The Economic Journal, **114** (*January*), 69–82. © Royal Economic Society 2004. Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

INVERSE CAMPAIGNING*

Kai A. Konrad

It can be advantageous for an 'office motivated' party *A* to spend effort to make it public that a group of voters will lose from party *A*'s policy proposal. Such effort is called inverse campaigning. The inverse campaigning equilibria are described for the case where the two parties can simultaneously reveal information publicly to uninformed voters. Inverse campaigning dissipates the parties' rents and causes some inefficiency in expectation. Inverse campaigning also influences policy design. Successful policy proposals hurt small groups of voters who lose a lot and do not benefit small groups of voters who gain a lot.

Policy reform proposals are often debated publicly. Information processed in this debate may change the voters' attitudes towards the reform. This information is often of a particular type. Consider, for instance, the debate on tax reform. Often, the advocates of a tax reform do not identify the set of voters who gain but do point out that the reform will eliminate some 'undeserved' large benefits of a minority group, or close some 'tax loophole' that benefits a minority group of voters.[1] They point to a group of voters who will lose from the reform. Similarly, the party that opposes the reform identifies small interest groups which will receive large benefits from the reform and accuses the reform advocates of favouring a small minority at the expense of the large majority. For instance, the Democratic National Platform (2000, p. 5) criticised the tax reform suggested by the Republicans as follows: 'The Bush tax slash ... is bigger than any cut Newt Gingrich ever dreamed of. It would let the richest one percent of Americans afford a new sports car and middle class Americans afford a warm soda'. A particular voter in the remaining 99% segment may benefit or lose from the tax cut, depending on the allocation of the reduction in spending among the different categories of public expenditure that is not known. However, these voters can correctly calculate that they will make a loss in expected value terms.

I will call this type of information policy *inverse campaigning*. Inverse campaigning differs from ordinary campaigning where parties use resources to tell the voter how beautiful, moral, and competent they are (positive campaigning) or where they use them to tell the voter how bad, ugly, and incompetent the opponent is (negative campaigning).[2] An example that illustrates a possible rationale for inverse campaigning is as follows. Suppose a party *X* proposes a policy. Suppose there are 100 voters. If the policy proposal is carried out, 51 voters gain one unit and 49 voters lose one unit. Suppose further that each voter knows this distribution of gains and

* I thank Helmut Bester, Amihai Glazer, Daniel Krähmer, Frode Meland and participants in seminars at UCL, Bonn, Bergen and Frankfurt and two anonymous referees for valuable comments. The usual caveat applies.

[1] See, e.g., page 19 of the agreement between German Social Democrats and the Green Party (http://www.spd.de/servlet/PB/show/1023294/Koalitionsvertrag.pdf2002).

[2] For a discussion of positive and negative campaigning see, e.g., Skaperdas and Grofman (1995) and Harrington and Hess (1996).

losses, but does not know whether he belongs to the group of winners or to the group of losers. In the absence of information, all voters will vote for party *X*, because this choice maximises each voter's expected payoff. Consider now a party *Y* which opposes this policy proposal. Suppose party *Y* identifies three voters a_1, a_2 and a_3 who gain if the policy proposal is carried out, and informs the public that these voters will be among the winners. Once this has happened, all remaining uninformed voters will update their probability beliefs and their expected gains from the policy proposal fall from +2/100 to −1/97. Accordingly, the three informed voters will vote for party *X*, but all 97 uninformed voters will vote for party *Y*.

The central idea in this example that motivates party *Y* to engage in inverse campaigning is as follows. It is difficult and costly for a voter to calculate whether he or she gains or loses from a particular policy reform. This has frequently been recognised in the literature on policy reform and it results from the complexity of many policy proposals and their various general equilibrium repercussions. If it becomes known that the reform affects a well-defined group, the information is also valuable to the voters who do not belong to this group: if the reform takes from a group, the redistributional impact of the reform is more likely to benefit the majority of voters who do not belong to this group. Similarly, if the uninformed majority learns that the reform shifts massive benefits to a small minority group, it becomes more likely that the reform will be less advantageous to this majority of voters.

A further aspect is that this mechanism will have some impact on the design of the reform. If a party chooses a reform that makes it easy for the opposition to identify a minority group that gains much by this reform, the reform is unlikely to receive majority support. However, by choosing a reform that inflicts substantial losses on a well determined minority group the party can increase the likelihood of adoption.

The importance of the group of incompletely informed voters has been shown in a number of contexts. Feddersen and Pesendorfer (1996) explain why incompletely informed voters may abstain from voting even if they have some expectations about the benefits and costs of the different policy proposals. It is important for their result that the uninformed and informed voters' preferences are aligned. This is the case, for instance, if all voters gain or all voters lose from a reform proposal. In contrast, the mechanism in this paper focusses on reforms where there is a conflict of interests between voters about the policy proposal, for instance, for redistributive reforms. Fernandez and Rodrik (1991) develop a theory of structural conservativism that is based on a statistical phenomenon similar to the one in this paper. They explain why the majority of voters – the *ex ante* uninformed – may first oppose a reform and why a majority of voters – the *ex post* informed voters who learn that they will gain from the reform – may then favour the reform once it has been adopted and all the voters have learned whether they belong to the winners or losers.[3] They explain the time inconsistent preferences of voter

[3] This learning effect is also crucial for the results in Glazer and Konrad (1993) who show that groups of voters may oppose a welfare enhancing reform if, when the reform is adopted, they lose control over future projects.

majorities which have a status-quo preference.[4] Their results also rely on the decisiveness of the group of incompletely informed voters. However, they consider the information status of voters prior to the election to be exogenous and do not consider whether and how the information status and their voting decision can be influenced by strategic information revelation.

In this paper time consistency is not an issue. I consider the parties' campaign incentives and show that they have an incentive to strategically reveal information publicly about who benefits or loses from policy adoption. I analyse the way two parties' incentives interact. The focus is on whether parties or candidates can manipulate the voting outcome in their favour by giving information to small groups of voters, what kind of information campaigns they use, what the welfare properties of the campaign equilibrium are and what inverse campaigning implies for the design of policy proposals.[5]

Section 1 establishes a framework in which inverse campaigning can be studied. Section 2 analyses one party's unilateral incentive to disclose information. Section 3 turns to the problem of simultaneous information disclosure. Section 4 discusses extensions and implications of the main result for the design of policy reform, and Section 5 summarises the results.

1. The Framework

Suppose there are two parties X and Y. Party X is committed to implementing a particular reform. Party Y is committed to abstaining from this reform. The share $\frac{1}{2} + e$ of voters benefits from the reform that party X proposes and each of these voters has a benefit equal to some $t > 0$. These voters are called 'type-x voters'. The share $\frac{1}{2} - e$ of voters loses from this reform, and the loss of each voter in this group is the same size t as a winner's gain. These voters are called 'type-y voters'.

The reform could be a complex change in the system of taxes or transfers with general equilibrium repercussions. The consequences of such reform for a single individual are difficult and costly to calculate. With a continuum of voters, rational voters are not willing to spend anything on information acquisition. I assume that all voters are therefore uninformed about their type, but that they know the distribution of types. The analysis could be carried out for the case in which some groups of voters know the effect of the reform for their individual payoffs at some cost in terms of complexity and notational effort. As long as this share of voters is small, or if the share of winners and losers from the reform is sufficiently similar in size, the results obtained here generalise to these cases. I discuss this in Section 4.

Analytically the type uncertainty is described as follows. The set of voters is V, and has a measure $p(V) = 1$. A subset V_x of voters is of type x. This subset has a measure of $p(V_x) = \frac{1}{2} + e$ and, without loss of generality, $e \geq 0$ (otherwise 'not

[4] The literature on policy reform is vast. Some of this literature is surveyed in Rodrik (1996). Much emphasis has been given to the issue of time consistency. However, there seems to be little research on the role played by strategic information production for policy adoption.

[5] A small literature in industrial organisation considers the consequences of consumers' information status with respect to experience goods; see, e.g., Bergemann and Välimäki (1996). The inverse campaigning idea could be applied there to study firms' incentives to inform customers.

implementing the reform' and 'implementing the reform' switch roles). All other voters are of type y and constitute the set V_y that is of measure $p(V_y) = \frac{1}{2} - e$. Voters know the distribution of types, but do not know their own type. Accordingly, without any further information, each voter considers the probability ξ of being of type-x as $\xi = \frac{1}{2} + e$.

Parties are office motivated. They care about winning more than 50% of the votes (as in presidential elections or the competition between two candidates more generally). Let θ_Y and $\theta_X = 1 - \theta_Y$ be the shares of voters voting for party Y and party X, respectively. Then party Y's benefit is

$$\Psi(\theta_Y) = \begin{cases} 1 & \text{if } \theta_Y > 1/2 \\ 1/2 & \text{if } \theta_Y = 1/2 \\ 0 & \text{if } \theta_Y < 1/2 \end{cases} \tag{1}$$

and party X's benefit is $1 - \Psi(\theta_Y)$, where the benefit of winning is normalised to 1.

The sequence of actions is as follows. In STAGE 0 nature assigns a type to each voter. That is, each voter becomes an element of V_x or V_y. All this is common knowledge to the parties and the voters, but voters do not know their own type.

Given a continuum of voters, each voter has a negligible impact on the election outcome and has no incentive to invest resources in becoming informed. Parties' incentives to invest in information on voters' types, however, can be considerable: as will be shown, parties can affect the election outcome by collecting information on very small groups of voters. The information acquisition decision is made in STAGE 1. Parties X and Y can choose respectively sets A and B that are measurable subsets of V and then inform the voters in these sets about their types. For simplicity, if a party chooses a subset I with measure $p(I)$, this is not a pure random selection; the party can determine how big the share of voters in I is that belongs to V_x or to V_y, that is, they can choose how many x-types or y-types they would like to identify and reveal.[6] The party's cost of information acquisition for a set I of voters is proportional to the number of voters who become informed about their type, that is, the cost is $cp(I)$. Accordingly, the payoff of party Y becomes

$$G_Y(A, B) = \Psi[\theta_Y(A, B)] - cp(B), \tag{2}$$

where A is the set of voters whose types are identified by party X, B is the set chosen by party Y, and θ_Y is the share of voters who will choose party Y given these choices about information acquisition. The function $\theta_Y(A,B)$ will be determined later. The payoff of party X is determined analogously.

In STAGE 2 the choices of sets A and B and the measures $p(A \cap V_x)$, $p(A \cap V_y)$, $p(B \cap V_x)$ and $p(B \cap V_y)$ are publicly observed and the voters who are in these sets also learn their individual types. Accordingly, some voters know their individual types and some other voters know that they belong to the set $V \backslash (A \cup B)$ and can

[6] Alternatively, one could assume that each party first chooses a set I of voters whose types are then determined and then chooses which subset of voters from I the party will inform in public about their types. This revelation choice is an additional complication because the voters' out-of-equilibrium expectations could be conditional on these choices and this could generate further equilibria.

update their prior beliefs about their probabilities of being type x or type y accordingly.

In STAGE 3 voters vote sincerely; voters who know their types vote for the party whose programme they prefer and voters who do not know their types vote for the party whose programme maximises their expected payoff.

Before proceeding to describe the equilibria with information acquisition, it is instructive to show the outcome where there is no access to information, i.e., if $A \cup B \equiv \emptyset$. In this case each voter is uninformed and maximises an expected payoff that is equal to $t(\frac{1}{2} + e) - t(\frac{1}{2} - e) = 2et$ if party X is elected and equal to 0 if party Y is elected. Accordingly, all voters vote for party X if $e > 0$. We state this benchmark case as

PROPOSITION 1. *If all voters are uninformed, all voters vote for the party that maximises the expected payoff of the uninformed voter. If $e > 0$ all vote for party X.*

2. Unilateral Inverse Campaigning

Let $e > 0$. Suppose only party Y can acquire information, i.e., $A = \emptyset$. The case in which only party X can acquire information is uninteresting for $e > 0$, because in this case party X wins all the votes if all parties abstain from information acquisition. The general case in which all parties simultaneously acquire and reveal information is considered in Section 3.

The mapping between a choice of a set B of voters and voters' choices is as follows. All voters from the set B become fully informed about their types and vote according to their types. All other voters remain incompletely informed about their types. However, they do update their beliefs. Their beliefs about the probability of being of type y are updated as follows. For any subsets A, $B \in V$ define

$$A_x \equiv A \cap V_x, \quad A_y \equiv A \cap V_y, \quad B_x \equiv B \cap V_x, \quad B_y \equiv B \cap V_y. \tag{3}$$

Let party Y choose set B. Given that $\xi = \frac{1}{2} + e$ was a voter's probability of being of type x in the absence of information, using Bayes Rule, for $i \notin B$ the updated probability $(1 - \tilde{\xi}(B))$ of being of type y becomes[7]

$$1 - \tilde{\xi}(B) \equiv 1 - \frac{\xi - p(B_x)}{1 - p(B)} = \frac{\frac{1}{2} - e - p(B_y)}{1 - p(B)} \tag{4}$$

and i votes for Y if this probability is larger than $1/2$. For the case of equality, where only one party acquires information, adopting the following tie-breaking rule in this Section is without loss of generality and makes the analysis as simple as possible. This rule is that a voter who is indifferent votes for party Y.

Party Y will not choose to identify voters who, if informed, prefer party Y. More formally:

[7] Both parties and voters are fully informed about e, and all new information about A and B is shared among all players. This simplifies the analysis because Bayesian updating then strictly follows (4), and equilibria can be ruled out that could be based on out-of-equilibrium beliefs of voters if parties had, or gained, superior information and could select the information they reveal.

PROPERTY 3.1. *Party Y will choose some B with $p(B_y) = 0$.*

For a proof I show that any B with $p(B_y) > 0$ is strictly dominated by $\hat{B} = B \backslash B_y$. To see this note first that $\hat{B}$ has a lower information cost than B by $cp(B_y)$. It is, therefore, sufficient to show that $\Psi(B) \leq \Psi(\hat{B})$.

(i) If B yields $1 - \tilde{\xi}(B) < 1/2$, then $\Psi(B) = 0$. But $\Psi(\hat{B}) \geq 0$.
(ii) If B yields $1 - \tilde{\xi}(B) = 1/2$, then the total number of voters voting for Y is not lower if the party chooses $\hat{B}$. The reason is as follows. $1 - \tilde{\xi}(B) = 1/2$ implies $1 - \tilde{\xi}(\hat{B}) > 1/2$ by (4). Hence, all uninformed voters vote for party Y if party Y chooses $\hat{B}$. Moreover, for a choice of $\hat{B} = B \backslash B_y$, the set $V \backslash \hat{B}$ of uninformed voters includes B_y. Accordingly, $\Psi(\hat{B}) = 1 \geq \Psi(B)$.
(iii) If $1 - \tilde{\xi}(B) > 1/2$, this implies that $1 - \tilde{\xi}(\hat{B}) > 1/2$ and the same reasoning as in (ii) applies.

Summarising, $\Psi(\hat{B}) \geq \Psi(B)$ and $cp(\hat{B}) < cp(B)$ if $p(B_y) > 0$.

Property 3.1 suggests that party Y does not benefit from informing type-y voters. It chooses a set B such that $p(B) = p(B_x)$. It will inform only type-x voters about their type. Intuitively, Y wins if, and only if, the incompletely informed voters are decisive and vote for party Y. Identifying voters who gain from the reform (type-x voters) is useful for party Y because uninformed voters consider it more likely that they will lose from the reform if more voters who gain are identified. However, identifying reform losers (type-y voters) is counterproductive for party Y as the remaining uninformed voters consider it less likely that they will belong to the losers of the reform.

A second, more straightforward observation is

PROPERTY 3.2. *Any two sets B, B' with $p(B_y) = p(B'_y) = 0$ and $p(B) = p(B')$ yield the same θ_Y.*

Property 3.2 states that which particular subset of voters from the subset V_x of type-x voters is chosen and informed by party Y does not matter for the voting outcome. Only the size of the set B_x of voters of type x that are informed matters for the voting outcome. The reason is that these voters will vote for x in any case, and all other voters update according to (4), but this updating is based only on the measure of the set of B_x voters who are informed and not on the particular set.[8]

Party Y's optimal campaign policy is therefore characterised by the optimal measure p of voters from the set V_x whose type is revealed. To find the optimal p, four ranges of p have to be distinguished. For $p < 2e$, the uninformed voters are decisive and vote for X. For $p \in [2e, 1/2)$ the uninformed voters are decisive and vote for Y. Note that this range is non-empty only if $e < 1/4$. For $p = 1/2$, there is a tie with $\theta_Y = \theta_X = 1/2$. For larger p, there is a majority of voters who know they are of type x. The maximum payoff therefore is attained at $p = 2e$ (and at a slightly

[8] This property depends on the fact that all voters in the respective sets V_x and V_y are homogeneous. In Section 4 generalisations will be discussed with a continuum of fully heterogeneous voters. It will become clear from this discussion that, for heterogeneous sets V_x and V_y, party Y prefers to identify groups of voters who gain most strongly from party X's policy proposal.

larger p for other tie-breaking rules) or at $p = 0$. The choice $p = 2e$ yields higher payoff than $p = 0$ if

$$2ec < 1. \tag{5}$$

The inequality (5) describes that the minimum cost of informing a sufficient number of voters needed to change the decision of the remaining uninformed voters (left hand side of (5)) is smaller than the benefit from being elected that was normalised to unity (right hand side of (5)). Even for extremely high information cost, this condition can easily be fulfilled if e is not much different from 0, that is, if the set of beneficiaries of the reform is approximately 1/2. We summarise this as

PROPOSITION 2. *Suppose only party Y can make use of inverse campaigning. Let* $e < 1/4$. *If* $2ec < 1$, *a situation in which party Y reveals information about a set* $B \subset V_x$ *of voters of type x with* $p(B) = 2e$ *is a perfect Bayesian equilibrium.*

To make this intuitive, recall the finite numbers example in the introduction where there are 51 voters of type x and 49 voters of type y and in which case e equals 1%. If no voters are informed, party X wins: all voters vote for X, because each has a 51:49 chance of being of type x. If party Y reveals the types of two type-x voters, these two voters will vote for X, but the remaining 98 uninformed voters change their beliefs. Their chances of being of types x or y are now 49:49, and, given the tie-breaking rule, they will all vote for Y. The minimum percentage of type-x voters who need to be informed to cause this reversal of the uninformed voters' decision is 2%, or $2e$. Party Y would not want to incur unnecessary cost to inform even more voters. Further, the cost condition states that party Y's cost of informing two voters is lower than the gain from winning. Finally, if $e > 1/4$, in the finite numbers example this translates into a distribution with more than 75 voters of type x and less than 25 voters of type y. Party Y would have to inform more than 50 voters that they are of type x to make the uninformed vote for Y. But then the uninformed voters are a minority and the informed majority votes for X. Hence, party Y could not change the outcome by inverse campaigning.

In this Section an asymmetric situation was considered in which party X had an advantage in the uninformed situation ($e > 0$) but party Y was allowed to acquire and disseminate information about voters' actual types/preferences. This analysis was carried out mainly in order to reveal the intuition about why a party might want to inform groups of voters that they are better off by voting against this party. This type of effort was called *inverse campaigning*.

It is more plausible for both parties to have similar opportunities of acquiring and disseminating information, and I turn to this case next.

3. Simultaneous Campaigning

Depending on the distribution of the voters' types and the comparison between the cost of information acquisition and dissemination and the benefit of being elected, there are many cases that could be considered if both parties can acquire and disseminate information. I concentrate on the case that is perhaps most relevant for which

$$\frac{1}{2e} > c, \tag{6}$$

and for which the cost of information acquisition is in the range

$$c > \frac{4}{1 - 8e}. \tag{7}$$

The other cases can be considered briefly when discussing these conditions. The two inequalities together imply $0 \leq e < 1/16$, i.e., that the two alternatives proposed by the two parties split the voter population approximately evenly into winners and losers. If e is large, then party Y has a considerable disadvantage. As with unilateral inverse campaigning, inverse campaigning will break down if one party's advantage is too large.

Conditions (6) and (7) show that the cost of informing voters is not negligible but that it is also not prohibitively high. These assumptions are important for eliminating cases in which information acquisition does not take place because it is prohibitively costly or in which information acquisition is very inexpensive. The first inequality is identical with (5): if $1/(2e) > c$ does not hold, there will be no campaigning and party X will win. Note, however, that $1/(2e) > c$ always holds if e is sufficiently small, that is, if neither party has a considerable advantage. Further, if $c > 4/(1 - 8e)$ does not hold, then a party's gain from winning is higher than the cost of informing about a quarter of all voters. In this case the equilibria will be in mixed strategies and the results derived below will partially carry over to this case, although parties may also use other strategies than inverse campaigning.[9]

We first note:

Proposition 3. *If $e \geq 0$ is sufficiently small, no equilibrium in pure strategies exists.*

For a proof of the nonexistence of a pure-strategy equilibrium suppose that (A, B) characterises an equilibrium in pure strategies. Note first that $p(A) = 0$ cannot hold in the equilibrium. If party X chooses some A with $p(A) = 0$, then by $1/(2e) > c$, Y can optimally choose some B with $p(B_y) = 0$ and $p(B_x)$ slightly above $2e$, because this makes B win the election and has the lowest cost among the choices that make Y win. But this makes A with $p(A) = 0$ suboptimal for party X. Suppose now $p(A) > 0$. Party Y's optimal reaction to this A is either some appropriately chosen $B(A)$ with $p(B_x) > 0$ that makes Y win with certainty or $p(B) = 0$. For both these cases, the choice of A is not an optimal answer to $B(A)$: if $p[B(A)] = 0$ then some $\hat{A}$ with $p(\hat{A}_y) = \delta$ for small non-negative δ dominates A and if $B(A)$ makes Y win with certainty then some $\hat{A}$ with $p(\hat{A}) = 0$ dominates A.

[9] If the second inequality in (7) is violated, the total size of the voter population induces a cap on inverse campaigning, and some of the equilibria are similar to contest equilibria as in Che and Gale (1998).

Hence, some A with $p(A) > 0$ can also not be X's pure equilibrium strategy and this shows that there can be no pure-strategy equilibrium.

Here, and in what follows, I adopt the rule that uninformed voters who are indifferent because they think that they are equally likely to be type x or type y, randomise and vote for party X or party Y with equal probabilities. While it does not matter for the qualitative results, this tie-breaking rule simplifies the analysis of the case where the two parties simultaneously choose inverse campaigning effort. This tie-breaking rule leads to a unique voting outcome for all given choices of A and B. All voters $i \in A \cup B$ vote according to their type. All voters who are not in this set update their beliefs and vote accordingly.

Before we characterise an equilibrium we notice two properties:

PROPERTY 4.1. *None of the parties will choose some set I of voters with $p(I) > \frac{1}{4} - 2e$.*

This property is an implication of the cost condition $c > 4/(1 - 8e)$. The choice of some I with $p(I) \geq \frac{1}{4} - 2e$ has a higher cost than the maximum gain from winning.

PROPERTY 4.2. (*Inverse campaigning*) *If A and B are in the equilibrium support of parties X and Y, respectively, then $p(A_x) = p(B_y) = 0$.*

This property states that party X acquires information only to identify type-y voters and to reveal their type and party Y acquires information only to identify type-x voters and to reveal their type. Accordingly, if a party uses resources in order to inform voter groups and the public about the implications of the reform, the party informs interest groups who then oppose this party's programme.

A proof of Property 4.2 is in the Appendix. The intuition for this property is as follows. The decisive group of voters is the group of incompletely informed voters who have to vote on the basis of expectations about whether they benefit or lose from the reform. For party X it is important to change the prior beliefs of this group favourably. If party X reveals that some group of voters is of type y, the size of the decisive group of voters will be reduced and the newly informed voters will vote for party Y. But the group of incompletely informed voters is still decisive and the fact that some measure of type-y voters has been identified and eliminated from the set of incompletely informed voters will make it more likely that a voter in this incompletely informed group belongs to the voters of type x who prefer party X. Hence, party X benefits from informing and revealing voters of type y. Conversely, party X is harmed if party X reveals that some group of voters is of type x. Incompletely informed voters will then revise their probability estimates and will consider it less likely that they are of type x. The analogous reasoning explains why it is not in party Y's interest to inform incompletely informed voters of type y of their type.

The following proposition characterises an equilibrium for a broad range of parameters as shown in (6) and (7).

PROPOSITION 4. *Suppose both parties can make inverse campaigning effort. A perfect Bayesian equilibrium in mixed strategies exists that is described by choices of sets A and B made by parties X and Y, respectively, such that $p(A_x) = 0$ and $p(B_y) = 0$ for all A in the* *equilibrium support of X and all B in the equilibrium support of Y, and with* $p(A)$ *and* $p(B)$ *distributed according to cumulative distribution functions* F_X *and* F_Y *with*

$$F_X[p(A)] = \begin{cases} 2ec + cp(A) & \textit{for } p(A) \in [0, 1/c - 2e] \\ 1 & \textit{for } p(A) > 1/c - 2e \end{cases} \tag{8}$$

and

$$F_Y[p(B)] = \begin{cases} 2ec & \textit{for } p(B) \in [0, 2e] \\ cp(B) & \textit{for } p(B) \in [2e, 1/c] \\ 1 & \textit{for } p(B) > 1/c. \end{cases} \tag{9}$$

The equilibrium payoffs are $2ec$ *for party X and* 0 *for party Y.*

For a proof that (8) and (9) establish an equilibrium in mixed strategies, given Properties 4.1 and 4.2 it is sufficient to show that these probability distribution functions establish mutually optimal responses. To see this, consider first the payoff of party Y for different choices $p(B)$. Y wins if $(\frac{1}{2} - e) - p(A_y) > (\frac{1}{2} + e) - p(B_x)$ or, equivalently, if $p(B_x) - 2e > p(A_y)$. If X chooses the mixed strategy as in (8), then party Y wins with probability $F_X[p(B_x) - 2e]$. Party Y's payoff from some choice B with $p(B_y) = 0$ is equal to

$$F_X[p(B_x) - 2e] - cp(B_x). \tag{10}$$

This can be seen as follows. As the benefit of being elected is normalised to 1, the expected benefit of being elected is equal to the probability that Y wins the election. For a choice $p(B) = p(B \cap V_x) = p(B_x)$, this probability is given by (8) as $F_X[p(B_x) - 2e]$. The second term in (10) is the campaign cost. The payoff in (10) is equal to zero if $p(B_x) \in \{0\} \cup [2e, 1/c]$ and smaller than zero for all B with $p(B_x)$ outside this range. Hence, any mixed strategy by Y with support $\{0\} \cup [2e, 1/c]$ is an optimal response to F_X as defined in (8). Similarly, party X wins if $(1 + e) - p(B_x) > (1 - e) - p(A_y)$, or, equivalently, if $p(A_y) > p(B_x) - 2e$. This is the case with probability $F_Y[p(A_y) + 2e]$ if party Y chooses the mixed strategy described by (9). Party X's payoff from choosing some set A_y of y-types becomes

$$F_Y\left[p(A_y) + 2e\right] - cp(A_y). \tag{11}$$

This payoff is equal to $2ec$ for all A for which $p(A_x) = 0$ and $p(A) \in [0, 1/c - 2e]$ and smaller than $2ec$ for all other A.

The mixed strategy equilibrium that is characterised in Proposition 4 follows straightforwardly from the theory of all-pay auctions, as in Hillman and Riley (1989) and Baye *et al.* (1996). They also show that the equilibrium cumulative density functions in the two-player all-pay auction are unique for the case $e = 0$, and their line of reasoning extends to small $e > 0$. The important element of the proof of Proposition 4 is therefore property 4.2 which makes sure that parties choose A and B from disjunct sets. This ensures that the parties' payoffs are functions of the measures of A and B and not of the sets A or B themselves, and this turns the problem into a simple all-pay auction.

The main result can be summarised as follows. If neither party is particularly disadvantaged by its commitment to support or to oppose a particular policy reform, and if voters are uncertain whether they belong to the winners or losers of the reform, then parties may have an incentive to change the decisions of incompletely informed voters who maximise their expected payoff by revealing how the reform will affect some minority groups of voters. A party will typically publicly identify groups that have good reason to oppose this party's proposal in order to change the prior beliefs of the remaining group of incompletely informed voters favourably. Proposition 4 also implies that the sum of the parties' expected rents in the equilibrium is equal to $2ec$ and that these fully accrue to the party that would be elected in the absence of campaigning. Hence, much of the parties' rent is dissipated in the inverse campaigning effort. For the case of symmetry ($e = 0$), all rents are fully dissipated by these activities.

4. Generalisations and Implications

4.1. *Ex ante Informed Voters*

In the previous Sections, I assumed that all voters are uninformed unless one of the parties informs them about their types. For some reforms some sets of voters may know the direction of the impact of the reform even in the absence of campaigning. However, for some other sets of voters, the impact of the reform may be unclear. In this case the results in the paper continue to hold as long as the set of voters who know they gain is not much smaller or larger than the set of voters who know that they lose. Suppose, for instance, the sets are of precisely equal size. Then these *ex ante* informed voters neutralise each other perfectly, and the aggregate set of these voters has no impact on the election outcome. Hence, the election outcome is determined by the set of *ex ante* uninformed voters. The incentives for influencing the voting outcome by inverse campaigning are even stronger in this case. The reason is that the sets A or B needed to change the incompletely informed voters' decisions are even smaller, because there are fewer incompletely informed voters.

4.2. *Skewed Payoff Distributions*

One could expect that voters' gains and losses from reform are not a binary variable and that the distribution of gains and losses for many reforms is skewed. This complicates the analysis but strengthens the incentives for inverse campaigning. In this case, the parties are no longer indifferent to the subset of voters of the opposite type that they prefer to identify. Consider the example of a purely redistributive tax reform that leaves aggregate income unchanged. Uninformed voters will like a reform if a set of, say, 10% of voters is identified who all lose one unit because this increases the expected payoff for uninformed voters. However, they will like the reform even better if a set of 1% of voters is identified who lose 100 units each. The increase in their expected payoff from this latter information is much stronger than for the former information, even though the set of voters who become informed is much smaller. If campaign costs are proportional to the size of the set of voters whose type is identified, then parties will prefer to identify sets of voters whose stakes in the reform are high. Inverse campaigning towards voters who have high stakes in the reform is more effective.

4.3. *Design of Policy Reform*

The insight about skewed payoffs and the effectiveness of inverse campaigning has some implications for the optimal design of policy reforms. Suppose a party X designs a policy reform proposal that is purely redistributive and does not change aggregate rents. It is useful for party X if there is a small minority group A that incurs major per capita losses from the reform. Party X can publicly identify this group. This campaigning is very effective. Its cost is low, given that the set A is small, and the size of the set of decisive voters is also not reduced by much. However, because each voter in A loses much if the reform is enacted, the gains of the uninformed voters must be high. The more each voter in set A loses, the larger the increases in the expected gains of the uninformed voters. Conversely, it is dangerous for party X if the reform generates large *per capita* benefits for some small group. The opponent of party X will identify this group of reform winners. This information will lower the expected gain from the reform for the large set of incompletely informed voters and will make it more likely they will oppose the reform.

Accordingly, with inverse campaigning, a policy proposal for redistribution is more likely to succeed if there are no small groups of voters who gain much, but there are rather small groups who lose much. Parties may take this into account when designing redistributional policies.

Inverse campaigning is only one of many explanations for the precise form of legislation that may reinforce or counteract each other. It is interesting to note, for instance, that the implications of inverse campaigning for policy choices in a voting context are the reverse of the predictions of Olson's (1965) logic of collective action in a lobbying context. He suggests that small interest groups with high stakes successfully influence policy outcomes to their benefit.

5. Summary and Discussion

This paper considers the question why parties or candidates in a two-party system use resources for inverse campaigning: they inform the public that small interest groups gain by a victory of their competitor, so that these interest groups also vote for their competitor. The intuitive reason for this behaviour is that the information about other voters' gains or losses from a policy reform changes the perceptions and expectations of uninformed voters about whether they will gain or lose from this reform.

What are the crucial assumptions for this puzzling result and how plausible is inverse campaigning for different types of policy reform? First, it is important for the voters to be uncertain about what a policy reform means for them personally. This assumption is probably fulfilled for many reform proposals and for a large set of voters in a complex environment where voters have very little incentive to use resources to learn whether they gain or lose from a reform. Second, it is important for the parties to be able to acquire information about the groups of voters which win or lose by the reform, and to be able to disseminate this information. Parties then can indeed influence the election outcome favourably by inverse campaigning. Third, it was assumed here that the shares of winners and losers and the size of their losses or gains are given. Hence, the revelation of information about a group of winners does not affect the expected quality of a policy proposal as such. Some policy proposals are more likely to meet this condition than others. For instance, implementing a reform that has considerable allocative effects may increase or decrease efficiency, and there may also be uncertainty about the aggregate efficiency gains of a reform. Searching for, and finding, individuals who benefit may then be an indication of the proposal's good quality. If this type of uncertainty is sufficiently important, it weakens the incentives for inverse campaigning. For instance, in a world in which the benefits of a policy proposal are perfectly positively correlated across all voters, identifying some voters who benefit from the proposal will make other voters revise upwards their expectations about what the proposal will mean to them. However, there are many policy proposals that have reasonably well known efficiency effects in the aggregate but for which it may be difficult to determine who wins and who loses. A situation where what is considered good news for one group of voters is bad news for other voters is the context in which inverse campaigning is most likely to play a role.

WZB and Free University of Berlin

Date of receipt of first submission: July 2002
Date of receipt of final typescript: March 2003

Appendix

Proof of Property 4.2. Consider some A with $p(A) < \frac{1}{4} - 2e$. Suppose B with $p(B_y) > 0$ is an optimal answer to this A. Note first that any B with $p(A_y \cap B_y) > 0$ is suboptimal for party Y as it is dominated by $B \backslash (A_y \cap B_y)$ which generates the same information for voters and has lower cost for party Y. I therefore restrict consideration to B with $p(B_y) > 0$ and $p(A_y \cap B_y) = 0$. I show that $\hat{B} = B \backslash B_y$ dominates B.

First, $\hat{B}$ has an information cost that is lower by $cp(B_y)$.

Second, the expected gain from becoming elected is not reduced by $\hat{B}$, compared to B, that is, $\Psi(B) \leq \Psi(\hat{B})$. To show this, note that, by Property 4.1, at least some votes by the set of incompletely informed voters are required for winning the election. Y cannot win without at least some support by incompletely informed voters. Incompletely informed voters vote for Y if their probability of being of type y is larger than 1/2. Their beliefs $(1 - \tilde{\xi})$ about this probability are updated for given A and B according to Bayes Rule such that

$$1 - \tilde{\xi} = \frac{1 - (\frac{1}{2} - e) - p(A_y \cup B_y)}{1 - p(A_y \cup B_y) - p(A_x \cup B_x)}.$$

This term is decreasing in $p(B_y)$, as $\frac{1}{2} + e \geq \frac{1}{2} > p(A_x \cup B_x)$ by Property 4.1. Now consider three cases. First, if $1 - \tilde{\xi}(A, B) < \frac{1}{2}$, then $\Psi(A, B) = 0 \leq \Psi(A, \hat{B})$. That is, the election outcome under $\hat{B}$ cannot be worse than under B if party Y loses for sure when it chooses B. Second, if $1 - \tilde{\xi}(A, B) = \frac{1}{2}$, then party X gets half of the uninformed votes, and, depending on $p(A_x)$ and $p(B_y)$, this may, but need not, be enough to win. However, if party Y chooses $\hat{B}$ in this case, then $1 - \tilde{\xi} > \frac{1}{2}$ and party Y wins for sure. The same reasoning applies if $1 - \tilde{\xi}(A, B) > \frac{1}{2}$. A choice of $\hat{B}$ also leads to a sure election victory. But if $(B \backslash B_y)$ dominates B for any given A, then it also dominates B for any random mixture of As.

Now consider some choice B by party Y with $p(B_y) = 0$ and show that any A with $p(A_x) > 0$ is also suboptimal for party X given this choice B by party Y. For a proof, note first that $p(A_x) < \frac{1}{4} - 2e$ and $p(B_x) < \frac{1}{4} - 2e$ by Property 4.1. Suppose some A with $p(A_x) > 0$ is optimal. Then $\hat{A} = A \backslash A_x$ dominates A. To see this first note that $\hat{A}$ always has an information cost that is lower than the cost for A by $cp(A_x)$. But, in addition, the expected election benefit is not higher for A than for $\hat{A}$ for the following reason. By $p(A_x \cup B_x) < \frac{1}{2} - 4e$ and $p(A_y \cup B_y) < \frac{1}{2} - 4e$, the group of incompletely informed voters is decisive. The probability for being type x is updated according to

$$\tilde{\xi} = \frac{(1 + e) - p(A_x \cup B_x)}{1 - p(A_y \cup B_y) - p(A_x \cup B_x)},$$

and this term is strictly decreasing in $p(A_x \cup B_x)$, as $1 + e \geq \frac{1}{2} > p(A_y \cup B_y)$ by Property 4.1. For $\tilde{\xi}(A, B) < \frac{1}{2}$ the party X loses the election if it chooses A, and a choice $\hat{A}$ can only increase election probabilities. For $\tilde{\xi}(A, B) = \frac{1}{2}$ the choice of $\hat{A}$ turns the possible victory into a sure victory and for $\tilde{\xi}(A, B) > \frac{1}{2}$ the party Y's election victory is certain for both the choice of A and the choice of $\hat{A}$. Again, the argument extends to a random selection of B, and this concludes the proof.

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