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ABSTRACT

Higher Bars for Incumbents and Experience*

This paper analyzes optimal re-election bars when incumbents gain socially valuable experience in office. We develop a two-period model in which the output of a public good depends on an office-holder's effort, ability and experience. When campaigning for election to an open seat in the first period, candidates can make binding offers of the minimum share of the votes they must obtain to be re-elected in the second period, should they win in the first. We prove that, in equilibrium, both candidates offer the same vote-share threshold, that it exceeds 50 percent, and that it is socially optimal. The higher threshold increases the expected effort over both periods and tends to raise the expected level of ability of office-holders in the second. Together, these effects outweigh the expected loss of incumbents' acquired experience, which results from their reduced chances of getting re-elected with the higher bar. The socially optimal vote threshold is increasing in the value of experience. All of the above conclusions would hold if the optimal threshold were set instead by law.

JEL Classification: D7, D82 and H4
Keywords: elections, experience, incumbency advantage, political contracts and vote-share thresholds

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1 Introduction

Motivation and Idea

While citizens and candidates for public office may differ in their ideological leanings and views of distributional justice, they share many objectives, such as economic growth, full employment, efficient infrastructure, good education systems and security. Ensuring that able candidates are elected to office and motivating them, once elected, to work for these common goals are, therefore, vital concerns in representative democracies; and the electoral cycle, in which incumbents must stand for re-election, is the main device to meet them. In practice, however, it is applied in a very rigid way, inasmuch as incumbents seeking re-election need no more votes than their challengers in order to win.

We shall argue that introducing the possibility that incumbents face higher thresholds than new candidates seeking office, whereby the level of the threshold arises endogenously as part of the electoral campaign process, will improve social welfare. This holds, even if there are social gains from incumbents' experience in office. The key point of this paper is that although such experience is socially valuable in office and will attract more votes, higher bars for incumbents result in the deselection of the significantly less able among them. Moreover, higher bars for incumbents tend to motivate newly elected candidates to exert more effort to produce public goods. We establish that these latter effects can outweigh the expected loss of losing incumbents' experience, and so raise aggregate welfare.

Model and Results

We employ a simple two-period model in which voters elect an office-holder at the start of each period. In the first, two candidates (say, a left-wing and a right-wing candidate) compete in an open-seat election. The winner chooses an ideological policy, which meets with varying degrees of approval among the electorate, and a level of public good provision, which all voters value equally. How much of the public good is provided depends on the office-holder's ability and effort. If, moreover, he is re-elected to a second term, output will be higher for given levels of ability and effort, reflecting the gains from experience in the first term.

During the campaign, candidates cannot commit to ideological policies or to specific levels of provision of the public good. What they can do, however, is to make a binding commitment to the vote threshold to which they will be held in the second period, in the event that they are elected in the first. These vote thresholds can be any fraction of votes in $\left[\frac{1}{2}, 1\right]$, and are called vote-share contracts.

In this framework, a vote-share threshold above 50% does indeed improve welfare. Effort is higher in the first period, as is the expected level of effort over the two-period cycle. The expected level of ability of second-period office-holders also increases if experience matters sufficiently. Together, these effects always outweigh the expected loss of incumbents' acquired experience that results from their lower chances of getting re-elected, even if the expected level of ability of second-period office-holders should fall.

What is more, both candidates, spurred on by the rewards of office, offer the socially optimal vote threshold, which is always more than 50% of the votes in the second period. Thus, competition in vote-share contracts always improves welfare relative to standard elections, in which the hurdle is 50% for incumbents and challengers alike.

The socially optimal vote threshold is increasing in the value of experience, as is the gain in welfare relative to standard elections. The reason is that voters then are more inclined to vote for an incumbent of a given ability, which they can infer from his performance in office. Thus, this incumbent will be supported by a larger majority in his re-election bid. Higher vote-share thresholds, moreover, induce higher effort in the first period. Finally, low political polarization yields high vote thresholds in equilibrium, since it is easier for incumbents with high or intermediate levels of ability to obtain the support of large majorities.

Relation to the Literature

This paper is related to several strands of the literature. The proposal is partly motivated by the observation that incumbents in democracies are very frequently successful in their re-election bids. In the US Congress, for instance, incumbents are typically re-elected around 90% of the time (Center for Responsive Politics, 2012). A large literature has established that incumbents have a robust and substantial advantage over challengers in elections.[1] A high success rate in re-election bids is, per se, not a concern, since it can arise from above-average abilities, exceptional effort or experience. However, the literature has identified numerous reasons why incumbents are so successful and why such success may be a matter of concern for society.[2]

Second, our framework involves a retention game, a sub-class which has been thoroughly examined by Banks and Sundaram (1998). Raising the bar for incumbents is a particular way to change retention decisions, and we show that re-election rules that depend on previous terms are socially desirable.

Third, a commitment to a higher vote threshold is one particular type of political contract, which are verifiable election promises associated with remuneration or sanctions, depending on whether these promises are kept. (See Gersbach (2008) for a survey of the recent literature.) Vote-share thresholds are particularly simple political contracts, as they consist of a single number.

Fourth, higher vote-share thresholds for incumbents have been introduced and justified for circumstances in which the advantages of incumbency are socially detrimental (Gersbach, 2007).[3] The main contribution of this paper is to show that even when incumbency yields advantages, such as experience,[4] realizing the potential improve-

[1]See Ansolabehere and Snyder (2002) and Ansolabehere et al. (2006). For an earlier estimate of the incumbency advantage, see Gelman and King (1990).

[2]See, e.g., Ashworth and Bueno de Mesquita (2008) and Gordon and Landa (2009) for a recent illuminating discussion of the literature and Hodler et al. (2010) for a recent model.

[3]This theme has been further developed by Gersbach (2009).

[4]We resort to a very simple notion of experience in this paper: it depends solely on the duration in office, and not on the amount of public good produced in the first period, in contrast to the tradition of the learning-by-doing literature (see Arrow (1962) for the seminal paper).

ment in welfare requires that there be higher vote thresholds for incumbents, relative to standard elections.

The remainder of the paper is organized as follows. The basic model is set out in Section 2. In Section 3, we derive a series of results for the benchmark case, namely, with standard elections. The corresponding results with vote-share contracts follow in Section 4. In Section 5, we examine the effect of such contracts on social welfare. Section 6 contains a sketch of certain extensions of our basic model and some concluding remarks.

2 The Model

We develop a variant of Gersbach (2007), in particular, by introducing experience gained in office. There are two periods, denoted by $t = 1, 2$, and a continuum of voters indexed by $i \in [0, 1]$. There are two candidates, denoted by k or $k' \in \{L, R\}$, where L (R) is left-(right-)wing politician, who compete for office on both election dates. The winner of the first election, and thus the incumbent in the second election, differs from the challenger in two respects: his activities and the resulting outcomes may reveal his ability, and his experience in office may increase his productivity in producing public goods in a second term. While the former can go either way, the latter is a socially desirable reason for him to be re-elected – all else being equal.

2.1 Policies and Utilities

Whatever be his ideological persuasion, the elected politician has to decide on two policies.

- Ideological Policy: I

  The incumbent decides on a one-dimensional ideological policy $I \in [0, 1]$. Voters are ordered according to their ideal points such that i is the ideal point of voter i, who derives utility $-(i_{kt} - i)^2$ from i_{kt}, the platform chosen by incumbent k in period t. We assume that ideal points are uniformly distributed in $[0, 1]$

- Public Project: P

  The incumbent undertakes a public project in each period. Let g_t denote the level of its provision in period t. All voters derive the same value from g_t. The level of g_t is assumed to depend on the value of the incumbent's experience, his ability, a_k, and effort, e_{kt} (≥ 0), as follows:

$$g_t = g_t(\gamma, e_{kt}, a_k) = \gamma(e_{kt} + a_k), \tag{1}$$

  where the parameter $\gamma = \gamma_l$ (> 0) if incumbent k is in his first term in office, and $\gamma = \gamma_h$ if he is in his second, with $\gamma_h > \gamma_l$ and corresponding levels of provision $g_t(\gamma_l, e_{kt}, a_k)$ and $g_t(\gamma_h, e_{kt}, a_k)$, respectively. The increase in the incumbent's productivity in his second term, $\gamma_h - \gamma_l$, is called the value of experience. Let a_k be a random variable distributed uniformly on $[-A, A]$ with $A > 0$. The incumbent's effort costs are $C(e_{kt}) = ce_{kt}^2$ in each period, with $c > 0$.[5]

To simplify the analysis, we assume that voters and politicians do not discount the future. $V_i(\cdot, \cdot)$ denotes the lifetime utility of voter i, depending on who is in office in $t = 1$ and $t = 2$. There are two cases:

- $V_i(k, k) = g_1(\gamma_l, e_{k1}, a_k) - (i_{k1} - i)^2 + g_2(\gamma_h, e_{k2}, a_k) - (i_{k2} - i)^2,$
- $V_i(k, k') = g_1(\gamma_l, e_{k1}, a_k) - (i_{k1} - i)^2 + g_2(\gamma_l, e_{k'2}, a_{k'}) - (i_{k'2} - i)^2, \quad k \neq k'.$

The candidates derive utility from two sources:

- Benefits from policies

  Politicians are assumed to derive the same benefits from policies I and P as ordinary voters of their type. Candidate R's most preferred point with regard to I is denoted by μ_R, with $\mu_R > \frac{1}{2}$. We assume that the candidates' ideal points

[5] We note that effort and ability are perfect substitutes in the production of public goods. It follows from continuity that the results in this paper continue to hold if effort and ability are sufficiently good substitutes.

are symmetrically distributed around the median voter's ideal point, which is located at one-half. Thus, candidate L's ideal point is $\mu_L = 1 - \mu_R$.

- Office-holding

  The incumbent derives private benefits b (> 0) from holding office, not only in the form of his salary, but also non-monetary benefits like prestige or the satisfaction of being in power.

Let $V_R(\cdot,\cdot)$ denote politician R's lifetime utility, which depends on whether he is in office in $t = 1$ and $t = 2$. We have to distinguish four cases:

- $V_R(R,R) = b - (i_{R1} - \mu_R)^2 - ce_{R1}^2 + g_1(\gamma_l, e_{R1}, a_R) + b - (i_{R2} - \mu_R)^2 - ce_{R2}^2 + g_2(\gamma_h, e_{R2}, a_R)$,
- $V_R(R,L) = b - (i_{R1} - \mu_R)^2 - ce_{R1}^2 + g_1(\gamma_l, e_{R1}, a_R) - (i_{L2} - \mu_R)^2 + g_2(\gamma_l, e_{L2}, a_L)$,
- $V_R(L,R) = -(i_{L1} - \mu_R)^2 + g_1(\gamma_l, e_{L1}, a_L) + b - (i_{R2} - \mu_R)^2 - ce_{R2}^2 + g_2(\gamma_l, e_{R2}, a_R)$,
- $V_R(L,L) = -(i_{L1} - \mu_R)^2 + g_1(\gamma_l, e_{L1}, a_L) - (i_{L2} - \mu_R)^2 + g_2(\gamma_h, e_{L2}, a_L)$.

The lifetime utility of politician L, denoted by $V_L(\cdot,\cdot)$, is defined analogously.

2.2 Information and the Equilibrium Concept

A candidate learns his ability only once in office, and after choosing his level of effort. These are his private information. Voters observe output g_t, but they are not able, ex-ante, to distinguish how much of g_t is due to effort and how much to ability. We stress, however, that they will be able to *infer* as much in equilibrium. We assume, furthermore, that voters observe the incumbent's stance where policy I is concerned, and that they vote sincerely, i.e., they vote for the candidate who generates a higher expected utility.[6] The overall game including the parameters and the candidates' most

[6] In an electorate with a finite population, it is optimal for the electorate to vote sincerely, as this is the best response for rational voters in a two-party system (see e.g. Austen-Smith (1989)). We assume that voters in a society with a continuum of citizens also vote sincerely, as this can be viewed as a limit case.

preferred ideological positions μ_R and μ_L are common knowledge.

The political process is governed by the simple-majority rule in the first period, as applied to two-candidate races. Throughout the paper, we assume that $\frac{\gamma_h^2-\gamma_l^2}{2c\gamma_h} < A$ to ensure that, in equilibrium, the probability of re-election is smaller than 1. Finally, we assume that b is so large that candidates will always prefer to be in office under all circumstances. We seek perfect Bayesian Nash equilibria in pure strategies of the game.

2.3 The Overall Game

We summarize the course of events for standard elections in the overall game in the following figure:

2.4 Welfare

We use the utilitarian criterion to define social welfare. From the ex-ante perspective, the level of social welfare is given by

$$W = \mathbb{E}[g_1] + \mathbb{E}[g_2] + \mathbb{E}\left[\int_0^1 (i_{k1} - i)^2 di\right] + \mathbb{E}\left[\int_0^1 (i_{k'2} - i)^2 di\right],$$

where $\mathbb{E}$ is the expectation operator applied at the beginning of the game. Note that the office-holder k' in the second period may be the same as in the first period. In all equilibria we will derive in the paper, i_{k1} and i_{k2} will be either μ_R or μ_L. As μ_R and μ_L are symmetrically distributed around the median $i = \frac{1}{2}$, the last two terms in W will be the same in all equilibria. Hence, welfare comparisons involve only the first two terms in W.

3 Standard Elections

We assume that if there is a tie in period 1, the winner is decided by the toss of a fair coin; whereas if there is a tie in period 2, the incumbent is declared the winner. We proceed by backward induction.

3.1 The Second Period

As candidates cannot commit to policy platforms, the winner will choose his most preferred platform in $t = 2$. The level of g_2 depends on whether he is in his first term (wherein he has the low productivity parameter γ_l and will not learn his ability a_k until he has chosen e_{k2}), or in his second term (wherein he has already discovered his ability a_k and has the high productivity parameter γ_h).

Proposition 1

Suppose candidate R is elected in period 2. Then

(i) he will choose

α) $i^*_{R2} = \mu_R$ *and* $e^*_{R2} = \frac{\gamma_h}{2c}$ *if he has been in office in period 1;*

β) $i^*_{R2} = \mu_R$ *and* $e^*_{R2} = \frac{\gamma_l}{2c}$ *if L has been in office in period 1;*

(ii) his expected utility at the beginning of period 2 is given by, respectively,

α) $V^*_{R2}(R, R) = b + \frac{\gamma_h^2}{4c} + \gamma_h a_R$,

β) $V^*_{R2}(L, R) = b + \frac{\gamma_l^2}{4c}$.

Proof: See Appendix.

3.2 The First Period

In the first election, the candidates have equal chances of winning, as the median voter is indifferent between them. Without loss of generality, we will assume throughout the remainder of the paper that R is elected in the first election if both receive the same share of votes. We obtain the following Fact, which holds in every equilibrium with pure strategies:

Fact 1

If candidate R is elected in period 1,

(i) he will choose $i_{R1} = \mu_R$ for policy I;

(ii) voters will perfectly infer his ability a_R at the end of period 1.

Politician R cannot gain more votes in the second election by choosing $i_{R1} \neq \mu_R$, as voters know that, if re-elected, he will choose his ideal point in period 2 anyway, which is common knowledge. Part (ii) follows from the informational structure of the game. As the incumbent does not observe his ability before he exerts effort, it follows that in any pure strategy equilibrium, he will choose exactly one level of effort, which is independent of a_R. The voters know this and expect some level of effort, which in equilibrium will be equal to the effort actually chosen. Any deviation of g_1 from the equilibrium effort will be interpreted correctly as variation in ability, since $a_R = \frac{g_1 - \gamma_l \hat{e}_1}{\gamma_l}$.

We next derive the optimal effort of the office-holder in the first period. Suppose that voters expect an effort level given by $\hat{e}_1$. Then, let $p(e_{R1}, \hat{e}_1)$ denote the probability that office-holder R will be re-elected, and $\widetilde{a}_R(e_{R1}, \hat{e}_1)$ his expected level of ability, conditional on his being re-elected and given the choice of e_{R1}. We obtain

Fact 2

$$p(e_{R1}, \hat{e}_1) = \frac{1}{2} + \frac{1}{2A}\left(e_{R1} - \hat{e}_1 + \frac{\gamma_h^2 - \gamma_l^2}{2c\gamma_h}\right), \tag{2}$$

$$\widetilde{a}_R(e_{R1}, \hat{e}_1) = \frac{A + \hat{e}_1 - e_{R1}}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c\gamma_h}. \tag{3}$$

Proof: See Appendix. Note that the probability of R being re-elected is increasing in e_{R1}, since for a given expectation $\hat{e}_1$, the incumbent can improve the public's estimate of his ability by exerting more effort, and a more favorable evaluation of his ability increases his re-election chances. However, the expected level of R's ability, conditional on his re-election, decreases with e_{R1}, since an increase in e_{R1} implies that R's chances of being re-elected improve, even for lower levels of ability.

The incumbent's optimization problem can be written as:

$$\max_{e_{R1}\geq 0}\Bigg\{b+\gamma_l e_{R1}-ce_{R1}^2 \\ +p(e_{R1},\hat{e}_1)\left(b+\gamma_h\left(\frac{\gamma_h}{2c}+\widetilde{a}_R(e_{R1},\hat{e}_1)\right)-\frac{\gamma_h^2}{4c}\right) \\ +(1-p(e_{R1},\hat{e}_1))\left(\frac{\gamma_l^2}{2c}-(\mu_R-\mu_L)^2\right)\Bigg\}. \tag{4}$$

The next proposition characterizes the choice of effort in equilibrium, in which the voters' expectation coincides with the incumbent's actual choice.

Proposition 2

(i) R chooses

$$e_{R1}^* = \frac{1}{2c}\left\{\gamma_l+\frac{1}{2A}\left[b-\frac{\gamma_h^2}{4c}+(\mu_R-\mu_L)^2\right]\right\}. \tag{5}$$

(ii) R is re-elected with probability

$$p(e_{R1}^*,e_{R1}^*)=\frac{1}{2}+\frac{(\gamma_h^2-\gamma_l^2)}{4Ac\gamma_h}. \tag{6}$$

- *The average ability level of a re-elected incumbent is given by*

$$\widetilde{a}_R(e_{R1}^*,e_{R1}^*)=\frac{A}{2}-\frac{(\gamma_h^2-\gamma_l^2)}{4c\gamma_h}. \tag{7}$$

Proof: See Appendix. We note that a losing incumbent loses the private benefits from holding office in $t=2$ and must endure his opponent's ideological policy in office. Hence, as indicated by Part (i), the larger is b, or $(\mu_R-\mu_L)$, the higher the effort R is willing to invest. Observe from (2), however, that the improvement in the probability of getting re-elected by increasing effort is decreasing in A: at the optimum, a greater spread of abilities reduces effort. A higher γ_l also reduces the probability of being re-elected, but it also increases the marginal value of effort today, and the net effect is to raise e_{R1}^*. The converse holds for γ_h: the effort exerted in the first period is lower.

Given the optimal choice of e_{R1}, it is seen from (6) that the incumbent's chances of being re-elected are better than even, and are increasing in the value of experience, as expressed by $\gamma_h - \gamma_l$. Since the expected value of the challenger's ability is the same as the incumbent's ex ante, the value of experience places the latter at an advantage, even if he turns out to be somewhat incompetent. The bigger is $\gamma_h - \gamma_l$, the more the voters will put up with him, as expressed by (7).

4 Elections with Vote-Share Contracts

As part of the electoral campaign in $t = 1$, each candidate is now allowed to offer a vote-share contract, which stipulates the vote-share threshold $s_k \in \left[\frac{1}{2}, 1\right]$ that he must reach to be re-elected in $t = 2$ if he should win in $t = 1$. The winner in $t = 1$ is determined by the simple-majority rule. Throughout this section, we assume that $2\mu_R - 1 < A\gamma_h$, which ensures interior solutions with regard to the probability of re-election. We denote results with such vote-share contracts by the superscript H.

4.1 The Second and First Periods in Office

Assume that R is elected in $t = 1$ with a vote-share threshold $s_R \geq \frac{1}{2}$. In $t = 2$, R will choose $i^{*H}_{R2} = \mu_R$ and $e^{*H}_{R2} = \frac{\gamma_h}{2c}$ if he is still in office; otherwise L will choose $i^{*H}_{L2} = \mu_L$ and $e^{*H}_{L2} = \frac{\gamma_l}{2c}$. Thus, Proposition 1 is still valid. In $t = 1$, however, the candidates' calculus is different. Equations (2) and (3) have to be modified to:

Fact 3

$$p^H(e^H_{R1}, \hat{e}^H_1) = \frac{1}{2} + \frac{1}{2A}\left(e^H_{R1} - \hat{e}^H_1 + \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h} - \frac{1}{\gamma_h}(2\mu_R - 1)(2s_R - 1)\right), \tag{8}$$

$$\widetilde{a}^H_R(e^H_{R1}, \hat{e}^H_1) = \frac{A + \hat{e}^H_1 - e^H_{R1}}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c\gamma_h} + \frac{(2\mu_R - 1)(2s_R - 1)}{2\gamma_h}. \tag{9}$$

<u>Proof:</u> See Appendix. These specialize to equations (2) and (3) for $s_R = \frac{1}{2}$. The optimal choice of e^H_{R1} is obtained by solving problem (4), where $p(e_{R1}, \hat{e}_1)$ and $\widetilde{a}_R(e_{R1}, \hat{e}_1)$ are replaced by $p^H(e^H_{R1}, \hat{e}^H_1)$ and $\widetilde{a}^H_R(e^H_{R1}, \hat{e}^H_1)$, respectively. We obtain

Proposition 3

(i) R chooses

$$e_{R1}^{*H} = \frac{1}{2c}\left\{\gamma_l + \frac{1}{2A}\left[b - \frac{\gamma_h^2}{4c} + (\mu_R - \mu_L)^2 + (2\mu_R - 1)(2s_R - 1)\right]\right\}. \tag{10}$$

(ii) R is re-elected with probability

$$p^H(e_{R1}^{*H}, e_{R1}^{*H}) = \frac{1}{2} + \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h} - \frac{(2\mu_R - 1)(2s_R - 1)}{2A\gamma_h}. \tag{11}$$

- *The average ability level of a re-elected incumbent is given by*

$$\tilde{a}_R^H(e_{R1}^{*H}, e_{R1}^{*H}) = \frac{A}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c\gamma_h} + \frac{(2\mu_R - 1)(2s_R - 1)}{2\gamma_h}. \tag{12}$$

Proof: See Appendix. Comparing (5) with (10), we observe that if $s_R > \frac{1}{2}$, the equilibrium effort level is higher than in the standard election. The higher threshold reduces the chances of re-election if effort remains unchanged, but this can be ameliorated by making a stronger effort. Compared to standard elections, the higher vote threshold causes the deselection of incumbents with lower ability, and so raises the average ability of those who do, as expressed by the additional term $\frac{(2\mu_R-1)(2s_R-1)}{2\gamma_h}$ on the right-hand side of (12).

4.2 Electoral Competition in Vote-Shares

We now consider the initial campaign stage, when both candidates compete for office by offering vote-share contracts. It will turn out to be useful to consider the ex ante optimal vote-share threshold from the perspective of the median voter, denoted by s^*. This threshold is the solution of the following problem:

$$\max_{\frac{1}{2} \le s_R \le 1} \left\{ \gamma_l e_{R1}^{*H} + \gamma_l \mathbb{E}\left[a_R^H\right] + p^H(e_{R1}^{*H}, e_{R1}^{*H})\Big(\gamma_h \tilde{a}_R^H(e_{R1}^{*H}, e_{R1}^{*H}) + \gamma_h e_{R2}^{*H}\Big) \right.$$
$$\left. + \Big(1 - p^H(e_{R1}^{*H}, e_{R1}^{*H})\Big)\Big(\gamma_l \mathbb{E}\left[a_L^H\right] + \gamma_l e_{L2}^{*H}\Big) \right\},[7] \tag{13}$$

where e_{L2}^{*H} denotes the equilibrium effort of the left-wing candidate if he is new in office in $t = 2$. We obtain

[7] Recall that μ_R and μ_L are symmetrically distributed around the median voter's ideal point.

Proposition 4

$$s^* = \min\left\{\frac{1}{2} + \frac{\gamma_l \gamma_h}{4c(2\mu_R - 1)}, 1\right\} > \frac{1}{2}. \tag{14}$$

Proof: See Appendix. We note that s^* is increasing if μ_R becomes smaller. When political polarization is low ($\mu_R - \mu_L$ is small), it is easier for incumbents with a given ability to obtain the support of large majorities. We also observe, that the value of s^* is increasing in γ_h. The intuition runs as follows. A higher value of γ_h means, *ceteris paribus*, that experience matters more. As a consequence, the median voter desires that candidates in $t = 1$ commit to higher vote-share thresholds, since an experienced incumbent with a particular ability will obtain more votes per se, and higher values of s^* induce higher effort. The comparative statics will be developed fully in the next section.

We conclude this section with the characterization of vote-share thresholds chosen in equilibrium.

Proposition 5

Both candidates offer s^*, and both have the same probability of winning the first election.

Proof: See Appendix. Propositions 4 and 5 establish that the introduction of vote-share contracts at least increases the utility of the median voter, since he prefers s^* over $s = \frac{1}{2}$.

5 The Effects of Vote-Share Contracts on Welfare

It is clear that welfare does not change with a threshold $s_R = s_L = \frac{1}{2}$, since this is equivalent to a standard election. According to Propositions 4 and 5, the introduction of vote-share contracts leads, in equilibrium, to $s^* > \frac{1}{2}$, so that Proposition 3 comes into play. In the following, we examine how its introduction affects expected effort over both periods, the expected level of ability of the office-holder in the second period, and overall welfare – all in equilibrium. We focus on interior equilibrium outcomes in this section, i.e. $\frac{1}{2} < s^* < 1$.[8]

5.1 Expected Effort

We assume that R is elected in period 1. Let $\mathbb{E}[e_2^*]$ denote the expected effort of the office-holder in the second period, i.e., the effort of the re-elected incumbent, weighted by his probability of re-election, plus the effort of the challenger, weighted by his probability of winning. We define

$$\mathbb{E}[e_R^*] := \mathbb{E}[e_{R1}^*] + \mathbb{E}[e_2^*] \tag{15}$$

as expected total effort in the standard election and so obtain

$$\mathbb{E}[e_R^*] = e_{R1}^* + \frac{\gamma_h}{2c}\Big(p(e_{R1}^*, e_{R1}^*)\Big) + \frac{\gamma_l}{2c}\Big(1 - p(e_{R1}^*, e_{R1}^*)\Big).$$

Analogously, we define $\mathbb{E}[e_R^{*H}]$ as expected effort over both periods with vote-share contracts, and so obtain

$$\mathbb{E}[e_R^{*H}] = e_{R1}^{*H} + \frac{\gamma_h}{2c}\Big(p^H(e_{R1}^{*H}, e_{R1}^{*H})\Big) + \frac{\gamma_l}{2c}\Big(1 - p^H(e_{R1}^{*H}, e_{R1}^{*H})\Big).$$

This yields

Proposition 6

(i)

$$\mathbb{E}[e_R^{*H}] - \mathbb{E}[e_R^*] = \frac{(2\mu_R - 1)(2s^* - 1)}{4Ac} \cdot \frac{\gamma_l}{\gamma_h} = \frac{\gamma_l^2}{8Ac^2}. \tag{16}$$

(ii) The introduction of vote-share contracts increases the expected level of effort over both periods.

Proof: See Appendix. It is seen from equation (16) that the difference between expected total effort with vote-share contracts and that in standard elections increases with s^*, but is independent of γ_h. The reason for the latter are two offsetting effects. On the one hand, effort declines when the incumbent can look forward to large gains from

[8] A similar reasoning can be applied to the case $s^* = 1$.

experience in the second period, which makes winning re-election easier for given s^*. On the other hand, candidates are willing to offer higher bars for their re-election bid, which induces more effort in the first period. Part (*ii*) follows from (16) and the fact that $s^* > \frac{1}{2}$.

5.2 Expected Ability of the Winner in Period 2

It follows from (7), (12) and $s^* > \frac{1}{2}$ that vote-share contracts raise the average ability of re-elected candidates. On the other hand, they reduce the probability that incumbents will be re-elected, to be replaced by challengers whose expected level of ability is zero. In a standard election, we define the expected ability of the incumbent in period 2, given that R chooses e^*_{R1} in $t = 1$, as

$$\mathbb{E}[a_R(e^*_{R1}, e^*_{R1})] \; := \; \Big(p(e^*_{R1}, e^*_{R1})\Big) \cdot \widetilde{a}_R(e^*_{R1}, e^*_{R1}) + \Big(1 - p(e^*_{R1}, e^*_{R1})\Big) \cdot \mathbb{E}[a_L], \quad (17)$$

where the second term vanishes by virtue of $\mathbb{E}[a_L] = 0$. Analogously, we define $\mathbb{E}[a^H_R(e^{*H}_{R1}, e^{*H}_{R1})]$ as the expected ability of the incumbent in the second period given that candidates offer vote-share contracts and R chooses e^{*H}_{R1} in the first period.

Proposition 7

The introduction of vote-share contracts increases (decreases) the expected ability of the incumbent in the second period if $\frac{\gamma_h}{\gamma_l} > \frac{1+\sqrt{17}}{4}$ $\left(\frac{\gamma_h}{\gamma_l} < \frac{1+\sqrt{17}}{4}\right)$.

<u>Proof:</u> See Appendix. Note that the value of the ratio $\frac{\gamma_h}{\gamma_l} = \frac{1+\sqrt{17}}{4}$ just exceeds $\frac{5}{4}$. Hence, if experience raises productivity by clearly more than 25%, the expected ability of office-holders increases when vote-share contracts are introduced. There are two intuitive reasons for this result.

- The incumbent's re-election chances increase with the value of experience, $\gamma_h - \gamma_l$. The positive effect of vote-share contracts on expected ability, via the higher average ability of re-elected candidates, has relatively more weight if the re-election probability is higher.

- The average ability of a re-elected candidate decreases with the spread between γ_h and γ_l. The negative effect of vote-share contracts on expected ability, via a lower re-election probability, has relatively less weight if the average ability of a re-elected candidate is lower.

Both effects taken together explain why a larger spread between γ_h and γ_l increases the expected level of ability in period 2.

We further obtain

Proposition 8

Under vote-share contracts, an increase in γ_h decreases the average ability of a re-elected incumbent in the second period.

Proof: See Appendix. When experience is highly productive, lower-ability incumbents have something substantial to offer from a welfare perspective, as reflected in this result.

5.3 Summary

As we showed in Subsections 5.1 and 5.2, introducing vote-share contracts always increases expected overall effort, but decreases the expected ability of the office-holder in the second period if $\frac{\gamma_h}{\gamma_l} < \frac{1+\sqrt{17}}{4}$. In that event, the effects will be offsetting, but not wholly so. Table 1 summarizes the effects of introducing vote-share contracts on the key variables for the case $s^* < 1$.

	$\gamma_l < \gamma_h < \frac{1+\sqrt{17}}{4}\gamma_l$	$\gamma_h = \frac{1+\sqrt{17}}{4}\gamma_l$	$\gamma_h > \frac{1+\sqrt{17}}{4}\gamma_l$
$\mathbb{E}$[Overall effort]	$\uparrow$	$\uparrow$	$\uparrow$
$\mathbb{E}$[Ability in $t = 2$]	$\downarrow$	no change	$\uparrow$
Total welfare	$\uparrow$	$\uparrow$	$\uparrow$

Table 1: Effects of vote-share contracts ($s^* < 1$)

5.4 Social Welfare

Finally, we summarize all effects of vote-share contracts on social welfare.

- Effects on welfare via effort: Vote-share contracts induce a higher level of effort in period 1, but reduce the expected level of effort in period 2, since the probability of re-election decreases. Hence, the probability that the second-period level of effort will take the value $\frac{\gamma_h}{2c}$ decreases.

- Effects on welfare via ability: Vote-share contracts increase the average ability of re-elected incumbents, but reduce the probability of their re-election in favor of a challenger, whose expected ability is zero. This latter effect will be good or bad, *ceteris paribus*, for society depending on whether the expected ability of the incumbent in the second period is smaller or larger than zero.

Recall from Proposition 7 that whether introducing vote-share contracts increases or decreases expected ability in period 2 depends on the ratio of γ_h to γ_l. In the following Theorem, which is our main result, we summarize the overall effect of introducing vote-share contracts.

Theorem 1

(i) Competition of candidates with vote-share contracts yields $s_R = s_L = s^*$. The threshold s^* maximizes welfare and thus yields higher welfare than under standard elections.

(ii) The welfare-enhancing effect of vote-share contracts is increasing in γ_h and γ_l, and is decreasing in c.

Proof: See Appendix. We note that part (i) is a direct consequence of Propositions 4 and 5 and the observation that the welfare-optimal vote threshold is equal to the median voter's optimal choice.

Part (ii) states that the size of the welfare gains from the introduction of vote-share contracts depends on office-holder's productivity and private costs. The reasons are subtle, as there are many channels through which γ_h, γ_l and c affect total welfare. The value of experience is particularly striking and worthy of discussion in detail. The intuition runs as follows. Higher values of γ_h make the re-election of incumbents more valuable. From the perspective of the median voter in the first period, it is then more desirable that successful candidates offer higher vote-share thresholds, as these will motivate them to work harder in the first period. The associated impact on the expected level of ability of office-holders in the second period is small, so that expected welfare increases.

So far we have focused on competition of candidates with vote-share contracts. As only the level of the vote-share threshold matters for the welfare analysis, we obtain

Corollary 1

The same welfare gains as with vote-share contracts can be achieved when s^* is set by law.

According to Corollary 1, the electorate can achieve the welfare gains either by letting candidates compete with vote-share contracts or by setting s^* by law.[9]

6 Discussion and Conclusion

There are numerous fruitful extensions that can be pursued. We take up two lines here. Some advantages of incumbency are socially detrimental, and these could be incorporated into the current model. Gersbach (2007) examines what happens when incumbents can engage in socially wasteful activities to improve their re-election chances. In such circumstances, the welfare-improving impact of vote thresholds should be reinforced. Similarly, the application of vote thresholds to models in which the incumbent's competence remains unknown to voters, in the spirit of Rogoff and Sibert (1988), Rogoff (1990), Canes-Wrone et al. (2001), Shi and Svensson (2006) and Hodler et al. (2010), could prove useful.

The second line involves asymmetric competition. Consider, for example, two candidates who are *ex ante* heterogeneous. For instance, candidates may differ in their costs

[9]In a broader context, the parameters of two-candidate races are likely to differ across different two-candidate races. Then, competition with vote-share contracts is preferable to thresholds fixed by law, as competitive outcomes adjust themselves accordingly.

of effort or ideological distance from the median voter. Suppose μ_L is located closer to the ideal point of the median voter than μ_R, i.e., $\mu_L > 1 - \mu_R$. Then candidate L will have an *ex ante* advantage over his opponent R. It follows that L can allow himself a lower vote-share threshold than R in order to win the initial election.

Vote-share contracts appear to be a powerful tool to curb the undesirable advantages of incumbency, while preserving the desirable ones. Introducing such contracts would fundamentally alter the way in which political campaigns and elections would operate, beyond the effects explored in this paper. Hence, the course taken by liberal democracies would also change significantly – as would the outcomes. It is not guaranteed that in all circumstances, such changes will be welfare-improving. The risk of experimenting with vote-share contracts appears to be quite limited. If politicians were to promise high vote thresholds and often fail to reach them, there would be much higher turnover rates in legislatures. If, on the other hand, politicians declined to offer vote thresholds significantly higher than 50%, the innovation would have little or no impact. Given the limited downside risk, it appears to be high time to explore the innovation's potential by introducing it in practice.

Appendix

Proof of Proposition 1

As incumbent, R will choose $i^*_{R2} = \mu_R$ (part (i)), since this is also the last term. Where effort is concerned, his decision problem is

$$\max_{e_{R2}} \{\gamma_h(e_{R2} + a_R) - ce^2_{R2}\},$$

which yields $e^*_{R2} = \frac{\gamma_h}{2c}$. If, however, this is his first term, the corresponding problem is

$$\max_{e_{R2}} \{\mathbb{E}[\gamma_l(e_{R2} + a_R)] - ce^2_{R2}\},$$

whose solution is $e^*_{R2} = \frac{\gamma_l}{2c}$. He will, of course, choose $i^*_{R2} = \mu_R$.

Part (ii). Substituting these values into $V_R(\cdot, \cdot)$, R's expected utility from I and P as incumbent is $\gamma_h \left(\frac{\gamma_h}{2c} + a_R\right) - c\left(\frac{\gamma_h}{2c}\right)^2 = \frac{\gamma_h^2}{4c} + \gamma_h a_R$, and $\gamma_l \left(\frac{\gamma_l}{2c}\right) - c\left(\frac{\gamma_l}{2c}\right)^2 = \frac{\gamma_l^2}{4c}$ if he is in his first term.

■

Proof of Fact 2

It is optimal for the median voter $\left(i = \frac{1}{2}\right)$ to re-elect R if this yields him a higher expected utility in $t = 2$. Formally, this will hold iff [10]

$$\gamma_h \left(\frac{\gamma_h}{2c} + (a_R + e_{R1} - \hat{e}_1)\right) - (\mu_R - \frac{1}{2})^2 \geq \gamma_l \frac{\gamma_l}{2c} - (\mu_L - \frac{1}{2})^2,$$

where we have used the fact that upon observing g_1, the median voter infers R's ability level from $\frac{g_1}{\gamma_l} - \hat{e}_1 = a_R + e_{R1} - \hat{e}_1$. Using our assumption that $\mu_L = 1 - \mu_R$, we can rewrite the above condition as

$$a_R \geq -e_{R1} + \hat{e}_1 - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}. \tag{18}$$

Condition (18) states that R will be re-elected if his ability is at least the critical level $-e_{R1} + \hat{e}_1 - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}$. Since we have assumed that ability is uniformly distributed on $[-A, A]$, this gives $p(e_{R1}, \hat{e}_1) = \frac{1}{2} + \frac{1}{2A}\left(e_{R1} - \hat{e}_1 + \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}\right)$.

[10] If he is indifferent between the candidates, we assume that he gives the incumbent the nod.

Finally, the arithmetical average of $-e_{R1} + \hat{e}_1 - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}$ and A yields R's expected ability, conditional on the fact that he is re-elected: $\widetilde{a}_R(e_{R1}, \hat{e}_1) = \frac{A + \hat{e}_1 - e_{R1} - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}}{2}$.

■

Proof of Proposition 2

Together with equations (2) and (3), problem (4) yields the following first-order condition:

$$\gamma_l - 2ce_{R1} + \frac{1}{2A}\left(b + \frac{\gamma_h{}^2}{4c} + \frac{\gamma_h\left(A + \hat{e}_1 - e_{R1} - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}\right)}{2}\right)$$
$$-\frac{\gamma_h}{2}\left(\frac{e_{R1} - \hat{e}_1 + \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}}{2A} + \frac{1}{2}\right) - \frac{1}{2A}\left(\frac{\gamma_l{}^2}{2c} - (\mu_R - \mu_L)^2\right) \quad = \quad 0.$$

In equilibrium, $\hat{e}_1 = e_{R1}$ will hold, so the equilibrium effort is given by

$$e_{R1}^* = \frac{1}{2c}\left\{\gamma_l + \frac{1}{2A}[b - \frac{\gamma_h{}^2}{4c} + (\mu_R - \mu_L)^2]\right\}.$$

We obtain parts (*ii*) and (*iii*) by using the fact that $\hat{e}_1 = e_{R1}$ will hold in equilibrium.

■

Proof of Fact 3

The derivation of (8) and (9) is similar to that of (2) and (3). With $s_R \geq \frac{1}{2}$, R is re-elected if and only if all voters $i \geq 1 - s_R$ prefer him, as he needs at least s_R votes. This gives the condition

$$\gamma_h\left(e_{R2}^{*H} + (a_R + e_{R1}^H - \hat{e}_1^H)\right) - (\mu_R - (1 - s_R))^2 \geq \gamma_l e_{L2}^{*H} - (\mu_L - (1 - s_R))^2.$$

Using $\mu_L = 1 - \mu_R$, one obtains

$$a_R \geq -e_{R1}^H + \hat{e}_1^H + \frac{1}{\gamma_h}(2\mu_R - 1)(2s_R - 1) - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}. \qquad (19)$$

The right-hand side of this inequality gives the minimum ability R must have to be re-elected, which is increasing in s_R. With condition (19), it is straightforward to show that (2) and (3) generalize to (8) and (9).

■

Proof of Proposition 3

The incumbent's problem is the same as in Proposition 2, except that we have to use equations (8) and (9) instead of (2) and (3). The associated first-order condition is

$$\gamma_l - 2ce_{R1} + \frac{1}{2A}\left(b + \frac{{\gamma_h}^2}{4c} + \frac{\gamma_h A + (2\mu_R - 1)(2s_R - 1) + \gamma_h \hat{e}_1 - \gamma_h e_{R1} - \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}}{2}\right)$$
$$-\frac{\gamma_h}{2}\left(\frac{1}{2} + \frac{1}{2A}[e_{R1} - \hat{e}_1 - \frac{1}{\gamma_h}(2\mu_R - 1)(2s_R - 1) + \frac{(\gamma_h^2 - \gamma_l^2)}{2c\gamma_h}]\right)$$
$$-\frac{1}{2A}\left(\frac{{\gamma_l}^2}{2c} - (\mu_R - \mu_L)^2\right) = 0.$$

In equilibrium, $\hat{e}_1 = e_{R1}$ must hold. Hence, the equilibrium effort e_{R1}^{*H} is

$$e_{R1}^{*H} = \frac{1}{2c}\left\{\gamma_l + \frac{1}{2A}\left[b - \frac{\gamma_h^2}{4c} + (2\mu_R - 1)(2s_R - 1) + (\mu_R - \mu_L)^2\right]\right\}.$$

■

Proof of Proposition 4

We substitute equations (11) and (12) into problem (13), and use the fact that $\mathbb{E}\left[a_L^H\right] = 0$ and $\mathbb{E}\left[a_R^H\right] = 0$. This yields the following first-order condition:

$$\frac{(2\mu_R - 1)\gamma_l}{2Ac} - \frac{(2\mu_R - 1)}{A\gamma_h}\Big(\frac{A\gamma_h + (2\mu_R - 1)(2s_R - 1)}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c} + \frac{(\gamma_h^2 - \gamma_l^2)}{2c}\Big)$$
$$+(2\mu_R - 1)\Big(\frac{1}{2} - \frac{(2\mu_R - 1)(2s_R - 1)}{2A\gamma_h} + \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h}\Big) = 0.$$

Solving for s_R yields $s^* = \frac{1}{2} + \frac{\gamma_l \gamma_h}{4c(2\mu_R - 1)}$. The second derivative with respect to s_R is negative, which establishes that s^* solves problem (13).

■

Proof of Proposition 5

First, observe from (11), (14) and the assumption $2\mu_R - 1 < A\gamma_h$ that the incumbent's re-election chances with offer s^* (≤ 1) exceed zero. The incumbent will exert effort high enough to sustain his re-election chances, as b is sufficiently large. Any deviation from s^* to a higher or a lower vote-share threshold will result in electoral defeat, as the median voter prefers the offer s^*. Hence, deviation is not profitable. Uniqueness of s^* follows in the same way. If k chooses $s_k \neq s^*$, then k' will certainly win the election by choosing $s_{k'} = s^*$.

■

Proof of Proposition 6

By substituting for $p(e^*_{R1}, e^*_{R1})$ from equation (6), we obtain

$$\begin{aligned}\mathbb{E}[e^*_R] &= \frac{1}{2c}\left\{\gamma_l + \frac{1}{2A}\left[b - \frac{\gamma_h^2}{4c} + (\mu_R - \mu_L)^2\right]\right\} \\ &\quad + \frac{\gamma_h}{2c}\Big(\frac{1}{2} + \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h}\Big) + \frac{\gamma_l}{2c}\Big(1 - \frac{1}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h}\Big). \qquad (20)\end{aligned}$$

Similarly, from equation (11), we obtain

$$\begin{aligned}\mathbb{E}[e^{*H}_R] &= \frac{1}{2c}\left\{\gamma_l + \frac{1}{2A}\left[b - \frac{\gamma_h^2}{4c} + (\mu_R - \mu_L)^2 + (2\mu_R - 1)(2s_R - 1)\right]\right\} \\ &\quad + \frac{\gamma_h}{2c}\Big(\frac{1}{2} + \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h} - \frac{(2\mu_R - 1)(2s_R - 1)}{2A\gamma_h}\Big) \\ &\quad + \frac{\gamma_l}{2c}\Big(1 - \frac{1}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h} + \frac{(2\mu_R - 1)(2s_R - 1)}{2A\gamma_h}\Big). \qquad (21)\end{aligned}$$

Subtracting (20) from (21) yields, after some straightforward algebra,

$$\mathbb{E}[e^{*H}_R] - \mathbb{E}[e^*_R] = \frac{(2\mu_R - 1)(2s_R - 1)}{4Ac} \cdot \frac{\gamma_l}{\gamma_h}.$$

Part (*ii*) follows directly from equation (16).

■

Proof of Proposition 7

We use the fact that the expected ability of a new left-wing office-holder in period 2 is equal to zero and substitute for $p(e^*_{R1}, e^*_{R1})$ and $\widetilde{a}_R(e^*_{R1}, e^*_{R1})$ from (6) and (7) into equation (17). After some straightforward manipulation, we obtain

$$\mathbb{E}[a_R(e^*_{R1}, e^*_{R1})] \;=\; \frac{A}{4} - \frac{(\gamma_h^2 - \gamma_l^2)^2}{16Ac^2\gamma_h^2}. \tag{22}$$

Then we substitute from (11) and (12) into $\mathbb{E}[a^H_R(e^{*H}_{R1}, e^{*H}_{R1})]$ and obtain

$$\begin{aligned} \mathbb{E}[a^H_R(e^{*H}_{R1}, e^{*H}_{R1})] &= \frac{A}{4} - A\Big(\frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h} - \frac{(2\mu_R - 1)(2s^* - 1)}{2A\gamma_h}\Big)^2 \\ &= \frac{A}{4} - \frac{(\gamma_h^2 - \gamma_l^2)^2}{16Ac^2\gamma_h^2} + \frac{(2\mu_R - 1)(2s^* - 1)(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h^2} \\ &\quad - \frac{(2\mu_R - 1)^2(2s^* - 1)^2}{4A\gamma_h^2}. \end{aligned} \tag{23}$$

From equation (22) and (23), we obtain the following result:

$$\mathbb{E}[a^H_R(e^{*H}_{R1}, e^{*H}_{R1})] - \mathbb{E}[a_R(e^*_{R1}, e^*_{R1})] = \frac{(2\mu_R - 1)(2s^* - 1)}{4A\gamma_h^2}\Big(\frac{(\gamma_h^2 - \gamma_l^2)}{c} - (2\mu_R - 1)(2s^* - 1)\Big).$$

If $s^* = \frac{1}{2} + \frac{\gamma_h\gamma_l}{4c(2\mu_R - 1)} < 1$, we obtain

$$\mathbb{E}[a^H_R(e^{*H}_{R1}, e^{*H}_{R1})] - \mathbb{E}[a_R(e^*_{R1}, e^*_{R1})] = \frac{\gamma_l[2(\gamma_h^2 - \gamma_l^2) - \gamma_h\gamma_l]}{16Ac^2\gamma_h}. \tag{24}$$

Equation (24) yields Proposition 7.

■

Proof of Proposition 8

For $s^* < 1$, substituting from (14) into (12), yields

$$\tilde{a}^H_R = \frac{A}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c\gamma_h} + \frac{\gamma_l}{4c};$$

hence,

$$\frac{\partial \tilde{a}^H_R}{\partial \gamma_h} = \frac{-\left[8c\gamma_h^2 - 4c(\gamma_h^2 - \gamma_l^2)\right]}{16c^2\gamma_h^2} = \frac{-(\gamma_h^2 + \gamma_l^2)}{4c\gamma_h^2} < 0.$$

■

Proof of Theorem 1

Part (i): As all voters place the same value on (g_1, g_2), and ideological tastes are symmetrically distributed, welfare optimal vote-share thresholds are identical to the threshold desired by the median voter. Hence, Part (i) follows from Propositions 4 and 5 and the observation that $s_R = \frac{1}{2}$, $s_L = \frac{1}{2}$ are feasible vote-share contracts.

To prove Part (ii), we calculate the welfare-improvement that can be achieved by vote-share thresholds. Suppose, without loss of generality, that candidate R is elected in $t = 1$. We denote the welfare-improvement associated with the threshold s_R over standard elections by Δ. It is given by

$$\begin{aligned}\Delta \equiv \Big\{ &\gamma_l e^{*H}_{R1} + \gamma_l \mathbb{E}\left[a^H_R\right] + \left(p^H(e^{*H}_{R1}, e^{*H}_{R1})\right) \cdot \left(\gamma_h \tilde{a}^H_R(e^{*H}_{R1}, e^{*H}_{R1}) + \gamma_h e^{*H}_{R2}\right) \\ &+ \left(1 - p^H(e^{*H}_{R1}, e^{*H}_{R1})\right) \cdot \left(\gamma_l \mathbb{E}\left[a^H_L\right] + \gamma_l e^{*H}_{L2}\right) \Big\} \\ -\Big\{ &\gamma_l e^*_{R1} + \gamma_l \mathbb{E}\left[a_R\right] + \left(p(e^*_{R1}, e^*_{R1})\right) \cdot \left(\gamma_h \tilde{a}_R(e^*_{R1}, e^*_{R1}) + \gamma_h e^*_{R2}\right) \\ &+ \left(1 - p(e^*_{R1}, e^*_{R1})\right) \cdot \left(\gamma_l \mathbb{E}\left[a_L\right] + \gamma_l e^*_{L2}\right) \Big\}.\end{aligned}$$

Substituting $e^{*H}_{R2} = e^*_{R2} = \frac{\gamma_h}{2c}$, $e^{*H}_{L2} = e^*_{L2} = \frac{\gamma_l}{2c}$, $\mathbb{E}\left[a^H_L\right] = \mathbb{E}\left[a_L\right] = \mathbb{E}\left[a^H_R\right] = \mathbb{E}\left[a_R\right] = 0$ and the values for e^*_{R1}, $p(e^*_{R1}, e^*_{R1})$, $\tilde{a}_R(e^*_{R1}, e^*_{R1})$, e^{*H}_{R1}, $p^H(e^{*H}_{R1}, e^{*H}_{R1})$ and $\tilde{a}^H_R(e^{*H}_{R1}, e^{*H}_{R1})$ from Propositions 2 and 3, we obtain the following expression:

$$\begin{aligned}\Delta = \frac{\gamma_l}{2c}\Big\{ &\gamma_l + \frac{1}{2A}\left[b - \frac{\gamma_h^2}{4c} + (2\mu_R - 1)(2s_R - 1) + (\mu_R - \mu_L)^2\right]\Big\} \\ &+ \left[\frac{1}{2} + \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h} - \frac{(2\mu_R - 1)(2s_R - 1)}{2A\gamma_h}\right] \\ &\cdot \left[\gamma_h\left(\frac{A}{2} + \frac{(2\mu_R - 1)(2s_R - 1)}{2\gamma_h} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c\gamma_h}\right) + \frac{\gamma_h^2}{2c}\right] \\ &+ \left[1 - \frac{1}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h} + \frac{(2\mu_R - 1)(2s_R - 1)}{2A\gamma_h}\right] \cdot \frac{\gamma_l^2}{2c} \\ &- \frac{\gamma_l}{2c}\Big\{\gamma_l + \frac{1}{2A}\left[b - \frac{\gamma_h^2}{4c} + (\mu_R - \mu_L)^2\right]\Big\} \\ &- \left[\frac{1}{2} + \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h}\right] \cdot \left[\gamma_h\left(\frac{A}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4c\gamma_h}\right) + \frac{\gamma_h^2}{2c}\right] \\ &- \left[1 - \frac{1}{2} - \frac{(\gamma_h^2 - \gamma_l^2)}{4Ac\gamma_h}\right] \cdot \frac{\gamma_l^2}{2c}.\end{aligned}$$

After some manipulation, this reduces to[11]

$$\Delta = \frac{(2\mu_R - 1)(2s_R - 1)}{4A\gamma_h}\left(\frac{\gamma_l\gamma_h}{c} - (2\mu_R - 1)(2s_R - 1)\right).$$

In equilibrium for $s_R = s^*$ and $s^* < 1$ we obtain

$$\Delta = \frac{\gamma_l^2\gamma_h}{16Ac^2}.$$

From the last result, Part *(ii)* of Theorem 1 follows at once.

■

[11]We note that setting $\frac{\partial\Delta}{\partial s_R} = 0$ yields the expression for s^* in Proposition 4.

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