Referenda as a Catch-22[1]

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Abstract

The result of a referendum delivers a significant amount of information about social preferences to each composite member of the society. This paper argues that, beyond this obvious fact, the choice not to offer a referendum by an authority, although permitted to do so, may enhance as well the information individuals posses about social preferences. The addition of a referendum option in the rules of a game, that is, by enabling the authority to offer referenda at will, results in an assured re-election of authorities that implement socially beneficial policies, and in a decrease of the re-election probability of authorities that implement socially obnoxious policies. In a sense, by allowing an authority to offer referenda, an inescapable Catch-22 is introduced in the game, which inhibits the re-election of a measure of "bad" authorities and, thus, confirms that one of the main benefits of a democratic institution is the preservation of "good" authorities in power.

1 Introduction

A liberal perception of democratic institutions suggests that "they assist the society to preserve "good" authorities in power and get rid of "bad" ones". Institutions of democratic expression such as elections for president or parliament members are obviously in accordance with this view, as the voting behavior of the citizens in a political environment incorporates retrospective elements. Referenda though, even if they are by definition a democratic institution, seem to fall short of an equivalent palpable correspondence with the mentioned idea. This is due to the specific nature of the referendum, which contents itself to a binary revelation of social preference between two alternative policies and renounces any direct connection with authority election. To detect the existence of a smouldering affinity between referenda and the re-election probability of an authority in a democratic environment, one should gradually determine the interests of the component members of this environment and focus on the determinant factors of their behavior.

Authorities, in political environments of representative democracy, like those we experience today and where there exist a periodical evaluation of the authority's performance through an election procedure by the society, find the goal of remaining in power very important. This is due to the value of holding office which suggests that authorities desire to implement their preferred policies for as long as they can or that authorities enjoy ego rents during their incumbency as policy makers. By this fact, it becomes evident that authorities are willing to conscribe all disposable utensils to convince the society confide the governance to them for the next period as well. The arguments that follow corroborate the suspicion that institutions of direct democracy, like referenda, behave like ministrants of socially beneficial and executioners of socially detrimental regimes.

In particular, what this paper attempts to identify, is the necessary set of elements of a political environment, so as calling for referenda to make sense. We shall focus on the informational impact that referenda have on the authority's probability of reelection. The result of a referendum contains a lot of information about social preferences, and rational individuals should use this information when it is needed to do so. The idea is partially related to the Aghion and Tirole (1997) discussion on formal and real authority, in which informational asymmetries define the amount of real power distributed among the agents. The following analysis will argue that a referendum alters the beliefs the society has about its own "type", that is, about the distribution of opinions in the given society.

Going back to the literature, one observes that there exists a broad list of researchers that examined the effects of direct democracy institutions, such as referenda, on many social parameters. Cronin (1989) discusses the accordance between referenda and the democratic instincts of modern societies. Frey (1994) points out a polarization effect that the announcement of a referendum has in the social distribution of opinions while Feld and Savioz (1997) investigate the relationship of such institutions with the economic performance of the community. Frey and Stutzer (2000) argue on the positive correlation between institutions of direct democracy and self-reported level of happiness, after an empirical study they conducted in Switzerland. There are other relevant studies as well, attached with the idea of electronic democracies (Grossman (1995), Budge (1996)) or with the concept of procedural utility (Frey, Benz, Stutzer (2003)). The aim of this paper, is to complement this literature, by studying how the inclusion of a referendum option in the authority's choice set affects the authority's re-election probability. An experimental approach, which verges to this papers attempt, has been conducted by Klor and Winter (2007) and suggests

that provision of information on social preferences to the voters increases the total welfare of the society. Even if this experiment was primarily conducted to provide a clear understanding on the interaction between public opinion polls and voters turnout in the elections, it supplied interesting information concerning the influence that the disclosure of information about social preferences may induce on an authority's re-election chances.

The analytical tools that are used in this paper and are worth mentioning, are the standard cornerstones of the political economy literature. Hotelling's (1929) contribution on the stability of competition and "The economic theory of democracy" by Downs (1957) combined with the concepts that support the utilitarian setting of Sen (1986) and Samuelson (1983), offer a productive framework and an exciting playground. The general modeling framework refers to the, so called, agenda control literature and will attempt to complement the findings of Romer and Rosenthal (1978), Denzau, Mackay (1983), Banks (1990) and Lupia (1992). In this literature, as in this paper's model, a setter can decide whether to offer or not a referendum to the voters, but, unlike the goals of this paper, the mentioned literature limits its interest in identifying which shall be the policy outcome of the procedure in various environments of asymmetric information. As it has been, alreday, stated, the most evident difference of this paper to the related literature consists of the augmented goal of identifying the effects that the existence of a referendum option induces on the re-election probability of an authority, apart from policy outcomes that such procedures incur.

1.1 The informational impact of the Referendum

A referendum consists, normaly, of two alternatives that are offered for a public vote, and its outcome identifies one of these two as the alternative most preferred by the majority of the individuals. It slickly follows that referenda have a direct, and obvious, effect on the informational environment of the society. That is, by the public announcement of the referenda result, information about social preferences is delivered to the society and to the authority. In a world of perfect information the result of a referendum would not have any informational impact as the information is already perfect, but in a more realistic environment of imperfect information the result could help the society and the authority retrieve information related to social preferences.

If we consider the simple example of a politically isolated individual with no information about the preferences of other individuals in the society, then it would not be an exaggeration to claim that this individual assigns to each possible distribution of opinions the same probability of being identical to the real distribution of opinions of the given society. As he has no information, all conceivable distributions may be identical to the real one, and, thus, his information is actually described by a distribution over all possible distributions of opinions of the society. Now, if this individual observes the outcome of a referendum that the authority has previously offered then he improves his information. That is, if alternative alpha has collected more votes than alternative omega (alpha was preferred by the majority of the society) then the individual can use this information and exclude from his prior beliefs on possible distributions of opinions of the society, all distributions that fail to justify the result of the referendum.

What this paper attempts to identify is whether this possibility of informational refinement, that the existence of a referendum option offers, breeds alterations related to the authority's welfare or not. If such cases are identified then one could consider that the referendum option itself is either a powerful weapon or a grenade detached from its safety ring in the authority's arsenal.

2 The Model

The policy space that shall be considered will be formaly represented by the segment $[0,1] \subseteq \Re$. Let the society be a continuum of individuals (voters) characterized by their ideal policy and are distributed in $[0,1]$ according to a distribution function $F(i)$. Preferences of the individuals on policy outcomes are single-peaked. We formally define the utility of an individual $i \in [0,1]$ after the implementation of a policy $p \in [0,1]$ by: $u_i(p) = -|p-i|$, where i is the ideal point of individual i. The median voter m is defined by $F(m) = 1/2$. Define $b \in [0,1]$ to be a direct decision of the authority. A referendum is formally defined as a pair $\{d_1, d_2\}$ where $d_1 \in [0,1]$, $d_2 \in [0,1]$, $d_1 < d_2$ and the winner alternative of the referendum is defined as $w(\{d_1, d_2\}, m) \in \{d_1, d_2\}$. In our framework, the authority is interested both in implementing its ideal policy and in holding office, and sorts these objectives in an absolute priority manner (lexicographic preferences). Following the assumptions of the related literature (see eg. Lupia 1992), the decision to offer a referendum is costly. The authority will take an action $\alpha \in \Omega$ that will determine the policy outcome $p \in [0,1]$. So we consider the policy outcome as a function of the authority's action, $p(\alpha)$ which suggests that $u_i(\alpha) = -|p(\alpha) - i|$. An action α is either a direct decision b or a referendum $\{d_1, d_2\}$ followed by a direct decision b. In other words an action α is a pair $\{0, b\}$ if no referendum is offered, and a pair $\{\{d_1, d_2\}, b\}$ if a referendum is offered. So Ω is the set that contains all possible actions of the authority. We shall refer to a specific authority by its ideal policy $r \in [0,1]$. Given the above, the utility of an authority r after choosing an action α can be formally defined by: $u_r(v_A(\alpha), v_B(\alpha), v_C(\alpha))$, where $v_A(\alpha) = -|p(\alpha) - r|$, $v_B(\alpha) = h(\alpha)$, $v_C(\alpha) = -c$ if a referendum is offered and $v_C(\alpha) = 0$ if not. Note that $h(\alpha)$ is the probability of r being reelected. The authority's preferences satisfy $u_r(v_A(\alpha), v_B(\alpha), v_C(\alpha)) > u_r(v_A(\alpha'), v_B(\alpha'), v_C(\alpha'))$ if for any $\alpha, \alpha' \in \Omega$ either $v_A(\alpha) > v_A(\alpha')$, or $v_A(\alpha) = v_A(\alpha')$ and $v_B(\alpha) > v_B(\alpha')$ or $v_A(\alpha) = v_A(\alpha')$, $v_B(\alpha) = v_B(\alpha')$ and $v_C(\alpha) > v_C(\alpha')$ hold.

The game is constructed in the following way. In the first stage an authority r is randomly selected from the population. In the second stage the authority has to take an action $\alpha \in \Omega$ as described above. If a referendum is offered $z(d_1), z(d_2)$, which are defined as the percentage of the population that voted for d_1 and d_2 respectably, are announced. In the third stage the authority implements the policy $p(\alpha)$. Finally, in the last stage, a challenger r' appears and the society chooses by voting either to preserve authority r in power or to elect challenger r' as the new authority. The challenger's r' policy preferences are unknown to the society, that is, the choice between r and r' is equivalent to the choice between preserving authority r and randomly picking a new one from $F(i)$. For r, and equivalently for r', to win this election procedure, a simple majority of votes is sufficient.

In the second stage, if the authority actually chooses to offer a referendum $\{d_1, d_2\}$ then an individual i votes for the alternative d_1 iff $|d_1 - i| < |d_2 - i|$ and vice versa. Given the preferences of the individuals (single-peakedness in a single dimension) and Black's theorem, the alternative that will be preferred by a majority is the one that is preferred by the median voter m, and this is why $w(\{d_1, d_2\}, m)$ is a function of m. We will have that, $w(\{d_1, d_2\}, m)$ is equal to d_1 if $|m - d_1| < |m - d_2|$ and to d_2 if $|m - d_1| > |m - d_2|$.

In the last stage $p(\alpha)$ will already have been implemented and individuals will be asked to vote for or against the authority r. For an individual i to vote for r it is necessary that $u_i(\alpha) > Eu_i(\alpha')$ where α' is the action that the next authority r' will choose, that is the challenger's optimal action. If the authority r is preferred by a majority to the next authority r' then r remains in office for

the next period as well. Note that all voting procedures of this game will be compulsory.

At this point a preliminary result can be stated, which will provide a necessary and sufficient condition for the authority r to be re-elected

Proposition 1 *Authority r that takes an action α will be re-elected if and only if the median voter m votes for its re-election, that is, if and only if $u_m(\alpha) > Eu_m(\alpha')$.*

Note that, given this result, which states that the authority r will be re-elected if and only if the median voter votes for its re-election, the probability of an authority r being re-elected after the choice of an action α can be formulated as $h(\alpha) = prob[u_m(\alpha) > Eu_m(\alpha')]$.

The analysis that will follow, will distinguish between the two extreme cases with respect to the information individuals have about $F(i)$. In the first case we will consider perfect information about the distribution of opinions $F(i)$ by every member of the society and in the second case we shall consider a wide informational asymmetry between the authority, that will have full information about $F(i)$, and the society, which will have less information about $F(i)$.

2.1 Complete Information

Both the authority r and the society have perfect information about the form of $F(i)$ in this case. Since lexicographic preferences have been assumed, the problem of the authority r is described as follows:

1. Select $\Omega_1 \subset \Omega$ s.t. $\forall \alpha^1 \in \Omega_1$, $\alpha^1 = \arg\max\{v_A(\alpha)\}$.
2. Select $\Omega_2 \subset \Omega_1$ s.t. $\forall \alpha^2 \in \Omega_2$, $\alpha^2 = \arg\max\{v_B(\alpha)\}$.
3. Select $\Omega_3 \subset \Omega_2$ s.t. $\forall \alpha^3 \in \Omega_3$, $\alpha^3 = \arg\max\{v_C(\alpha)\}$.

Then every $\alpha \in \Omega_3$ is defined to be an optimal action for the authority. We shall briefly name all $\alpha \in \Omega_3$ as α^*. It is a strategy refinement utility maximization program. As preferences are lexicographic, the authority isolates primarily the strategies that maximize v_A, then refines this selection and keeps just those that offer the higher value for v_B, and respectively with v_C. Hence, we can state that all optimal actions of the authority r, that is, all α^* are such that $p(\alpha^*) = r$.

Proposition 2 *If both the authority and the individuals have perfect information on $F(i)$, then the optimal action of an authority r is $\alpha^* = (0, r)$.*

What becomes as well evident in this setup, is the fact that an authority r either gets re-elected with certainty ($h(\alpha) = 1$) or does not get re-elected also with certainty ($h(\alpha) = 0$). This is because the authority can compute both $u_m(\alpha)$ and $Eu_m(\alpha')$ accurately and, thus, estimate its re-election probability precisely as well. In short an authority r, such that its optimal action, as defined above, begets $u_m(\alpha) > Eu_m(\alpha')$, gets re-elected with probability one ($h(\alpha) = 1$), and an authority r, such that its optimal action, begets $u_m(\alpha) < Eu_m(\alpha')$, gets re-elected with probability zero ($h(\alpha) = 0$).

In this setup, authorities have no interest in offering a referendum as it can not increase either v_A or v_B and just introduces a cost. But since games of perfect information are far from being reallistic one should try to investigate what is the behavior of an authority in environments of asymmetric information.

2.2 Asymmetric Information

Obviously, one could come up with numerous different combinations of informational asymmetries between the two participating entities of the game, but the case that is of particular interest in this paper is the one in which the authority has full information on the specific form of $F(i)$ and the individuals do not. Authorities, due to their power distinctiveness characteristic tend to have an extended set of means at their disposal to gratify their goals. Thus, it is reasonable to assume that they are in a position to use monitoring instruments, such as public opinion services, and have a great deal of information about the policy preferences of the society.

If individuals do not know the exact form of $F(i)$ due to a low level of political communication among them, it is rational to define their prior beliefs on the social distribution of opinions as follows. Consider the set Ξ, defined as the set that contains all conceivable cumulative distributions in $[0,1]$. Then define a set $X \subset \Xi$, such that $X = \{F_1(i), F_2(i)\}$, assuming that $F(i) \in X$, and the other cumulative distribution is randomly drawn from Ξ. Finally, consider a probability distribution over X given by q_1 and q_2 with $q_1, q_2 > 0$ and $q_1 + q_2 = 1$, where q_j is the probability of $F_j(i)$ being identical to $F(i)$. In short, individuals are unsure about the distribution of ideal points in the society, and consider that any of the two elements in X could be the real distribution with a certain probability. On the other hand, the authority is, equivalently, uncertain about the behavior of the individuals in the forthcoming elections. It makes sense to assume that an authority possesses all the necessary monitoring instruments that can collect information related to the society's policy preferences, but it would demand a gigantic and, relatively, senseless step to consider that an authority is in a position to gather information on what individuals believe concerning the social distribution of policy preferences. Thus, we shall summarize the information the authority has on the probability distribution (q_1, q_2) by the cumulative distribution $Q(q_1)$. This is not going to affect, in any substancial manner, the following analysis, but is added just for the provision of a more realistic framework.

An observation that guarantees the validity of the following analysis is that the set X satisfies a criterion of the minimum differentiation. This criterion implies that given the generic construction of X there exist at least one $s \in (0,1)$ such that $F_1(s) \neq F_2(s)$, with probability one. In first sight this might not look self-evident, but if one considers the composition of X, that is, a random draw of one cumulative distribution out of the set of all conceivable cumulative distributions and $F(i)$, then its validity becomes rather obvious.

Hence in this asymmetric information framework the game preserves its previous characteristics augmented with the above. In the first stage an authority r is randomly selected from the population. In the second stage the authority has to take an action $\alpha \in \Omega$. If a referendum is offered $z(d_1), z(d_2)$ are announced. In the third stage the authority implements the policy $p(\alpha)$ and individuals update their beliefs about $F(i)$. Finally, in the last stage the society chooses by voting to keep the authority or to randomly choose another one out of the population.

To make the statement of the following proposition more concrete and congnizable we shall proceed in the following classifications of the possible authorities given $F(i)$, X and $Q(q_1)$ and in the definition of the Catch-22 in this framework.

Note that in this informational setup the expectations that the median voter has on the challenger's r' optimal action α' depend on X and on q_1. That is, $Eu_m(\alpha') = -q_1 \int_0^1 |m - r'| dF_1(r') -$

$(1-q_1)\int_0^1 |m-r'|dF_2(r')$.

Definition 1 *An authority G^* is any authority r with Ω_1 such that $\forall\alpha\in\Omega_1$ and $\forall q_1\in[0,1]$ we have that $u_m(\alpha)>Eu_m(\alpha')$.*

Definition 2 *An authority B^* is any authority r with Ω_1 such that $\forall\alpha\in\Omega_1$ and $\forall q_1\in[0,1]$ we have that $u_m(\alpha)<Eu_m(\alpha')$.*

Definition 3 *An authority G' is any authority r with Ω_1 such that for at least one $\alpha\in\Omega_1$ we have that $u_m(\alpha)<Eu_m(\alpha')$ for some values of q_1 and $u_m(\alpha)>-\int_0^1|m-r'|dF(r')$*

Definition 4 *An authority B' is any authority r with Ω_1 such that for at least one $\alpha\in\Omega_1$ we have that $u_m(\alpha)>Eu_m(\alpha')$ for some values of q_1 and $u_m(\alpha)<-\int_0^1|m-r'|dF(r')$*

Authorities of type G^* and G' are "good" authorities in the sense that, in an environment of complete information (as modeled in the previous section), they would be re-elected with probability one. Equivalently, authorities of type B^* and B' are "bad", in the sense that undr complete information, they would be re-elected with probability zero. The difference between G^* and G' is that G^* has a probability of re-election equal to one, because independently of the voters beliefs on the true distribution of opinions in the society ($\forall q_1\in[0,1]$) we have that $u_m(\alpha)>Eu_m(\alpha')$, whereas G' authority's re-election depends on these beliefs. If we assume that $F_1(i)=F(i)$ then $h(\alpha)=1-Q(\bar{q_1})\in(0,1)$[1].Respectively, the difference between B^* and B' is that B^* has a probability of re-election equal to zero, because independently of the voters beliefs on the true distribution of opinions in the society ($\forall q_1\in[0,1]$) we have that $u_m(\alpha)<Eu_m(\alpha')$, whereas B' authority's re-election depends on society's beliefs. If we assume that $F_1(i)=F(i)$ then $h(\alpha)=Q(\bar{q_1})\in(0,1)$.

So, in this environment of asymmetric information, unlike the complete information scenario, there exist "good" authorities that might not be re-elected given some values of q_1 and, equivalently, some "bad" authorities can be re-elected for some values of q_1.

Summarising the above, authorities r, such that $|m-r|<\int_0^1|m-r'|dF(r')$ are authorities that the society would like to re-elect (provided the society had full information about $F(i)$), and will be, thus, named "good" authorities (G^* and G'). On the other hand, authorities r, such that $|m-r|>\int_0^1|m-r'|dF(r')$ are authorities that the society would not like to re-elect (provided the society had full information about $F(i)$), and will, respectively, be called "bad" (B^* and B'). By definition no value of r is "good" or "bad" independently of $F(i)$. Thus, it would be wise to distinguish two sets of cases. The first one consists of the cases that offer information to the individuals just by the policy that the authority decides to implement ($p(\alpha^*)=r$) and the second one of the cases that offer information to the individuals by the full action α^*. To make things clear imagine an authority r, such that $|m-r|<\int_0^1|m-r'|dF_j(r'),\forall\ F_j(i)\in X$, that is, a type

[1]When $F_1(i)=F(i)$, then G' type authorities satisfy: $-\int_0^1|m-r'|dF_1(r')<u_m(\alpha)<-\int_0^1|m-r'|dF_2(r')$. Which implies that $u_m(\alpha)<Eu_m(\alpha')$, if $q_1\in[0,\bar{q_1})$ and $u_m(\alpha)>Eu_m(\alpha')$, if $q_1\in(\bar{q_1},1]$ resulting in $h(\alpha)=1-Q(\bar{q_1})$

G^* authority. The median voter (always m refers to the original distribution $F(i)$) is willing to re-elect this authority no matter which $F_j(i) \in X$ is the real one. Hence, r is always re-elected and, thus, the authority is not willing to take the cost of offering a referendum. In the symmetric case an authority r, such that $|m-r| > \int_0^1 |m-r'|dF_j(r'), \forall\ F_j(i) \in X$, that is a type B^* authority, is not going to receive the vote of the median voter with probability one and, thus, the authority is not willing to take the cost of offering a referendum. In a sense, this is an equivalent framework as the one of complete information. The information individuals have about the social preferences and the implemented policy $p(\alpha^*)$ are sufficient to offer to a "good" authority a certain re-election and to a "bad" authority a certain failure in the forthcoming elections.

The second set of cases include the rest and is a game very similar to the Spence signaling model. For simplicity, assume that $F(i) = F_1(i)$. We consider here the authorities r, such that $|m-r| < \int_0^1 |m-r'|dF_1(r')$ and $|m-r| > \int_0^1 |m-r'|dF_2(r')$, that is, of type G', and authorities r, such that $|m-r| > \int_0^1 |m-r'|dF_1(r')$ and $|m-r| < \int_0^1 |m-r'|dF_2(r')$, that is, of type B'. As we defined, each $F_j(i) \in X$ is believed by the individuals to be identical to the real one with probability q_j. A type G' authority, can offer a referendum and signal its "good" type. This is guaranteed by the criterion of the minimum differentiation introduced above. That is, an action $(\{d_1, d_2\}, r)$, such that $F_1((d_1+d_2)/2) \neq F_2((d_1+d_2)/2)$ always exists in Ω. If such a referendum is offered, then the updated beliefs of the individuals will result in $q_1 = 1$ and, thus, $h(\alpha) = 1$. The authority in other words would have presented verifiable information to the society that the real distribution of opinions is $F_1(i)$ and, in this way, that it is a "good" authority, worthy of being re-elected. What would a "bad" authority, r of type B',do in this case? First of all, its obvious that B' type authorities despise informative referenda, as they guarantee them a zero probability of re-election. So lets assume that the individuals observe no referendum. They examine each element of X separately. Starting with $F_1(i)$ each individual considers the following. Would the authority be reelected if it presented verifiable information that $F_j(i) = F(i)$? Or in more formal manner, does $|m_j - r| < \int_0^1 |m_j - r'|dF_j(r')$ hold for $F_j(i)$? The answer could be either "yes" or "no". After answering these 2 questions the individual has a result. If all the answers are "no" then obviously the authority is a "bad" one and no update of beliefs takes place (no $F_j(i)$ is assigned a $q_j = 0$). If there appear "yes" answers then $F_j(i) \in X$ that gave the answer "yes" (say $F_2(i)$) is subject to the following refinement. If $|m_2 - r| > \int_0^1 |m_2 - r'|dF_1(r')$ for $F_2(i) \in X$ individuals assign zero probability to $F_2(i)$ being the real one and, hence, probability one to $F_1(i)$ being the real one. .

To formally define this belief refinement process, the Catch-22 notion shall be introduced at this point.

Definition 5 *Assuming $F_1(i) = F(i)$, the Catch-22 is active if and only if $|m_2 - r| < \int_0^1 |m_2 - r'|dF_2(r')$ and $|m_2 - r| > \int_0^1 |m_2 - r'|dF_1(r')$, where m_2 is such that $F_2(m_2) = 1/2$.*

If the authority r decides not to offer a referendum and the Catch-22 is active, it means that

assuming $F_2(i) = F(i)$ then r is of type G'. But if r is of type G' then a referendum should be observed, and since it is not, individuals infer that $F_2(i) \neq F(i)$. In this way elements of X are assigned zero probability of representing the truth, and real information is delivered to the society which leads to a re-election probability $h(\alpha) = 0$ for the B' type authorities that are trapped in this Catch-22. B' type authorities that dodge the Catch-22 conditions, preserve a re-election probability $h(\alpha) = Q(\bar{q_1})$.

Having described in detail all elements that take part in the optimal action choice and define the re-election probability of an authority r in this asymmetric information environment, it is easy to formally summarize the findings of the preceding analysis by the means of the following proposition.

Proposition 3 *Given the described informational environment and assuming $F_1(i) = F(i)$, the optimal action α^* and the respective re-election probability $h(\alpha^*)$ of an authority of type:*

- G^* is $\alpha^* = (0, r)$ and $h(\alpha^*) = 1$,
- B^* is $\alpha^* = (0, r)$ and $h(\alpha^*) = 0$,
- G' is $\alpha^* = (\{d_1, d_2\}, r)$ and $h(\alpha^*) = 1$, s.t. $F_1[(d_1 + d_2)/2] \neq F_2[(d_1 + d_2)/2]$,
- B' is $\alpha^* = (0, r)$ and $h(\alpha^*) = 0$ if the Catch-22 is active,
- B' is $\alpha^* = (0, r)$ and $h(\alpha^*) = Q(\bar{q_1})$ if the Catch-22 is inactive.

3 Catch-22?

The definition of a Catch-22 appears to be very simple but if one attempts to reach its origins might be confronted with an extended field of analytical obstacles. In the namesake novel J.Heller illustrates the nature of this catch as a game of no consequence of choice. More explicitly, we can describe it by the following definition given by Brams (1994). If a rational player participates in a game, where he has to choose among a finite number of alternative actions, and the payoff that each action generates is equal to worst or next worst payoff, then we may say that this rational player is confronted with a catch-22.

In our framework the existence of the described notion is present and one could safely frame it by the means of the following example. In the asymmetric information environment consider $r = 1/4 + \varepsilon$, $X = \{F_1(i), F_2(i)\}$, where $F_1(i)$ is a uniform distribution in $[0, 1]$, that is, $m_1 = 1/2$, $\int_0^1 |m_1 - r'| dF_1(r') = 1/4$ and $F_2(i)$ is such that the median $m_2 = 3/4$ and that $\int_0^1 |m_2 - r'| dF_2(r') < 1/4$. We observe that if the real distribution of opinions $F(i) = F_1(i)$ then $r = 1/4 + \varepsilon$ is a "good" authority, and if $F(i) = F_2(i)$ then it is a "bad" one. Let us assume for the time being that $F(i) = F_1(i)$. If the authority takes an action $\alpha = ((\{d_1, d_2\}, r)|$ such that $z(d_1), z(d_2)$ imply that $q_1 = 1$ and $F_1(i) = F(i))$ then its probability of re-election will be $h(\alpha) = 1$. Moving to the next step, that is, in case $F(i) = F_2(i)$ then if the authority takes an action $\alpha = (\{d_1, d_2\}, r)|$ such that $z(d_1), z(d_2)$ imply that $q_2 = 1$ and $F_2(i) = F(i))$ then its probability of re-election will be $h(\alpha) = 0$. If, instead, the authority takes an action $\alpha = (0, r)$ then the individuals will assert that that $F_2(i) = F(i)$ with $q_2 = 1$ as if that was not the case, the authority would prefer to signal it. Thus, the "bad" authority in this example is guaranteed a re-election probability of $h(\alpha) = 0$ whatever action it takes.

As we have observed, the decision to offer a referendum befits the Spence signaling game and, thus, the Catch-22 is the, equivalently to the Cho and Kreps intuitive criterion, truth divulgement automatism of the present game.

And, since one of the main objectives of democratic institutions is believed to be the exclusion of the "bad" authorities from the governance of a society, the result presented above avows itself an ally of this common wisdom. Moreover, one could add to this the comparative analysis between two different environments, from which the first one would allow the authority to offer referenda and the second one would not.

3.1 Comparative analysis

Consider an environment, as described in the model, where authorities are allowed to offer referenda and with the informational asymmetries described above. Define $h_R^g(\alpha^*)$ the re-election probability of a "good" authority r, such that $|m-r| < \int_0^1 |m-r'|dF(r')$ that has taken its optimal action α^* and $h_R^b(\alpha^*)$ the re-election probability of a "bad" authority r, such that $|m-r| > \int_0^1 |m-r'|dF(r')$ that has taken its optimal action α^* in the described environment.

Now consider an environment, where authorities are not allowed to offer referenda. Define $h_{NR}^g(\alpha^*)$ the re-election probability of a "good" authority r, such that $|m-r| < \int_0^1 |m-r'|dF(r')$ that has taken its optimal action α^* and $h_{NR}^b(\alpha^*)$ the re-election probability of a "bad" authority r, such that $|m-r| > \int_0^1 |m-r'|dF(r')$ that has taken its optimal action α^*. In this case an action $\alpha = b \in [0,1]$ and $v_C = 0$ as no referenda are allowed.

Theorem 1 *The re-election probability of a "good" authority is weakly higher in a game that allows for referenda than in a game that does not.*

Proof. By the third proposition (8) we know that $h_R^g(\alpha^*) = 1$. But what is the re-election probability of the same authority when the game does not allow for referenda? The beliefs about the real distribution of opinions $F(i)$ are $q_1 + q_2 = 1$. As we have defined, the authority has expectations on the exact value of q_1 given by $Q(q_1)$. So if the "good" authority is of type G^* then $h_{NR}^g(\alpha^*) = 1$ and if it is of type G' then $h_{NR}^g(\alpha^*) < 1$. ■

Theorem 2 *The re-election probability of a "bad" authority is weakly lower in a game that allows for referenda than in a game that does not.*

Proof. If the authority is of type B^* then $h_R^b(\alpha^*) = h_{NR}^b(\alpha^*) = 0$. If it is of type B' and the Catch-22 is inactive then $h_R^b(\alpha^*) = h_{NR}^b(\alpha^*) > 0$, and if it is of type B' and the Catch-22 is active then $h_R^b(\alpha^*) = 0 < h_{NR}^b(\alpha^*)$. ■

By the means of this simple comparative exercise, we observe that just the inclusion of the referendum option, and not necessaryly a referendum realization, in the set of the institutional rules of a political game (in the constitution of a state for example) increases the probability of re-election of socially beneficial authorities, and pulverizes the hopes of re-election of a measure of socially obnoxious authorities. The existence of a referendum option in the authority's choice set allows "good" authorities to use referenda so as to help society increase its level of information

about social preferences and, through this process, secure a certain re-election. On the contrary the existence of a referendum option functions as a filter which obstructs a certain set of bad authorities from being re-elected, even if a referendum never takes place.

4 Discussion of Assumptions and Results

In Caillaud and Tirole (2006) the issue of persuasion of a group by a sponsor of a proposal is treated. In the setup of their model, group members have prior beliefs on the value of the project and the proposer is allowed to transmit verifiable information to some of them. In our case, referenda are used by "good" authorities to convince voters that they are actually worthy of being re-elected. They are a persuasion mechanism comparable to the presentation of verifiable information discussed by Caillaud and Tirole.

Therefore, the existence of a referendum option in such political environments, improves the wellbeing of the society as they refine the beliefs individuals have about the authority's type. From a social point of view, any game between a society and its appointed authority has a special moral characteristic. Unlike theory, society's objective is not only to detect the optimal behavior of an authority but, moreover, to discover ways through which the welfare for the society could increase. In this direction, referenda, among their other characteristics, enhance social welfare as they have proven to be a stream of information that delivers evidence about the social distribution of opinions and, thus, about the type of the authority.

But is the structure of the model general enough? One could argue that imperfect information does not limit in the case in which individuals consider just two distributions as the possible true ones. And this would be a fair claim. In fact, the less information individuals have about the distribution of opinions the more distributions they should consider as possibly true. But, since the criterion of minimum differentiation holds in any discrete set of randomly chosen distributions, the equilibrium described in proposition two remains valid for any discrete set of considered distributions. Also, the strong result of the third proposition, which implies that in an environment where referenda are allowed "good" authorities are re-elected with probability one, remains valid as well. The only case in which enlargement of the set of the considered distributions is effective, is the probability of re-election computation of a "bad" authority. Even with a large set of distributions the results of the strategic considerations of the individuals shall come up with the eliminations of mistaken distributions (never the real distribution is eliminated from the set), but since an update in the beliefs follows, no positive norm on the probability of re-election may be stated.

Another element which appears in all discussions related with referenda, is the existence or not of a commitment rule. Authorities may be committed to implement the result of referendum or not by the constitution. The preceding analysis is not restrained by the existence of such a rule, because, referenda design is modeled in a way that permits any policy to be the winner of such a process. Authorities offer referenda if it is in their interest to inform the society in which way opinions are distributed, and they may do so, even if a commitment dimension exists.

Moreover, the specific modelling of the authorities preferences is hardly understood in this paper in the exact conventional manner, but, it incorporates all classical objectives of an authority in an absolute priority ordering. Lexicographic preferences capture the observation that when an authority faces a choice among a set of actions is hardly ever indifferent. The analysis focuses, as a large part of the related literature, on policy oriented authorities. The combined existence, in the same environment, of both policy and power oriented (in the sense that there could exist that

could have re-election as their first priority) authorities surpasses the aim of the current paper. In an attempt to focus on the pure force that the informational part of a referendum exhibits on the electoral behavior of the voters, assuming that the authority has the described lexicographic preferences is prudent. Any further complication, by introducing for example different degrees of interest among the two authority goals (implementation of its ideal policy and re-election) would require extra assumptions, such as the voters expectations on these degrees, and would generate analytical obstacles without enhancing the intuitive significance of the results. Authorities after all wish to stay in power if their benefit from holding office is larger than the benefit they would have if another authority was in power. In an ideological framework where ego rents are absent, no authority has any interest in implementing a policy that is not individually beneficial just to be there.

Finally, one could argue, that a study of more informational environments could be desirable. The possibility, for example, that the authority is also uncertain about the specific distribution of opinions in the society is not negligible. But would the detailed study of such a case improve the intuition we get from the existing findings? A brief overlook of the case allows the positive response, no. That is because authorities that are "good" or "bad" independently of which of the considered distributions is the true one, would behave exactly as before. And authorities that do not know if they are "good" or "bad" would offer referenda only in the case that their information suggested that they are "good" with high probability. Extra assumptions would be required, such as the relative quality of information between the authority and the society, without changing the analysis basic result, that is, the existence of the referendum option would presumably increase, in that case as well, the durability of a "good" authority and decrease the life-length of a "bad" one.

5 Conclusions

Referenda are democratic institutions with complicated features and a variety of dimensions. One of them, as demonstrated by the paper, is the informational impact they have on the electorate's behavior in the forthcoming authority elections. An authority can be viewed as "good" or "bad" only in contrast with the specific distribution of opinions of the society it interacts with. Referenda succour an imperfectly informed electorate in identifying whether their authority belongs in the first or the second category. Indistinguishable "good" authorities seem to be the ones that call for referenda in order to reveal their characteristics to the society and all the other tend to prefer not to, as they have no interest in doing so. A part of the indistinguishable "bad" authorities that, as all other bad authorities, prefers not to offer referenda, is subject to an inescapable Catch-22 which annihilates all hope of them being re-elected. As a result of the above, a comparative study of two games, with the only difference between them the existence or not of the referendum option, clearly proves the fact that if the political environment allows an authority to offer referenda, then the probability of re-election of the "good" authorities is higher than if it did not, and correspondingly lower probability of re-election of the "bad" ones. A result that reinforces the belief that democratic institutions in general, and not just elections for authorities, are weapons in the society's disposal against the preservation of prejudicial authorities in power.

6 References

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7 Appendix

Proof. (Proposition 1) Given the specific structure of the game and the authority's utility maximization program, $u_m(\alpha) = Eu_m(\alpha')$ is a probability zero event and, thus, we shall not study this case explicitly. In the following analysis $Eu_i(\alpha')$ will take two different forms. In the complete information case, we will have that $Eu_i(\alpha') = -\int_0^1 |i-r'|dF(r')$. In the asymmetric information case, we will instead encounter $Eu_i(\alpha') = -q_1 \int_0^1 |i-r'|dF_1(r') - (1-q_1)\int_0^1 |i-r'|dF_2(r')$, where $q_1 \in [0,1]$. Define $Z(i) = -|i-r| + \int_0^1 |i-r'|dF(r')$ and $\Xi(i) = -|i-r| + q_1 \int_0^1 |i-r'|dF_1(r') + (1-q_1)\int_0^1 |i-r'|dF_2(r')$. Consider $Z(m) < 0$ (or, equivalently, $\Xi(m) < 0$) . If we demonstrate that there exist a measure of i's in $F(i)$ at least equal to 1/2, such that, for these i's $Z(i) < 0$ ($\Xi(m) < 0$), then, we are done. To show this, we will need the derivative of $Z(i)$ ($\Xi(i)$), with respect to i. We get that $Z'(i) = -[(i-p(\alpha))/|i-p(\alpha)|] + 2F(i) - 1$ ($\Xi'(i) = -[(i-p(\alpha))/|i-p(\alpha)|] + 2[q_1F_1(i) + (1-q_1)F_2(i)] - 1$), which becomes $Z'(i) = 1 + 2F(i) - 1 = 2F(i) \geq 0$ for all $i < r$ ($\Xi'(i) \geq 0$ for all $i < r$) and $Z'(i) = -1 + 2F(i) - 1 = 2F(i) - 2 \leq 0$ for all $i > r$ ($\Xi'(i) \leq 0$ for all $i > r$). All statements that follow and concern $Z(i)$ are identical for $\Xi(i)$. Assume, first, that $Z(i) < 0$. In the case of $m > r$, we have that $Z(i) \leq Z(m) < 0$ for all $i \geq m$. If $m < r$, then we have that $Z(i) \leq Z(m) < 0$ for all $i \leq m$. Now assume that $Z(m) > 0$, we observe that, if $m > r$ and $r > E(r')$ then, since $Z'(i) \leq 0$ for all $i > r$, we get $Z(m) \geq Z(i) \geq Z(1)$ for all $i > r$. Since, $r > E(r')$, then $Z(1) = r - E(r') > 0$, which suggests that $Z(i) > 0$ for all $i > r$. If $r < E(r')$ then $Z(0) = -r + E(r') > 0$ and, since $Z'(i) \geq 0$ for all $i < r$, we get that $Z(i) \geq Z(0) > 0$ for all $i < r$. We moreover know that $Z'(i) \leq 0$ for all $i > r$, which implies that, $Z(i) \geq Z(m) > 0$ for all $i \in (r, m)$. The proof for the $Z(m) > 0$ and $m < r$ case is equivalent to the last one. ■

Proof. (Proposition 2) Authorities maximize first v_A, which, by definition, is maximized by any $\alpha \in \Omega$ such that $p(a) = r$. That implies Ω_1 contains the direct decision action $(0, r)$ and all the referenda actions $(\{d_1, d_2\}, r)$ which are infinitely many. Since $Eu_i(\alpha') = -\int_0^1 |m - r'|dF(r')$ is a fixed number and $u_i(\alpha) = u_i(\hat{\alpha})$, $\forall \alpha, \hat{\alpha} \in \Omega_1$ we get that $h(\alpha) = prob[u_m(\alpha) > Eu_m(\alpha')]$ is constant for all $\alpha \in \Omega_1$, that is, $\Omega_1 = \Omega_2$. But as it is easy to observe, Ω_2 contains only one action $\alpha = (0, r)$ that is costless for the authority. That is, $v_C((0, r)) = 0$ while all other actions in Ω_2 induce $v_C((\{d_1, d_2\}, r)) = -c$. Thus, $\Omega_3 = \{(0, r)\}$ and $\alpha^* = (0, r)$. ■