  $p$ . If  $x > 0$ , the opposition has an incentive to run a risky campaign for high enough  $p$  as this increases his chance of being elected. This, in turn, implies that it is not optimal for the incumbent to play safe. And when  $x = 0$  the incumbent has incentives to run risky a risky campaign for high  $p$  regardless of the anticipated action of his opponent.

We have not explored a situation where the politician is privately informed about his competence and so may use his actions to signal his information. This is not a straightforward extension as it would involve a recasting of our model. Nevertheless there are reasons to believe that our central finding that competitive elections with asymmetric learning technologies induce inefficiently high levels of reform would be robust to allowing for asymmetric information. In a separating equilibrium an informed competent politician would still overinvest in risky reform anticipating that a sequentially rational voter will reward him when doing so. Relatedly ? shows that private knowledge of ability leads to over-investment in risky projects where the agents payoff depends on the realized value of the project and his reputation.

Here we explored the impact of different communication technologies available to the incumbent and opponent. In doing so we assume that incumbents will be judged first and foremost on their record of policy delivery. But of course they can also campaign. Moreover we have not considered different types of campaign by the opponent. Certainly our central finding survive when the incumbent can engage in campaigning that is costless to the voter for some range of parameters. In particular, if the campaign of the incumbent is less informative than that of the opponent, as appears to have been the case in our motivating example depicted in Figure 1, then it will always be the case that for high  $p$  the incumbent will overinvest in reform.<sup>14</sup> The logic is now familiar: he anticipates that doing so provides his best chance of reelection when the opponent chooses a risky campaign. Beyond this we believe that the modeling framework developed here could be developed to explore the role of campaigns and their interaction with incumbents' policy choices. These and other extensions form part of our ongoing research agenda.

## 8. CONCLUSION

Elections allow voters to hold policymakers to account for their policy performance. This fact influences the endogenous choice of policy and hence how much if anything is learned about an incumbent's abilities. In particular certain types of policies (here we label them reform policies) allow voters to learn more about an incumbent's abilities. We have shown that the introduction of campaigns that are informative of an opponent's expected policy performance can lead to overzealous implementation of reforms by an incumbent who wants to showcase his talent. Surprisingly, the introduction of even a small amount of information about the opponent can lead to welfare losses

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<sup>14</sup>Given that the incumbent had a term in office to implement his desired policies it is not unrealistic to assume the voter will discount his campaign promises in greater measure than he would discount the opponent's ones. Relatedly, as noted earlier, there is a large empirical evidence starting with Jacobson (1978) that shows incumbent's campaign spending is less effective than opponent spending.

even when considering that such information is relevant to the voter's choice. These inefficiencies arise due to an important asymmetry between the incumbent and opponent—the former stands on a record of policy implementation that is more convincing to the voter of his prospective performance than any action taken by the opponent.

Our central and most robust finding is that asymmetric competition between the incumbent and his opponent creates incentives for over-investment in risky and costly projects. The result contrasts with expectations when agents take risk and are compensated by a salary that increases linearly in the agent's reputation. Then, as shown by ?, an agent who does not know his own ability under-invests in risky projects. The contrast is due to the coarseness of the agents reward structure—in our environment he is either retained in office or replaced—and the role of the opponent. These aspects combine so that the politician places too much emphasis on the retention decision and not enough on welfare.

## 9. APPENDIX

Before presenting proofs of our results we provide microfoundations for our informational structure  $p^L < p^l < p < p^h < p^H$ . Consider two random variables  $\theta_1$  and  $\theta_2$  describing the incumbent's competence when implementing risky policies in periods 1 and 2, respectively. They take value one when the incumbent is competent, 0 otherwise. The joint distribution of these two Bernoulli random variables is described by the following matrix

$$\begin{array}{c|cc} & \theta_2 = 0 & \theta_2 = 1 \\ \hline \theta_1 = 0 & p_{00} & p_{01} \\ \theta_1 = 1 & p_{10} & p_{11} \end{array}$$

such that  $p_{00} + p_{01} + p_{10} + p_{11} = 1$ . Both variables are positively correlated if and only if  $\frac{p_{11}}{p_{10}} > \frac{p_{01}}{p_{00}}$ . We assume that the prior probability being competent in any of the two periods is in both cases equal to  $p$ , it follows that  $p_{10} = p_{01}$ . We can thus rewrite the joint distribution as follows:

$$\begin{array}{c|cc} & \theta_2 = 0 & \theta_2 = 1 \\ \hline \theta_1 = 0 & 1 - p(2 - p^H) & p \cdot (1 - p^H) \\ \theta_1 = 1 & p \cdot (1 - p^H) & p \cdot p^H \end{array}$$

where  $p$  and  $p^H$  are numbers between 0 and 1. Under this new notation, both variables are positively correlated if and only if  $p^H > p$ . Finally note that  $p^H$  is the conditional probability of a high realization in  $\theta_2$  given a high realization in  $\theta_1$  ( $\Pr\{\theta_2 = 1 \mid \theta_1 = 1\} = \frac{p_{11}}{p_{10} + p_{11}} = p^H$ ). It is easy to show that the conditional realization of a high realization in  $\theta_2$  given a low realization in  $\theta_1$  is smaller



than  $p$  when both random variables are positively correlated ( $\Pr \{\theta_2 = 1 \mid \theta_1 = 0\} = \frac{p_{01}}{p_{00}+p_{10}} < p$ ).<sup>15</sup>

We now consider a different variable  $\theta_1^c$  that captures the competence at running a risky campaign in period 1. The joint distribution of these two variables can be summarized by the following matrix:

$$\begin{array}{c|cc} & \theta_2 = 0 & \theta_2 = 1 \\ \hline \theta_1^c = 0 & t_{00} & t_{01} \\ \theta_1^c = 1 & t_{10} & t_{11} \end{array}$$

Assuming once again that the prior probability of a high realization of this new variable is  $p$  and that it is positively correlated with  $\theta_2$  we can write the joint distribution of  $\theta_1^c$  and  $\theta_2$  as:

$$\begin{array}{c|cc} & \theta_2 = 0 & \theta_2 = 1 \\ \hline \theta_1 = 0 & 1 - p(2 - p^h) & p \cdot (1 - p^h) \\ \theta_1 = 1 & p \cdot (1 - p^h) & p \cdot p^h \end{array}$$

Finally, assuming a smaller positive correlation between these two variables than with the variables we analyzed earlier is equivalent to stating that:  $p_{11}p_{00} - p_{10}p_{01} > t_{11}t_{00} - t_{10}t_{01} > 0$ . From this last inequality, with straightforward algebra we obtain  $p^L < p^l < p < p^h < p^H$  where  $p^h = \Pr \{\theta_2 = 1 \mid \theta_1^c = 1\}$  and  $p^l = \Pr \{\theta_2 = 1 \mid \theta_1 = 0\}$ .

Having provided micro-foundations for our information structure we can now prove our main results. The proof of Lemma 1 follows from analysis in the main text. Here we provide remaining proofs.

**Proof of Proposition 1.** Substitute  $x = p$  in equation 2 and inspection of equation 1.

**Proof of Lemma 2.** In the subgame following the implementation of a successful reform by the incumbent the voter's expected payoff does not depend on the action taken by the opponent; correspondingly either campaign choice is part of a first best. So we consider the subgame following the implementation of the first period reform that was unsuccessful; and that following safe play by the incumbent. In both cases the voter obtains a higher payoff from a risky campaign  $\Leftrightarrow p \cdot p^h r + (1 - p) > 1 \Leftrightarrow p^h r > 1$ . The first best level of reform by the incumbent, in turn, satisfies

$$p[r + \max\{p^H r, 1\}] + (1 - p)[p \cdot \max\{1, p^h r\} + (1 - p)] > 1 + p \cdot \max\{1, p^h r\} + (1 - p). \quad (3)$$

When  $p^h r < 1$  this reduces to

$$p[r + \max\{p^H r, 1\}] + (1 - p) > 2$$

<sup>15</sup>This last conditional probability is our  $p^L$ .

so that the first best level of reform is equivalent to that analyzed in Lemma 1: the incumbent implements the first period reform if and only if  $p^H r > 1$  and  $pr > \frac{1+p}{1+p^H}$ . When  $p^h r > 1$  then in the first best the opponent plays risky. Recall that  $p^H > p^h$  by assumption. So in these remaining cases the first best satisfies

$$(1 + p^H)pr + (1 - p)[p \cdot p^h r + (1 - p)] > 1 + p \cdot p^h r + (1 - p) \Leftrightarrow pr > \frac{1 + p - p^2}{1 + p^H - p \cdot p^h}.$$

**Proof of Proposition 2.** We first show that a first best in which the incumbent chooses risky can always be sustained in equilibrium. Lemma 2 shows that when the incumbent adopts the risky policy, the first best (strictly) requires the opponent playing risky when  $p^h r > 1$  and the incumbent has been unsuccessful. Indeed it is optimal for the opponent to play risky in this case because  $p \cdot p^h r + (1 - p) > 1 \Leftrightarrow p^h r > 1$ . The condition for the first best level of reform is

$$p(r + \max\{p^H r, 1\}) + (1 - p)[p \cdot \max\{1, p^h r\} + (1 - p)] > 1 + p \cdot \max\{1, p^h r\} + (1 - p). \quad (4)$$

Assume the voter sets  $x = 0$ . Under these circumstances the opponent adopts a safe policy as a response to a safe policy by the incumbent.<sup>16</sup> The optimal action for the incumbent when inequality (2) holds is to adopt the risky policy:  $p(r + \max\{p^H r, 1\}) > 1$  when inequality (2) holds. It follows that the voter can always avoid “fear of failure” by never reelecting an incumbent that plays safe. We now show that there are parameter values for which a voter can not avoid the gambling on success effect. Gambling on success will occur in both cases when the opponent plays safe and when it plays risky. We first look at an equilibrium in which the opponent plays safe when incumbent plays safe, i.e.  $p \cdot \max\{1, p^h r\} < 1 - x$ . Reversing (and rearranging) the inequality in equation 4 we obtain conditions under which it is in voter’s interest that the incumbent plays safe:

$$p(r + \max\{p^H r, 1\}) < 1 + p[p \cdot \max\{1, p^h r\} + (1 - p)]. \quad (5)$$

Both incumbent and opponent play safe in equilibrium when the following equations 5a and 5b are satisfied

$$p(r + \max\{p^H r, 1\}) < 1 + x \qquad p \cdot \max\{p^h r, 1\} < 1 - x \quad (5a,5b)$$

Using equations 5 and 5a, we observe that the minimal value of  $x$  that ensures the incumbent plays safe when it is optimal to do so is  $x^* = p[p \cdot \max\{1, p^h r\} + (1 - p)]$ . Then (using equation 5b), for

<sup>16</sup>The opponent’s payoff of adopting a safe campaign when  $x = 0$  is 1 and the payoff of adopting a risky campaign is  $p \max\{p^h r, 1\}$ ; the latter is always smaller than 1 when  $pr < 1$ .

the opponent to do likewise it must be that

$$p \cdot \max\{p^h r, 1\} < 1 - p[p \cdot \max\{1, p^h r\} + (1 - p)]. \quad (6)$$

Straightforward algebraic manipulations show that inequality 6 is not satisfied for large values of  $p$ . So we conclude that at high values of  $p$  the voter cannot choose  $x \in [0, 1]$  so that both politicians choose safe.

Secondly, we look at an equilibrium in which the opponent plays risky when the incumbent plays safe. The following inequalities must then hold

$$p(r + \max\{p^H r, 1\}) < 1 + (1 - p) \quad p \cdot \max\{p^h r, 1\} > 1 - x \quad (6a, 6b)$$

Once again, for large values of  $p$  the right hand side of equation 6a is smaller than that in equation 5 and so the first best cannot be obtained. So we conclude that for large values of  $p$  the first best can not be obtained in equilibrium. Specifically the voter cannot avoid “gambling on success” for high values of  $p$ .

**Proof of Proposition 3.** Inefficiency arises in the case where  $p^h > p$  due to over investment in the risky reform in the region of the parameter space identified in proposition 2. By contrast when  $p^h = p$  then in the same region the voter attains a payoff of 2 in the first best and optimal equilibrium. But when  $p^H > p^h$  then her pay off is  $p(r + p^H r) + (1 - p)(p \cdot p^h r + (1 - p))$ . The threshold  $t$  identified in the statement of proposition 3 is the value  $p^h r$  that solves

$$p(r + p^H r) + (1 - p)[p \cdot p^h r + (1 - p)] = 2. \quad (7)$$

**Proof of Proposition 4.** There are three cases to consider. When  $p^h r < 1$  then any increase in  $p^h$  has no effect on voters payoffs; when  $p^h r > 1$  but less than the threshold  $t$  from proposition 4 then an increase in  $p^h$  starting from  $p^h = p$  can have a negative consequence due to its impact on the first period choice of the incumbent. Starting from  $p^h > p$  however we note from equation 3 that an increase in  $p^h$  has no impact on the incumbent’s behavior. Then such an increase can only benefit the voter due to learning about the opponent. Finally when  $p^h r > t$ , the statement of proposition 4 follows from inspection of equation 5 in the proof of proposition 3.

**Proof of Proposition 5.** Proposition 2 shows that the voter can induce risky play under circumstances where the incumbent has fear of failure and  $p^H > p^h$  and this result extends naturally to the case where  $p^H = p^h$ . So to prove our claim we show that when campaigns are as informative

as the incumbent's policy record (that is  $p^h = p^H$  and  $p^l = p^L$ ) then the voter can avoid that the incumbent gambles on success. First note that the voter is strictly indifferent between the incumbent and the opponent in all cases other than when exactly one politician succeeds. Let  $y \in [0, 1]$  represent her retention of the incumbent when indifferent following his choice of the risky action. Assume that in the parameter region where (when  $p^H > p^h$ ) gambling on success occurs, the voter sets  $x = 1$  and  $y = 0$ . It suffices to show that with this reelection probabilities the incumbent chooses safe even when anticipating that the opponent chooses risky. Then the incumbent prefers to adopt the risky policy only when  $p(r + (1 - p)\max\{1, p^H r\}) > 1 + (1 - p)$ . It is straightforward to show that this inequality is never satisfied: in particular for  $pr < 1$  the RHS is larger even when  $p^H r > 1$  and  $p = 1$ .

**Proof of Proposition 6.** Rearranging the solution provided in the main text, we have that in the first best the incumbent plays risky in period 1  $\Leftrightarrow$

$$p(r + \max\{1, p^H r\}) > 1 + p. \quad (8)$$

When  $p^h = p$  he plays risky in period 1  $\Leftrightarrow$

$$p(r + \max\{1, p^H r\}) > 1 + x. \quad (9)$$

The right hand side of equation 7 is larger than that of equation 6 when  $x = 1$  yielding under-investment for all values of  $p$  and smaller when  $x = 0$  yielding over-investment for all values of  $p$ , as claimed in parts (i) and (iii) of the statement of the proposition. When  $p^h = p$  and  $x = 1$  the incumbent plays risky in period 1 when  $p(r + \max\{1, p^H r\}) > 2$ . When  $p^h > p$  the opponent always chooses a risky campaign in response to safe play by the incumbent. Anticipating this the incumbent chooses risky in period 1  $\Leftrightarrow p(r + \max\{1, p^H r\}) > 2 - p$ . This corresponds with the claim made in part (iii). To complete the proof we verify the claim made in part (iv), namely that introducing informative campaigns improves information whilst it does not modify the incumbents action. When  $p^h = p$  and  $x = 0$  the incumbent plays risky in period 1 when  $p(r + \max\{1, p^H r\}) > 1$ . When  $p^h > p$  the opponent plays risky only when  $p \cdot p^h r > 1$ . This improves information as claimed. When  $x = 0$  the introduction of an informative campaign does not modify the incumbents behaviour. When  $p^h r < 1$  the incumbent plays risky in period 1 when  $p(r + \max\{1, p^H r\}) > 1$  as he would in the absence of an informative campaign. When  $p^h r > 1$  a necessary condition for risky play in period 1 is that  $p(r + \max\{1, p^H r\}) > 2 - p$ . Correspondingly the incumbent plays safe if and only if  $1 - p > p^H$ : the probability that the opponent fails when

choosing a risky campaign outweighs what is learned about the incumbent's abilities. We show that the conditions for an equilibrium where the incumbent plays safe anticipating that the opponent plays risky are never satisfied. Suppose it were the case that that  $p \cdot p^h r > 1$  and  $1 - p > p^H$ . Note that  $p \cdot p^h r > 1 \Rightarrow p \cdot p^H r > 1$ . So the equilibrium conditions are  $1/pr < p^H < 1 - p$ . These can only be satisfied for  $pr > 1$ ; but then the incumbent always plays risky. So introducing informative campaigns does not modify the incumbent's action.

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