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Off-the-peak preferences over government size*

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Abstract

We study the political consequences of policy preferences which are non-symmetric around the peak. While the usual assumption of symmetric preferences is innocuous in political equilibria with platforms convergence, it is not neutral when candidates are differentiated. We show that a larger government size emerges when preferences of the median voter off-the-peak are more intense towards overprovision (what we call *wasteful* preferences), whereas a smaller government results when her preferences are more intense towards underprovision (*scrooge* preferences). We then analyze the determinants of preferences off-the-peak and find that: (i) The sign of the third derivative of the policy-induced utility function indicates whether preferences are wasteful (positive) or scrooge (negative). (ii) The analog of Kimball's coefficient of prudence can be used to measure degrees of wastefulness and scroogeness. (iii) Consumers' risk aversion and government decreasing effectiveness in producing the public good generate scrooge

preferences, giving some electoral advantage to candidates proposing less public spending.

Key-words: Single-peaked preferences, citizen-candidate, coefficient of prudence, differentiated platforms, risk-aversion.

JEL classification numbers: D72, H31,H5

1   Introduction

Many models of political competition assume that preferences of voters over policies are single-peaked and symmetric around the peak. In fact, the assumption that voters possess quadratic preferences over policies is the most standard one in models that study the strategic behavior of candidates. There are however notable exceptions, such as the classical downsian model of political competition (Black, 1948; Downs, 1957), whose only restriction is single-peakedness.[1] In a well-known result, this model predicts that the two competing platforms converge in equilibrium to the median voter's bliss point, which obviously renders the non-symmetry of voters' preferences innocuous. Nevertheless, and despite its profound influence, the median voter theorem does not fully satisfy political scientists because that prediction is not in line with what we observe in real-world electoral competition.[2]

In the last decades, a number of articles have presented models of electoral competition where equilibrium platforms are differentiated. For instance, Calvert (1985) and Wittman (1983) derived separation of platforms from policy-motivated candidates with uncertainty on the distribution of voters. Likewise, Osborne and Slivinski (1996) and Besley and Coate (1997) separately proposed the citizen-candidate model where equilibria with differentiated platforms exist too. Their model intends to capture the essence of the workings of elections in representative democracies. The idea behind it is that, within representative democracies, it is citizen themselves and not their proposals that voters choose from. Placing a credibility restriction on the policy proposals of potential candidates, and a rationality clause on citizens' behavior, the model explains both the decision to run in an election (the number and types of candidates) and the possible outcomes.

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[1]Another exception is given by the directional voting model due to Rabinowitz and Macdonald (1989), in which preferences are asymmetric.

[2]Another critic that has been put forward is that the downsian model does not account for preferences of politicians over policies (e.g. Roemer, 2001).

In this paper, we follow the citizen-candidate approach to show that whenever *separation of platforms* holds in equilibrium, the non-symmetry of voters' preferences over policies is not an innocuous feature anymore. We introduce two natural alternatives to symmetric preferences, asymmetric towards overprovision –which we name *wasteful* policy preferences– and asymmetric towards underprovision – which we name *scrooge* policy preferences– and prove that each of these alternatives has a different impact on the predicted size of government: a larger government size is derived as a policy compromise whenever preferences of the median are wasteful. In turn, when preferences of the median are scrooge, the policy compromise entails a smaller government size. Furthermore, we show that, with scrooge or wasteful preferences, a regularity condition imposed on the slope of the marginal utility of public spending guarantees that more polarization of candidates is translated into greater differences between the peak of the median and the predicted policy.

We next study policy preferences off-the-peak. Even if we focus attention on the citizen-candidate model, our analysis on non-symmetric preferences is generally applicable to every two-party political competition model in which candidates choose separated platforms (e.g. Wittman, 1983, Caplin and Nalebuff, 1997).[3] In this line, we show that the third derivative of the utility representation of policy preferences with respect to the policy variable indicates the direction of the non-symmetry of preferences, with positive sign indicating wasteful preferences, and a negative one implying scrooge preferences. When the third derivative equals zero, in turn, preferences are symmetric. The sign of the third derivative of the relevant utility function has already been shown to have important implications in other economic settings. For example, in the theory of *precautionary saving* due to Kimball (1990), the sign of the third derivative of the utility function over consumption governs the presence or absence of a precautionary saving motive (where precautionary saving means to forego consumption this period when there is uncertainty about future periods).[4] In fact, we find that we can apply the

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[3]Two-candidate electoral competition is empirically relevant (see, for instance Jones, 1999; Wright and Riker,1989) and theoretically important: not only many models assume the exogenous existence of two political contestants, also the citizen-candidate model with sincere voters predicts the existence of just two-candidate equilibria for wide regions of the parameter set (Osborne and Slivinski, 1996).

[4]Groseclose (2001) also finds that the sign of the third derivative of the distant function between the ideal policy of voters and the implemented policy indicates whether swing voters prefer moderate movements form high-valence than low-valence candidates.

analog to Kimball's coefficient of prudence to compare the degree of scroogeness or wastefulness of different policy preferences.

We also use the sign of the third derivative to analyze what factors drive preferences to be wasteful or scrooge. We show that a positive coefficient of prudence (or, equivalently, DARA and CARA specifications of voters' risk aversion), as well as government decreasing effectiveness, drive preferences of voters to be scrooge. Wasteful preferences emerge if public expenditure enters as an input of either a capital production function or a health production function displaying more intense decreasing returns at lower investment levels. Our analysis reveals as well that the symmetry property of policy preferences holds only under quite stringent conditions.

Finally, we provide some numerical examples with plausible parameters that illustrate our theoretical results. We compare preferences of a median voter with different coefficients of risk aversion. We show in the proposed examples that more risk aversion makes preferences "more scrooge". As a consequence, there exists greater divergence between the policy preferred by the median voter and the compromise policy that emerges from every two-candidate equilibria according to the citizen candidate approach.

The remaining of the paper is organized as follows. The next section presents a general model of public good provision where the political process follows the citizen-candidate approach. Section 3 introduces three types of preferences over public expenditure off-the-peak: symmetric, wasteful and scrooge, and inquires about their implications for the outcome of the electoral process. In that section we also characterize and compare the proposed types of preferences. Section 4 analyzes the determinants of policy preferences off-the-peak in terms of the primitives of the model. Section 5 provides some numerical examples that quantify our theoretical results. Section 6 concludes.

2   A general policy problem

Consider a jurisdiction populated by a continuum of households with mass normalized to unity. Households are heterogeneous with respect to exogenously given income y. Income is distributed across the population according to some given distribution function with strictly positive density function f on the support $\left[\underline{y}, \bar{y}\right] \subset \mathbb{R}_+$. The income of household i is denoted by y_i. The mean and median income of the overall population are denoted by $\tilde{y}$ and y_m, respectively.

Preferences of household i are defined over bundles of private consumption $x_i \in \mathbb{R}_+$, and public expenditure $e \in \mathbb{R}_+$. Units of quality of the publicly provided good are normalized to be measured in units of the numeraire. Preferences have continuous utility representation $U(x_i, e)$, with strictly positive marginal utility in both arguments.

Public expenditures are financed through taxation levied on every household. Each household tax bill depends on the level of public expenditure and income. Household i's tax bill is described by a continuous function $\tau(e, y_i) \geq 0$, strictly increasing in the level of public expenditure. The tax bill is constrained to balanced *government budget,* so that every function τ satisfies

$$\int_{\underline{y}}^{\bar{y}} \tau(e, y) f(y) dy = e. \tag{1}$$

As a feasibility constraint, we require $\tau(e, y_i) \leq y_i$ for all $y_i \in \left[\underline{y}, \bar{y}\right]$.[5]

Households choose private consumption in a decentralized way. From strictly increasing marginal utility in private consumption, $x_i = y_i - \tau(e, y_i)$.[6] Induced *preferences over public expenditure* are derived from the indirect utility function (or policy-induced utility) of household i which can be written as

$$V(e, y_i) \equiv U(y_i - \tau(e, y_i), e). \tag{2}$$

While the utility representation U is identical across households, heterogeneity in income induces heterogenous preferences over public expenditure. We use V', V'', V''' to denote the first, second and third derivatives of V with respect to e. We assume that V is a C^3 function in argument e.

The following conditions on V are useful in the analysis that follows. The two first conditions on single-peakedness and single-crossing are standard. The third condition is a novel condition that, as we show below, provides additional insights into the nature of non-symmetric preferences over public expenditure.

Single-Peaked (SP): *V has a maximizer and is strictly quasi-concave in e.*

Strict Single-Crossing (SSC): *V' is strictly monotonic in y.*

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[5] This constraint imposes an upper bound on the total amount of public expenditure.

[6] For instance, under proportional income taxation, optimal private consumption is $x_i = y_i - t y_i$ where t is the marginal tax rate. According to (1) we have $t = \frac{e}{\tilde{y}}$ where $\tilde{y}$ denotes mean income, from where $\tau(e, y_i) = \frac{e y_i}{\tilde{y}}$.

Monotonic Satiation (MS): *V'' is strictly monotonic in e.*

By SP, every household i has an *ideal policy* (or peak), denoted by e_i^p, such that

$$e_i^p = \arg\max_e \; V(e, y_i). \tag{3}$$

Every household is worse off as the distance between a policy e and their ideal policy increases. Condition SP characterizes the entire domain of single peaked preference relations.[7] When the ideal policy of a household i is derived as an interior solution to (3), we have $V'(e_i^p, y_i) = 0$.

In turn, SSC is a sufficient condition that guarantees that majority preferences and preferences of the household with median income coincide.[8] By this condition, V' can be either strictly increasing or strictly decreasing in income. In the former case, rich households prefer more public expenditure than poor ones (e.g. public education). In the latter, the opposite holds, i.e., rich households prefer less public expenditure than poor ones (e.g. income redistribution).

Finally, MS is a regularity condition that restricts changes in the marginal utility of public expenditure to be strictly monotonic. According to MS, the marginal utility derived from public expenditure is either a strictly concave or a strictly convex function. Strict concavity of the marginal utility function implies that the principle of diminishing marginal utility (which basically captures the process of satiation) applies with increasing intensity. Thus, marginal utility derived from public expenditure falls faster at higher level of public expenditure. Strict convexity of course implies the opposite, that marginal utility falls more slowly at higher level of public expenditure.[9]

Citizen-candidate approach

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[7]Of course, this characterization accounts for a convex policy space and preferences with utility representation. Preferences over policies are single-peaked when the most preferred policy of household i is a singleton e_i^p, and for every pair of policies e, e' we have $V(e, y_i) > V(e', y_i)$ when $e' < e < e_i^p$ or $e_i^p > e > e'$.

[8]In fact, this is the one-dimensional version of the Spence-Mirrlees condition that characterizes the domain of strict single crossing preferences (see Milgrom, 1994; Gans and Smart, 1996). In our model, preferences over policies are strict single-crossing when for all $e' \neq e$, and for all $y_j > y_i$, if $V(e, y_i) > V(e', y_i)$ then $V(e, y_j) > V(e', y_j)$.

[9]Monotonic satiation is not such a stringent assumption as it may in principle seem. For example, CARA or DARA preferences for private consumption entail $u''' > 0$, i.e., that its marginal utility falls slower at high levels of consumption (e.g. Kimball, 1990).

The electoral process that determines the level of public expenditure in the jurisdiction follows the citizen-candidate pattern. This process has three stages. In stage 1, candidates declare themselves, in stage 2, households vote, choosing one among the candidates, and in stage 3 the winning candidate implements her platform. We study equilibria with two competing candidates, which we name *Low* (L) and *High* (H). Their platforms specify an amount of public expenditure, and are denoted by e_L and e_H respectively, where $e_L \leq e_H$.

In *stage 1*, households simultaneously decide whether or not to become candidates. In doing so, they must weigh, on the one hand, some positive entry costs, $c > 0$, against, on the other hand, some positive benefits derived from holding office, $b \geq 0$, and from choosing or affecting policy. Therefore, incentives to become candidate can be direct, from winning (or tying) the elections, or indirect, from affecting the candidate that wins. In the latter case, the entry cost would be compensated by enjoying a better policy. In *stage 2*, each household casts a vote. We consider sincere voting, i.e., each household votes for the candidate whose platform better matches their own policy preferences.[10] By plurality voting rule, the candidate that achieves more votes becomes the winning candidate. Finally, in *stage 3*, the winning candidate implements her policy. If two candidates tie, we take the midpoint of their platforms as the result of a policy compromise between the two winning candidates and denote it with e^*. In such case, the benefits each candidate derives from holding office reduce to $b/2$.

A two-candidate equilibrium is a (pure strategy) Nash equilibrium at the entry stage with the particularity that just two voters become candidates.

Definition: *A **two-candidate equilibrium** is given by a pair of platforms (e_L, e_H) such that no candidate improves withdrawing from the contest, and no other voter improves by becoming candidate.*

In every two-candidate equilibrium, the platforms of the candidates prevent the entry of a newcomer while providing incentives to stay in the race.

For every possible distribution of income across households, we guarantee existence of two-candidate equilibria. To prove this statement, we extend the proof of Osborne and Slivinski (1996) to preferences over policies satisfying SP and SSC.[11] The proof is in the Appendix.

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[10]We thus assume that voters only care for candidates' platform and not for other personal characteristics.

[11]Osborne and Slivinski assume that preferences of voters over policies are symmetric

Proposition 1 *Assume that policy preferences satisfy SP and SSC. If $b > 2c$, there always exist two-candidate equilibria. Furthermore, in every two-candidate equilibrium, candidates tie.*

The incentives of candidates to stay in the race are derived from the fact that each candidate, in equilibrium, gathers the same proportion of votes. This equilibrium property implies that the median voter must be indifferent between the equilibrium platforms. By SSC, the median voter coincides with the median income household, so that, in every equilibrium $V(e_L, y_m) = V(e_H, y_m)$. By SP, the equilibrium platforms must be located at different sides of the peak of the median, i.e., $e_L < e_m^p < e_H$. Since the median never fully satisfies her policy preferences, and only candidates that make her indifferent may run together in an electoral race, the pivotal role of the median is different from that played in the downsian model.[12]

Multiple two-candidate equilibria exist. It is worth mentioning, however, that the downsian equilibrium in which both candidates propose the peak of the median, is not an equilibrium in the citizen-candidate model.[13] Note also that for some income distributions, in equilibrium, candidates cannot be located too far from each other, since an additional candidate in between them could enter the race and win.

3   Preferences off-the-peak

In this section, we introduce two alternatives to symmetry –which we name *wasteful* and *scrooge* policy preferences– and we inquire about their implications for the outcome of the electoral process. We also characterize the proposed types of preferences and provide a coefficient that measures the degree of scroogeness or wastefulness.

Definitions of preferences

Given household i's peak e_i^p and letting d be a positive amount of public expenditure, we say that policy preferences of household i are **symmetric**

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around the peak and that voters only differ in their peak. Under their assumption, SSC is obviously satisfied.

[12] An equivalent pivotal role of the median is also considered in Duggan and Fey (2006, Theorem 5).

[13] This point is made by Palfrey (1984) who argues that two candidates with differentiated platforms located at each side of the median prevents the entry of a candidate with more extremist platform.

(around the peak) when

$$V(e_i^p - d, y_i) = V(e_i^p + d, y_i) \text{ for all } d \in (0, e_i^p).$$

In that case, household i is indifferent between any two policies that are equidistant to their peak.[14]

We consider two natural alternatives to symmetry. These alternatives capture how tolerant are households with respect to overprovision and underprovision with respect to their peak. Suppose household i is given a choice between two symmetric deviations from their peak, $e_i^p - d$ and $e_i^p + d$, we say that their preferences are **wasteful** whenever

$$V(e_i^p - d, y_i) < V(e_i^p + d, y_i) \text{ for all } d \in (0, e_i^p).$$

Thus, off-the-peak, that household prefers an excess in public expenditure over its symmetric defect. In the opposite case, that is whenever

$$V(e_i^p - d, y_i) > V(e_i^p + d, y_i) \text{ for all } d \in (0, e_i^p),$$

we say that preferences of household i are **scrooge**,[15] which implies that household i prefers a defect from the peak over its symmetric excess. Figure 1 illustrates these notions.

Our definition of wasteful or scrooge preferences is not related to the location of the peak of the preferences. The extent to which these two types of non-symmetric preferences emerge from reasonable assumptions on the primitives of the policy problem is analyzed in the following section.

Policy implications of wasteful and scrooge preferences

As it follows from Proposition 1, in every two-candidate equilibrium (e_L, e_H) condition $V(e_L, y_m) = V(e_H, y_m)$ holds. As a consequence, if preferences of the median are symmetric, then the policy compromise is e_m^p,

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[14]Let $\bar{e}$ be the upper bound in public expenditure. We implicitly assume that $2e_i^p < \bar{e}$. If such restriction does not hold, we need to define symmetry in the truncated interval $[0, \bar{e}]$, while this would be more rigorous, it does not provide additional insights into our analysis. Note also that this definition, together with the subsequent definitions of wasteful and scrooge preferences, only apply when e_i^p is an interior solution.

[15]Our choice of the term 'scrooge' is motivated by Ebenezer Scrooge, an extremely mean character in Charles Dickens' *A Christmas Carol*.
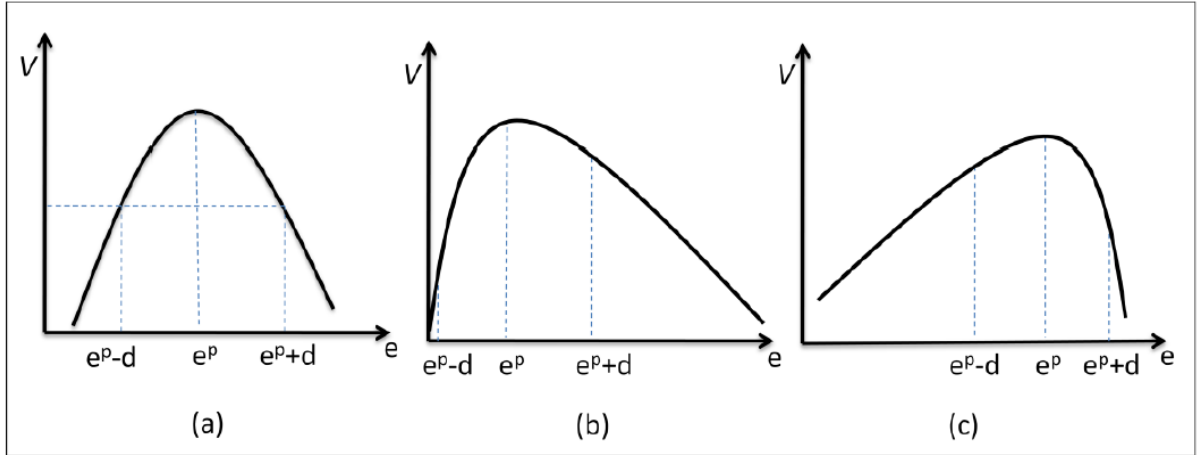
Figure 1: (a) Symmetric preferences (b) Wasteful Preferences   (c) Scrooge preferences

however, if preferences of the median are wasteful or scrooge, the equilibrium platforms cannot be equidistant to the peak of the median.[16] Thus, when preferences of the median are wasteful, $e^* > e^p_m$ and when preferences of the median are scrooge, $e^* < e^p_m$ (Figure 2 illustrates this point). The proposed arguments prove our next result.

Proposition 2 *Assume that policy preferences satisfy SP and SSC, then the compromise policy in every two-candidate equilibrium:*
- coincides with the peak of the median when her preferences are symmetric,
- is above the peak of the median when her preferences are wasteful,
- is below the peak of the median when her preferences are scrooge.

Thus, the two proposed alternatives to symmetric preferences entail the existence of a wedge between the peak of the median and the equilibrium policy compromise. It is important to stress that only the shape of the *median voter preferences off-the-peak* matters to derive the above result. In turn, by the SSC condition, the only relevant aspect of preferences of non-decisive voters is the location of the peak (whether it is to the right or to the left of the median).

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[16]Even if we account for uncertainty on the location of the median voter, the expected median as well as her preferences off-the-peak are relevant to predict the winning candidate when the two candidates at stage have different platforms (see Wittman, 1983).
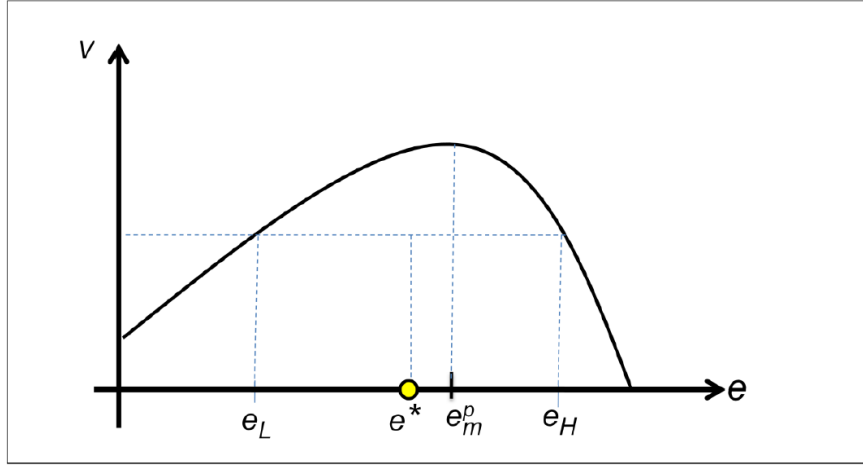
Figure 2: Illustration of Proposition 2 , median with scrooge preferences

The shape of preferences off-the-peak generate different configurations of two-candidate equilibria. The following proposition throws some additional light over the properties of the multiplicity of two-candidate equilibria. For that, we restrict attention to policy preferences satisfying MS. We show that whenever preferences of the median are wasteful, the equilibrium policy consists of more public expenditure the more extremist equilibrium candidates are, whilst in cases where her preferences are scrooge, it consists of less public expenditure the more extremist equilibrium candidates are. The proof is in the Appendix.

Proposition 3 *Assume that policy preferences satisfy SP, SSC, MS and that preferences of the median are either wasteful or scrooge. Then, the more extremist the two equilibrium platforms are, the larger the wedge between the compromise policy and the peak of the median.*

When preferences are symmetric, every two-candidate equilibrium entails an equivalent prediction in terms of the compromise policy. When preferences are non-symmetric, predictions concerning the compromise policy may vary across different two-candidate equilibria. The MS condition makes it possible to order the multiplicity of equilibria since higher polarization of the candidates' platforms is translated into greater divergence between the peak of the median and the compromise policy. In this way, by computing

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the two-candidate equilibrium with the most extremist candidates, we can compare the maximum divergence between the peak of the median and the compromise policy (we account for this in the numerical examples).

On the characterization of preferences

We have shown that the non-symmetry of preferences has relevant policy implications. For that, we have focused on the citizen-candidate approach. The following characterization results, in turn, do not depend on the specific electoral procedure. We first provide a characterization of preferences that satisfy SP and that are symmetric (around the peak).

Theorem 1: *Assume that policy preferences satisfy SP, then preferences are symmetric if and only if* $V'(e_i^p - d, y_i) = -V'(e_i^p + d, y_i)$ *for all* $d \in (0, e_i^p)$.

Proof. By SP, when V is symmetric $V(e_i^p - d, y_i) = V(e_i^p + d, y_i)$ for all $d \in (0, e_i^p)$. This implies that at any point $e_i^p - d$, the effect on V derived from increasing $e_i^p - d$ in any amount, is equal to the effect on V derived from decreasing $e_i^p + d$ by the same amount. In particular, when modifying $e_i^p - d$ and $e_i^p + d$ by an amount that approaches zero, we have $V'(e_i^p - d, y_i) = -V'(e_i^p + d, y_i)$.
Conversely, let V satisfy SP and $V'(e_i^p - d, y_i) = -V'(e_i^p + d, y_i)$ for all $d \in (0, e_i^p)$, and suppose, by contradiction, that V is non-symmetric. Then, the utility loss derived from decreasing public expenditure from e_i^p to $e_i^p - d$ cannot equal the utility loss derived from increasing public expenditure from e_i^p to $e_i^p + d$. Without loss of generality, consider the case where $V(e_i^p, y_i) - V(e_i^p - d, y_i) > V(e_i^p, y_i) - V(e_i^p + d, y_i)$; that expression is equivalent to $\int_{e_i^p - d}^{e_i^p} V'(e, y_i) de > -\int_{e_i^p}^{e_i^p + d} V'(e, y_i) de$, which is in contradiction with $V'(e_i^p - d, y_i) = -V'(e_i^p + d, y_i)$ for all $d \in (0, e_i^p)$. ∎

Hence, symmetric preferences require the slope of the policy-induced utility function to be equal in absolute terms at every pair of symmetric deviations from the peak. Clearly, when this condition does not hold, preferences are non-symmetric. Theorem 1 seems to indicate that, apart from cases where the marginal function V' falls at a constant rate (i.e., whenever $V''' = 0$), symmetry requires a somewhat farfetched behavior of the indirect utility function in the public spending direction.[17]

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[17]To see this, note that for any concave interval to the right of the peak, the corresponding (symmetric) interval to the left of the peak must be the exact symmetric but convex.

Following the above result, we want to provide a characterization of wasteful and scrooge preferences. By restricting the set of preferences according to MS, we show that the sign of the third derivative of V characterizes the proposed types of preferences.

Theorem 2: *Assume that policy preferences satisfy SP and MS then,*
- preferences are wasteful if and only if V' is strictly convex in $e \in (0, 2e_i^p)$,
- preferences are scrooge if and only if V' is strictly concave in $e \in (0, 2e_i^p)$.

Proof. If V' is strictly convex (or, equivalently, $V''' > 0$) in $e \in (0, 2e_i^p)$, by Jensens' inequality, the expected value of V' in the interval $[e_i^p - d, e_i^p + d]$ is above the value of V' in the mean of $[e_i^p - d, e_i^p + d]$ for all $d \in (0, e_i^p)$. Thus,

$$\int_{e_i^p - d}^{e_i^p + d} \frac{V'(e, y_i)}{2d} de > V'(e_i^p, y_i). \tag{4}$$

Solving for the integral, $\int_{e_i^p - d}^{e_i^p + d} \frac{V'(e, y_i)}{2d} de = \frac{1}{2d} [V(e_i^p + d, y_i) - V(e_i^p - d, y_i)]$. By continuity of V' and SP, $V'(e_i^p, y_i) = 0$, and $V(e_i^p + d, y_i) > V(e_i^p - d, y_i)$ for all $d \in (0, e_i^p)$, preferences are wasteful. If V' is strictly concave, the sign of Expression (4) is reversed and this proves that preferences are scrooge. Conversely, let preferences be wasteful and suppose that V' is not strictly convex. Then, by MS, V' must be strictly concave, which implies that preferences are scrooge, contradicting that preferences are wasteful. Following a similar line of reasoning, it is straightforward to prove part ii). ∎

The above proof reveals that the SP condition, alongside strict concavity of V' are sufficient conditions for scrooge preferences. Likewise, the SP condition together with strict convexity of V' are sufficient conditions for wasteful policy preferences. Only under MS, the strict concavity or convexity of V' become necessary conditions for scrooge and wasteful preferences, respectively. As illustrated in Figure 3, when V' is strictly concave, the marginal utility of public spending falls faster at higher levels of public expenditure. In that case, the utility loss emerging from receiving too much of public expenditure (an excess over the peak equal to d) is larger than the utility loss derived from too low a level of provision (a shortfall over the peak equal to d). Strict convexity of V' obviously implies the opposite: that marginal utility falls (and satiation occurs) more slowly at higher levels of public expenditure. In that case, it is more important to avoid a shortfall of spending with respect to the peak than to incur in an excess.
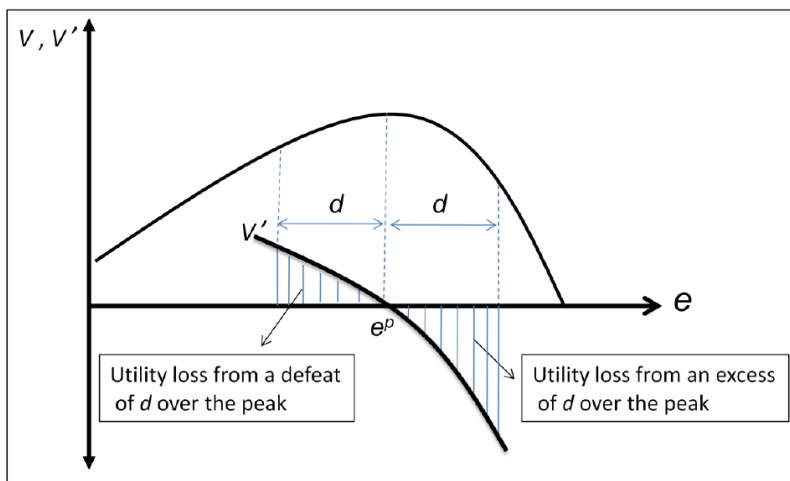
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Figure 3: Scrooge preferences, utility loss from symmetric deviations

Comparative degrees of wastefulness and scroogness

There is an analogy between our result concerning the characterization of wasteful and scrooge preferences, and the theories developed by Pratt (1964) and Kimball (1990). According to Pratt's theory of risk aversion, concavity of a utility function over consumption indicates the presence of risk aversion, while according to Kimball's theory of precautionary savings, concavity of the marginal utility of second period consumption entails precautionary savings. In both cases, the degree of concavity of the relevant function measures risk aversion or precautionary savings. These behavioral traits become thus comparable across pairs of concave functions such that one is a concave transformation of the other.

The similarity between our approach and theirs stems from the fact that, as we show next, under MS and as long as preferences satisfy a stronger version of SP (strict concavity of V), the curvature of the marginal policy-induced utility function determines the degree of non-symmetry of preferences. We can therefore apply the analog to the coefficient of prudence that Kimball (1990) proposes, to measure the level of scroogeness or wastefulness.[18]

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[18]Recall that Kimball's coefficient of prudence is defined as the negative of the third derivative of the utility function over consumption divided by the second derivative, i.e.

In order to state and prove this result, we need a precise definition of the degree of wastefulness and scroogeness of preferences: Consider two different utility functions V_1, V_2 satisfying SP and which peaks are e_1^p, e_2^p respectively. Each of these functions correspond to two different households with income y_1 and y_2 respectively. The functions $\delta_1(d)$ and $\delta_2(d)$ are implicitly defined by each of the following functions

$$V_1(e_1^p - d, y_1) = V_1(e_1^p + \delta_1(d), y_1)$$
$$V_2(e_2^p - d, y_2) = V_2(e_2^p + \delta_2(d), y_2).$$

Thus, by definition, households with preferences represented by V_i are indifferent between two deviations from their peak $e^p - d$ and $e^p + \delta_i(d)$. We say that V_2 is *more scrooge* than V_1 when $\delta_2(d) < \delta_1(d)$ for all $d \leq \min\{e_1^p, e_2^p\}$. Likewise, we say that V_2 is *more wasteful* than V_1 when $\delta_2(d) > \delta_1(d)$ for all $d \leq \min\{e_1^p, e_2^p\}$.

Theorem 3: *Let V_1, V_2 be policy-induced utility functions satisfying strict concavity in e, and MS. Let $\Delta = e_2^p - e_1^p$,*
if V_1, V_2 are scrooge and $-\frac{V_2'''(e, y_2)}{V_2''(e, y_2)} < -\frac{V_1'''(e-\Delta, y_1)}{V_1''(e-\Delta, y_1)}$ for all $e < \min\{2e_1^p, 2e_2^p\}$, then V_2 is more scrooge than V_1, and
if V_1, V_2 are wasteful and $-\frac{V_2'''(e, y)}{V_2''(e, y)} > -\frac{V_1'''(e-\Delta, y)}{V_1''(e-\Delta, y)}$ for all $e < \min\{2e_1^p, 2e_2^p\}$, then V_2 is more wasteful than V_1.

Proof. Consider the case in which V_1 and V_2 are scrooge (an analogous argument proves the result for wasteful preferences). By assumption, V_1' and V_2' are strictly decreasing functions of e, and can be related by a strictly increasing transformation g such that $V_2'(e) = g(V_1'(e-\Delta))$ where $\Delta = e_2^p - e_1^p$ (we omit argument y from V_1' and V_2' in the interest of clarity). I.e., V_2' is obtained as an increasing transformation of V_1' with the particularity that the argument of V_1' is normalized to $e - \Delta$. This implies that when $e = e_2^p$, $g(0) = 0$. We differentiate the expression,[19]

$$V_2''(e) = g'(V_1'(e-\Delta))V_1''(e-\Delta)$$
$$V_2'''(e) = g''(V_1'(e-\Delta))\left[V_1''(e-\Delta)\right]^2 + g'(V_1'(e-\Delta))V_1'''(e-\Delta).$$

From where

$$-\frac{V_2'''(e)}{V_2''(e)} = -\frac{V_1'''(e-\Delta)}{V_1''(e-\Delta)} - \frac{g''(V_1'(e-\Delta))V_1''(e-\Delta)}{g'(V_1'(e-\Delta))}.$$

$-\frac{u'''(x)}{u''(x)}$.

[19]We follow a similar argument to the one used by Pratt (1964), Theorem 1.

By MS, $V_1''' < 0$ and $V_2''' < 0$. Then, $-\frac{V_2'''(e,y)}{V_2''(e,y)} < -\frac{V_1'''(e-\Delta,y)}{V_1''(e-\Delta,y)}$ implies $g''(V_1'(e - \Delta)) < 0$ (g strictly concave).

By definition of $\delta_2(d)$, we have $V_2(e_2^p - d) = V_2(e_2^p + \delta_2(d))$, or equivalently, $\int_{e_2^p-d}^{e_2^p+\delta_2(d)} V_2'(e)de = 0$. Substituting function g,

$$0 = \int_{e_2^p-d}^{e_2^p+\delta_2(d)} V_2'(e)de = \int_{e_2^p-d}^{e_2^p+\delta_2(d)} g(V_1'(e - \Delta))de. \qquad (5)$$

By strict concavity of g, $\int_{e_2^p-d}^{e_2^p+\delta_2(d)} g(V_1'(e - \Delta))de < g(\int_{e_2^p-d}^{e_2^p+\delta_2(d)} V_1'(e - \Delta)de)$, where $\int_{e_2^p-d}^{e_2^p+\delta_2(d)} V_1'(e - \Delta)de = V_1(e_1^p + \delta_2(d)) - V_1(e_1^p - d)$. Since g is strictly increasing and $g(0) = 0$, then $V_1(e_1^p + \delta_2(d)) - V_1(e_1^p - d) > 0$ for all d. Since $V_1' < 0$ for all $e > e_1^p$, and by definition of $\delta_1(d)$, $V_1(e_1^p - d) = V_1(e_1^p + \delta_1(d))$, we deduce that $\delta_1(d) > \delta_2(d)$ for all $d \leq \min\{e_1^p, e_2^p\}$. ∎

According to this result, policy preferences are more scrooge for the "more concave" marginal utility representation, and more wasteful for the "more convex" marginal utility representation. The advantage of using this coefficient to measure scroogeness and wastefulness is that it can be easily calculated for specific applications.

When the peak derived from two different policy-induced utility function coincides, then $\Delta = e_2^p - e_1^p = 0$, and it is possible to compare degrees of non-symmetry just by comparing $-\frac{V_1'''(e,y_1)}{V_1''(e,y_1)}$ to $-\frac{V_2'''(e,y_2)}{V_2''(e,y_2)}$ for every $e < 2e_1^p$. Because it is the curvature around the peak that matters, in cases where the peak is not reached at the same level of public expenditure, the comparison must be made *around the corresponding peak*. That is to say, when $e_1^p \neq e_2^p$, we shall compare $-\frac{V_1'''(e-\Delta,y_1)}{V_1''(e-\Delta,y_1)}$ and $-\frac{V_2'''(e,y_2)}{V_2''(e,y_2)}$ for every $e < \min\{2e_1^p, 2e_2^p\}$. In this case, when $e = e_2^p$, then $e - \Delta = e_1^p$, i.e., preferences are compared around their respective peaks.

Finally, note that, as it occurs in Pratt (1964) and Kimball (1990), the ordering of preferences according to the level of scroogeness or wastefulness is a partial ordering (transitive but not complete).

4   Determinants of preferences off-the-peak

The previous section revealed that the size of government in two-candidate equilibria according to the citizen-candidate approach, as compared to the

prediction of the downsian equilibrium, depends on the preferences of the median *off-the-peak*. In this section, we analyze what may drive preferences to be symmetric, wasteful, or scrooge.

For expositional purposes, hereafter we analyze the case of quasi-linear preferences where $U(x_i, e) = u(x_i) + e$, yielding the following indirect utility function

$$V(e, y_i) \equiv u\left(y_i - \tau(e, y_i)\right) + e, \tag{6}$$

with $u' > 0$, $\tau' > 0$, $u'' \leq 0$, $\tau'' \geq 0$, except for $u'' = \tau'' = 0$.[20] The imposed conditions account for either risk neutral or risk averse households, as well as for constant or increasing mean taxation (i.e., a household tax bill per unit of public expenditure may be constant or increasing). It is easy to show that the proposed conditions guarantee SP, with V strictly concave. In addition, if the cross derivative $\tau''_{ey} \geq 0$, we can also guarantee SSC.[21]

As we show below, attitudes toward risk and precautionary savings, as well as the form of the tax bill plays a central role in shaping the preferences of households over public expenditure. We measure different degrees of risk aversion according to the Arrow-Pratt's coefficient of absolute risk aversion $r_A = -\frac{u''}{u'}$. Increasing absolute risk aversion (IARA) holds when $r'_A > 0$. Likewise, decreasing absolute risk aversion (DARA) and constant absolute risk aversion (CARA) corresponds to $r'_A < 0$ and $r'_A = 0$ respectively.

The generic tax bill function τ can capture different finance schemes, as well as different degrees of effectiveness in transforming tax revenues into public expenditure. We say that the *government is constant-effective* when the scheme τ is linear in e. When the government is constant-effective, every household faces a linear tax bill in the amount of public expenditure. Particular instances of constant-effective governments are given by the lump-sum tax, where $\tau = e$, or the proportional tax, where $\tau = \frac{e y_i}{\tilde{y}}$ with $\tilde{y}$ representing mean income and where the marginal tax bill per unit of income equals $\frac{e}{\tilde{y}}$. A progressive or regressive tax scheme can also be constant-effective. Thus, for instance, the tax bill function $\tau = e\rho(y_i)$ with ρ strictly increasing in income is progressive whenever $\rho'(y) > \frac{\rho(y)}{y}$ and regressive when $\rho'(y) < \frac{\rho(y)}{y}$.[22]

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[20]Note that if $u'' = \tau'' = 0$, the ideal policy of each household cannot be derived as an interior solution to their utility maximization problem.

[21]To see this, the cross derivative $V''_{ey} = -u''(1 - \tau'_y)\tau' + u'\tau''_{ey}$, where $u'' < 0$, $\tau''_{ey} \geq 0$ or $u'' = 0$, $\tau''_{ey} > 0$ are sufficient conditions for SSC. For instance, under proportional income taxation, $\tau(e, y_i) = \frac{e y_i}{\tilde{y}}$ where $\tilde{y}$ is mean income, we have $\tau''_{ey} = \frac{1}{\tilde{y}}$ which implies that rich households demand more public expenditure.

[22]For these functions to qualify as tax bill functions, the government budget must be

When τ is strictly convex in e, we say that *government is decreasing-effective.*[23] Convexity of τ in e can represent tax distortions, or congestions in government ability to transform tax revenue into public expenditure. Another interpretation is that it represents corruption of public officials, in which case convexity of τ in e reflects the deviation of tax revenues to other purposes different from public expenditure. Examples of convex τ under lump-sum or proportional income taxation are given by $\tau = e^\alpha$ and $\tau = \frac{e^\alpha y_i}{\tilde{y}}$ (with $\alpha > 1$) respectively.[24] Note that all these forms of decreasing-effective government generate a convex Laffer curve.

Solving for the derivatives of (6) with respect to e,

$$V' = -u'\tau' + 1 \tag{7}$$

$$V'' = u'' \left[\tau'\right]^2 - u'\tau'' \tag{8}$$

$$V''' = -u''' \left[\tau'\right]^3 + 3u''\tau'\tau'' - u'\tau'''. \tag{9}$$

Following the result in Theorem 2, the sign of (9) determines whether preferences satisfy the symmetric, scrooge or wasteful requirement. The following table summarizes in which cases the primitives of the problem u and τ yield each type of policy preferences. We cover most, if not all, the commonly used utility functions, as well as all the examples of tax bill functions we have mentioned.

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balanced. This implies ρ must satisfy $\int_{\underline{y}}^{\bar{y}} \rho(y_i)f(y)dy = 1$. A particular example of a non-proportional taxation that satisfies these requirements is the education finance scheme studied by Bénabou (2002).

[23] Related to the convexity of τ, Krasa and Polborn (2009) analyze the political consecuences derived from different parties showing different abilities to transform tax revenue into public good.

[24] A particular instance of a decreasing-effective government is considered by Hansen and Kessler (2001) which we will use in our numerical examples.

	$u'' = 0$	$u'' < 0, u''' = 0$	$u'' < 0, u''' > 0$
$\tau'' = 0$		Symmetric	Scrooge
$\tau'' > 0$ $\tau''' = 0$	Symmetric	Scrooge	Scrooge
$\tau'' > 0$ $\tau''' > 0$	Scrooge	Scrooge	Scrooge
$\tau'' > 0$ $\tau''' < 0$	Wasteful	Scrooge[25] (high r_A) / Ambiguous (otherwise) / Wasteful (low r_A)	Ambiguous

Table 1: Determinants of the shape of preferences off-the-peak

According to Table 1, symmetric preferences unambiguously follow from either (i) risk neutral households and a *particular* form of non-constant-effective government (where $\tau''' = 0$), implying that the marginal tax bill must increase at a constant speed with public expenditure, or (ii) a constant-effective government and risk averse households with a specific form of IARA (derived from $u''' = 0$, which implies $r_A^2 = r_A'$).[26] It is worth mentioning that there are more cases, not considered in the table, where preferences are symmetric. To identify all these cases, we can check, according to our result in Proposition 3, the necessary and sufficient condition for symmetry, which can be written as

$$u'(e_i^p - d)\tau'(e_i^p - d, y_i) + u'(e_i^p + d)\tau'(e_i^p + d, y_i) = 2 \text{ for all } d \in (0, e_i^p). \quad (10)$$

Thus, if $u'' = 0$ and $\tau'' > 0$ but $\tau''' \neq 0$, preferences will be symmetric as long as τ' is symmetric around e_i^p, or if $\tau'' = 0$ and $u'' < 0$ but $u''' \neq 0$, preferences will be symmetric as long as u' is symmetric around e_i^p. In the following

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[25]In this case, the third derivative of the indirect utility function writes: $V''' = u'[-3r_A\tau'\tau'' - \tau''']$.

[26]To show that $u''' = 0$ implies the IARA condition and where $r_A^2 = r_A'$, we take derivatives to the coefficient of absolute risk aversion $r_A' = -\left[\frac{u'''u' - (u'')^2}{(u')^2}\right]$. Substituting $u''' = 0$, we have $r_A' = \left[\frac{u''}{u'}\right]^2 = r_A^2 > 0$.

remark, we describe the conditions for symmetric preferences. In doing so, we disregard these last two cases since, a priori, there is no implicit reason, but a mathematical argument, for either τ' or u' to satisfy such symmetry requirements. Furthermore, such cases are not robust to small variations of τ' and u'.[27]

Remark 1: *Symmetric preferences only follow from:*
i) risk neutral households and a non constant-effective government characterized by an increasing marginal tax bill with $\tau''' = 0$,
ii) risk averse households with a specific form of IARA condition with $r_A^2 = r_A'$ and a constant-effective government.

Two particular examples of tax bill functions satisfying case i) are given by $\tau = e^\alpha$ with $\alpha = 2$ and by $\tau = \frac{e^\alpha y_i}{\tilde{y}}$ with $\alpha = 2$. Note, however, that preferences are not symmetric for every $\alpha \neq 2$. On the other hand, as far as we know, no commonly used utility function satisfies the requirement of case ii).[28] Remark 1 thus suggests that symmetric policy preferences require placing quite stringent restrictions on the primitives of the policy problem. It also suggests that there are many channels whereby we may move towards the case of non-symmetric preferences.

Risk neutrality, as well as risk aversion with DARA or CARA specifications of risk, are the assumptions more generally invoked in economic applications. In particular, DARA and CARA specifications of risk correspond best to our basic intuition about attitudes towards risk and to the available empirical evidence.[29] These conditions imply $r_A' < 0$ and $r_A' = 0$, respectively, and, since $r_A' = -\left[\frac{u'''u' - (u'')^2}{(u')^2} \right]$, both cases imply $u''' > 0$. Likewise, a constant-effective government or a decreasing-effective government with a marginal tax bill that increases faster at higher levels of public expenditure seems to us the appropriate form according to economic intuition. In particular, a tax bill function with $\tau'' > 0$ reflects increasing congestion in the government ability to transform tax revenues into public expenditure

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[27]Not to mention the case where $u'' < 0, \tau'' > 0$, and where symmetry requires the product function $g(e, y_i) = u'(e)\tau'(e, y_i)$ to be symmetric around e_i^p.

[28]In fact, most of them show derivatives that alternate in sign ($u' > 0, u'' < 0, u''' > 0$).This statement is justified by Pratt and Zeckhauser (1987).

[29]On the one hand, recent empirical evidence presented by Chiappori and Paiella (2008) does not give support to the IARA condition. On the other hand, DARA is widely considered to be reasonable (see Arrow 1971), and as postulated by Pratt (1964): DARA is implied by such behavior of investing in risky securities as one becomes richer.

or, following another interpretation, it reflects increasing public corruption at higher levels of public expenditure. On the contrary, $\tau'' < 0$ implies that the relative cost imposed by distortions or corruption (if they exist) are decreasing, an assumption that simple economic reasoning does not support. The following two remarks cover most commonly used utility functions as well as the most reasonable and widely applicable tax bill functions.

Remark 2: *If households are risk neutral and the government is constant-effective with the marginal tax bill increasing faster at higher levels of public expenditure, then preferences are scrooge.*

Remark 3: *If households are risk averse according to the CARA or DARA condition, and government is either constant-effective or decreasing-effective with the marginal tax bill increasing faster at higher levels of public expenditure, then preferences are scrooge.*

Under a quasi-linear utility representation, scrooge preferences are the norm. It is intuitive that consumers exhibiting DARA or CARA specifications of risk are more afraid of too low private consumption (or equivalently, too high levels of public expenditure) and therefore, they possess scrooge preferences. Likewise, government decreasing-effectiveness, with a cost of raising public funds (or corruption) that increases faster at higher levels of public expenditure, generates more intense preferences for underprovision, i.e., scrooge preferences.

An alternative utility representation is given by the quasi-linear (money-metric) specification of policy preferences $U(x_i, e) = x_i + h(e)$. This specification yields the following indirect utility function

$$V(e, y_i) \equiv y_i - \tau(e, y_i) + h(e), \tag{11}$$

in which h can be interpreted as a human capital production function, provided that e measures public expenditure in education. Alternatively, h could be a health status production function, provided that e measures public expenditure in health care. In both cases, positive and decreasing marginal returns in production emerge as natural assumptions, i.e., $h' > 0$, $h'' < 0$. These conditions together with $\tau'' \geq 0$ and τ''_{ey} guarantee SP and SSC. The third derivative of (11) is

$$V''' = -\tau''' + h'''. \tag{12}$$

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This reveals that, if the law of diminishing marginal returns applies with greater intensity at lower levels of public expenditure, then $h''' > 0$, which contributes towards wastefulness.

Remark 4: *If the government is constant-effective and the law of diminishing marginal returns to public expenditure applies with greater intensity at lower levels of public expenditure, then preferences are wasteful.*

For instance, Roemer (2001) considers the utility representation $U(x_i, e) = x_i + 2\alpha e^{\frac{1}{2}}$. Under proportional income taxation, $V = y_i - e\frac{y_i}{\tilde{y}} + 2\alpha e^{\frac{1}{2}}$, and it is straightforward to show that $V''' > 0$ and hence, that preferences are wasteful.

5   Numerical Examples

In the final part of the analysis we present two numerical examples of equilibrium. The objective is to further illustrate our results and to provide an idea of the magnitude of the effects we study under realistic parameter configurations. We do not perform a pure comparative statics exercise, as we will change two taste parameters at the same time in order to keep the peak constant. Instead, our intention is to quantify the impact of the shape of policy preferences *off-the-peak* for utility configurations with the same median voter's peak. We adopt a lognormal income distribution that matches the 2006 mean ($66,570) and median ($48,201) income in the US (in thousands). This requires setting the mean parameter at $\mu = 3.87$ and the variance parameter at $\sigma = 0.80$.

We follow a particular form of decreasing-effective government proposed by Hansen and Kessler (2001). These authors consider proportional income taxation in addition to a cost associated to raising public funds. Convexity of the function that captures the cost of raising public funds is translated into convexity of τ in e. According to their specification, $e = \left(t - \frac{t^2}{2}\right)\tilde{y}$ where $\frac{t^2}{2}$ is the cost of raising public funds.

Policy preferences are derived from the following primitive utility specification,

$$U(x_i, e) = \frac{1}{1 - \alpha}x_i^{1-\alpha} + \beta e$$

which displays DARA with parameter α/x.[30] Such specification yields the

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[30]Hence, that function exhibits constant relative risk aversion with parameter α.

following policy-induced utility function:

$$V(e,y) = \frac{1}{1-\alpha} \left[\frac{y_i}{\tilde{y}} \left[\tilde{y}^2 - 2\tilde{y}e \right]^{\frac{1}{2}} \right]^{1-\alpha} + \beta e.$$

It is straightforward to check that induced policy preferences satisfy SP, SSC and MS and that the peak is increasing in household income.[31] Note that, according to our results in Table 1, both the presence of risk aversion (with DARA and thus $u''' > 0$) and of public sector distortions (with $\tau'', \tau''' > 0$) generate scroogeness. In particular, we are within the scope of Remark 3 in the previous section.

The taste parameters α, β are chosen so that the median voter's peak matches US spending in K-12 education per pupil in 2006 ($9,138). We compare two cases with different coefficients of risk aversion (but the same peak): in example 1, $\alpha = 2.2$ and $\beta = 0.00024$, whilst in example 2, $\alpha = 1.5$ and $\beta = 0.0032325$. We follow the citizen-candidate approach in which costs from becoming candidate and benefits from holding office are set at $b = 0.8$ and $c = 0.46$, and equilibria with candidates located too close to the median do not exist.

Table 2 contains the results for three of the continuum of equilibria that emerge in each example: the first column presents results of the equilibrium with closest-to-median candidates, the second one an intermediate case, and the third one the equilibrium with the most polarized candidates. The first two rows contain the policy proposals of candidates Low and High. We use y_L and y_H to denote the income level of candidates with platforms e_L and e_H, respectively. Finally, the last row indicates the wedge between the compromise policy and the peak of the median voter in percentage rates. Results are also represented in Figure 4, which depicts the compromise policy in the set of two-candidate equilibria of our examples as well as the median voter's peak.

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[31] Solving for t we have $t = 1 - \frac{\left(\tilde{y}^2 - 2\tilde{y}e\right)^{\frac{1}{2}}}{\tilde{y}}$ and since $\tau = ty_i$, it follows that $\tau' = y_i \left(\tilde{y}^2 - 2\tilde{y}e\right)^{-\frac{1}{2}} > 0$, $\tau'' = y_i\tilde{y} \left(\tilde{y}^2 - 2\tilde{y}e\right)^{-\frac{3}{2}} > 0$, $\tau''' = 3y_i\tilde{y}^2 \left(\tilde{y}^2 - 2\tilde{y}e\right)^{-\frac{5}{2}} > 0$, and $\tau''_{ey} = \left(\tilde{y}^2 - 2\tilde{y}e\right)^{-\frac{1}{2}} > 0$
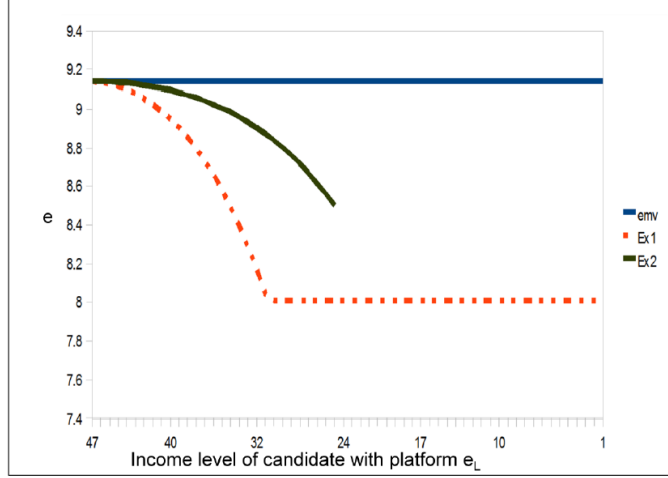
Figure 4: Comparing the policy compromise in the continuum of equilibria

	Example 1			Example 2		
e_L	2.76	1.1	0	7.47	5.09	2
e_H	14.33	15.38	16.02	10.73	12.75	14.89
y_L	35.25	32.85	31.41	40.76	32.85	24.7
y_H	66.57	71.80	75.38	57.15	71.80	98.67
e^*	8.54	8.24	8.01	9.10	8.92	8.45
e_m^p	9.14	9.14	9.14	9.14	9.14	9.14
$\frac{e_m^p - e^*}{e_m^p}$ (%)	6.5	9.86	12.37	0.45	2.42	7.58

Table 2: Numerical examples

It is immediate to see that the order of magnitude of differences among the median voter's most preferred policy and the compromise policy in two-candidate equilibrium can be significant (up to 12.37% in example 1). Such differences increase monotonically with polarization, as long as e_L is positive.[32] If the low proposal, e_L, does not reach its minimum fast enough, as in example 2, then equilibria fail to exist with too polarized candidates. The reason is that there are citizens with income between y_L and y_H who enter to win the elections.

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[32]Because spending proposals cannot be negative (or may be subject to some legal lower bound), more polarization beyond the point were candidates cannot reduce their proposals of public expenditure will not produce any effects on the compromise policy.
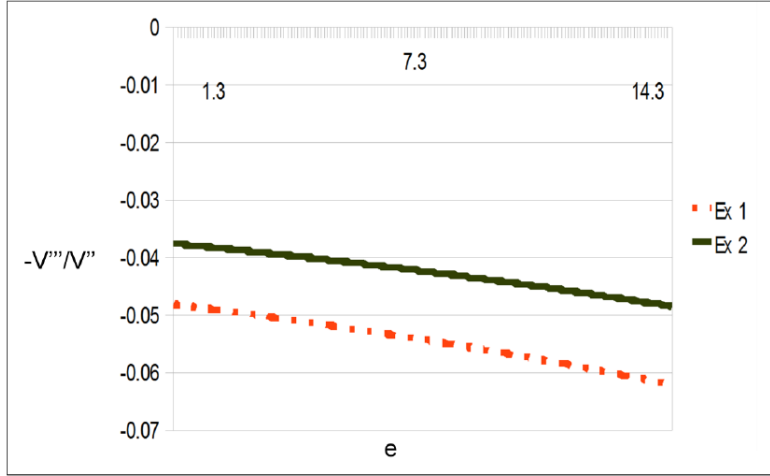
Figure 5: Comparison of the coefficient of scroogeness

Figure 5 depicts the degree of non-symmetry of policy preferences in the two examples. Let V_1 and V_2 be the policy-induced utility function for examples 1 and 2, respectively. Taking into account that the peak is the same in both specifications, and that $-\frac{V_2'''(e,y_m)}{V_2''(e,y_m)} > -\frac{V_1'''(e,y_m)}{V_1''(e,y_m)}$ in the whole domain, Figure 5 confirms that the median voter in example 1, who displays greater absolute risk aversion, has a larger (in absolute value) coefficient of non-symmetry and hence more scrooge policy preferences. In that case, the wedge between the median voter's peak and the compromise policy in two-candidate equilibria is larger. Moreover, the impact of polarization is more intense.

6   Concluding Remarks

The symmetry assumption of policy preferences is widely spread in the political economics literature. While this condition seems reasonable when the policy issue at stake is purely ideological, our analysis revealed that it requires placing very stringent restrictions on the primitives of an economic policy problem. In order to study the political implications of asymmetric policy preferences, we first introduced an induced preference relation over pairs of symmetric deviations from a voter's ideal policy, which we named off-the-peak preferences. We also named voters who prefer shortfalls in the

level of spending over symmetric excesses with respect to their peak *scrooge voters*, and those with the opposite policy tastes *wasteful voters*.

Our main finding regarding the shape of preferences off-the-peak is that the sign of the third derivative of the policy-induced utility function with respect to the policy variable indicates the direction of the bias of preferences towards overprovision (when V' is convex) or underprovision (when V' is concave). This feature of the policy-induced utility function is straightforward to check, and the result is applicable to a large body of policy problems, as long as preferences over policies are single-peaked. In particular, we showed that in models of two-party political competition where candidates' platforms do not converge, the non-symmetry of policy preferences has a relevant impact on the electoral result. To illustrate this point, we followed the citizen-candidate approach, where the median plays the following central role: while she is never offered her most preferred choice, equilibrium platforms exactly counteract each other to make her indifferent.[33] Exploiting that equilibrium requirement, we proved that the shape of the median voter's preferences off-the-peak affects the policy outcome: whenever these are scrooge (wasteful, or symmetric) the compromise policy implies lower (higher, or equal) public expenditure than her peak.[34] The concavity or convexity of the marginal policy-induced utility function thus also determines the direction of the wedge between the policy outcome in two-candidate equilibrium and the median voter's peak. Moreover, it allows the ranking of the continuum of two-candidate equilibria, as public expenditure exhibits a larger difference with respect to the median voter's ideal policy in equilibria with more polarized candidates.

Interestingly, the techniques used by Pratt to compare degrees of risk aversion, and by Kimball to compare degrees of prudence, can be used to

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[33] In a similar vein, and according to the membership-based equilibrium due to Caplin and Nalebuff (1997), if the platform of each party is the mean (or the median) of its members, no member of the party can improve by moving to the other party, and there exists a continuum of voters, then in equilibrium there must be an agent (not necessarily the median) that is indifferent between the two parties' platforms.

[34] Again, note that policy preferences off-the-peak are also crucial in models of electoral competition with two differentiated parties (e.g. Caplin and Nalebuff, 1997). To see why this may be the case, note that the median voter's off-the-peak preferences determine which party wins. More generally, scrooge (wasteful) preferences of the median voter provide candidates proposing low (high) spending with some electoral advantage. That advantage may or not be decisive depending on the specific location of the platforms in equilibrium.

compare degrees of non-symmetry of preferences. As we showed, Kimball's coefficient defines a partial order of preferences in terms of the intensity towards overprovision (wasteful) or towards underprovision (scrooge). This measure provides a tool that can be used, in future work, to analyze the impact of specific political reforms on policy preferences (where both, the effect over the peak, and off-the-peak are relevant to predict the electoral implications).

Turning attention towards the determinants of preferences off-the-peak, our analysis then highlighted several factors that may give rise to scrooge or wasteful preferences. Scrooge preferences emerge from DARA or CARA specifications of risk (or, equivalently, from a positive coefficient of prudence). Intuitively, DARA or CARA voters prefer to avoid too low a level of private consumption rather than too low a level of public expenditure. Likewise, scrooge preferences result from goverment's decreasing effectiveness, i.e. whenever expanding government spending implies incurring an increasing marginal cost of raising funds. On the contrary, suppose that voters do not exhibit risk aversion, that the government is constant-effective and that public expenditure is an input of the human capital production function. In that case, if the law of decreasing marginal returns applies with more intensity at lower levels of investment, voters will display wasteful off-the-peak policy preferences. Numerical examples illustrated the impact of a change in the coefficient of risk aversion and prudence on policy outcomes, and exposed that the magnitude of the effects here identified may actually be significant.

Our main results extend to policy problems with a multidimensional policy space, provided that preferences over policies are separable in each issue dimension. In that case, we can determine whether preferences over each political issue shape the proposed forms (symmetric, wasteful, or scrooge) by checking the sign of the third partial derivative.

Appendix

Proof of Proposition 1:

By SP, there always exist a pair of policies (e_L, e_H) such that $V(e_L, y_m) = V(e_H, y_m)$ where $e_L < e_H$. Define $G(y) = V(e_L, y) - V(e_H, y)$ and note that, given the definition of (e_L, e_H), that function satisfies $G(y_m) = 0$. By SSC, either $\frac{\partial V(e_L, y)}{\partial y} > \frac{\partial V(e_H, y)}{\partial y}$ or $\frac{\partial V(e_L, y)}{\partial y} < \frac{\partial V(e_H, y)}{\partial y}$. In the former case, $\frac{\partial G(y)}{\partial y} > 0$, and hence households with income below y_m strictly prefer e_H over e_L, whereas those with income above y_m strictly prefer e_L over e_H. In the latter case, we have $\frac{\partial G(y)}{\partial y} < 0$, and preferences of households over e_H with respect to e_L are reversed. Let us first show that the proposed policies (e_L, e_H) qualify as two-candidate equilibrium. If two households with preferred policies e_L and e_H respectively, become candidates, then there is a tie. In that case, the compromise policy is $e^* = \frac{e_L + e_H}{2}$. If $b > 2c$, then $V(e^*, y_H) - c + \frac{b}{2} > V(e_L, y_H)$ and $V(e^*, y_L) - c + \frac{b}{2} > V(e_H, y_L)$, so that both *High* and *Low* are better-off running the election; that is to say, no candidate has incentives to withdraw. Next, we show that no other household improves by entering the race: If a candidate with preferred policy e, where $e \leq e_L$ or $e \geq e_H$, entered the race, she would give the victory to the candidate whose platform is furthest from hers in the policy space. Likewise, a candidate with preferred policy $e \in (e_L, e_H)$ that entered the race, could not win provided the two other candidates are sufficiently close to each other. A candidate with no chance of winning an election may still want to enter the race, as that may modify the equilibrium policy to her benefit. A necessary condition to enter in this case is $V(e_L, y_i) - c > V(e^*, y_i)$ (when the preferred policy of this additional candidate is in the interval (e_L, e^*)), or $V(e_H, y_i) - c > V(e^*, y_i)$ (when the preferred policy of this additional candidate is in the interval (e^*, e_H)). In both cases, however, candidates with platforms e_L and e_H can be located sufficiently close to each other to guarantee that whatever the entry cost, the above conditions do not hold. Finally, suppose that there is an equilibrium where candidates do not tie. Then, the candidate that loses the election can improve by withdrawing from the contest, in contradiction with the assumption that this is an equilibrium.

Proof of Proposition 3:

We can write e_L and e_H as a function of d, so that $e_L = e_m^p - d$ and

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$e_H = e_m^p + \delta(d)$ where

$$V(e_m^p - d, y_m) = V(e_m^p + \delta(d), y_m).$$

By the implicit function theorem, $\delta'(d) = -\frac{V'(e_m^p - d, y_m)}{V'(e_m^p + \delta(d), y_m)}$. Also, in equilibrium, the utility loss from too low a level of provision $(e_m^p - d)$ must equal the utility loss from too high a level of provision $(e_m^p + \delta(d))$ so that,

$$\int_{e_m^p - d}^{e_m^p} V'(e, y_m) de = \int_{e_m^p}^{e_m^p + \delta(d)} V'(e, y_m) de. \tag{13}$$

By SP, V' is decreasing and $V'(e_m^p, y_m) = 0$. Scrooge preferences entail $\delta(d) < d$ and, by MS, V' is strictly concave in e. Thus, for condition (13) to hold, it must be the case that $V'(e^* - d, y_m) < -V'(e^* + \delta(d), y_m)$. According to $\delta'(d)$, scrooge preferences imply $\delta'(d) < 1$. Wasteful preferences entail $\delta(d) > d$ and, by MS, V' is strictly convex in e. Following the same reasoning, under wasteful preferences, $\delta'(d) > 1$. After straightforward manipulation, the outcome of two-candidate equilibria can be expressed as

$$e^*(d) = e_m^p + \frac{\delta(d) - d}{2}. \tag{14}$$

Taking derivatives

$$e^{*\prime}(d) = \frac{\delta'(d) - 1}{2}, \tag{15}$$

where $e^{*\prime}(d) < 0$ when preferences are scrooge, and $e^{*\prime}(d) > 0$ when preferences are wasteful.

References

[1] Arrow K. (1971), Essays in the Theory of Risk-Bearing. Chicago, IL: Markham Publishing Company.

[2] Benabou R. (2002), Tax and Education Policy in a Heterogeneous-Agent Economy: What Levels of Redistribution Maximize Growth and Efficiency?, *Econometrica* 70 (2): 481-517

[3] Besley, T., Coate, S. (1997), An Economic Model of Representative Democracy, *Quarterly Journal of Economics* 112: 85-114.

[4] Black D. (1948), On the Rationale of Group Decision-Making. *Journal of Political Economy* 56: 23-34.

[5] Calvert, R. (1985), Robustness of the Multidimensional Voting Model: Candidate Motivations, Uncertainty, and Convergence, *American Journal of Political Science* 29: 69-95

[6] Caplin, A., Nalebuff, B. (1997), Competition among Institutions, *Journal of Economic Theory*, Elsevier, 72 (2): 306-342.

[7] Chiappori P.A., Paiella M. (2008), Relative Risk Aversion is Constant. Evidence from Panel Data, mimeo, University of Naples.

[8] Downs A. (1957), *An Economic Theory of Democracy*. New York: Harper and Row.

[9] Duggan J., Fey M. (2006), Repeted Downsian Electoral Competition, *International Journal of Game Theory* 35: 39-69.

[10] Gans J.S., Smart, M. (1996), Majority Voting with Single-Crossing Preferences, *Journal of Public Economics* 59: 219-237

[11] Groseclose T. (2001), A Model of Candidate Location When One Candidate Has a Valence Advantage, *American Journal of Political Science* 45 (4): 862-886.

[12] Hansen, N.A., Kessler, A.S. (2001), The Political Geography of Tax H(e)avens and Tax Hells, *American Economic Review* 91: 1103-1115.

[13] Jones, M. (1999), Electoral Laws and the Efective Number of Candidates in Presidential Elections, *The Journal of Politics* 61: 171-184.

[14] Kimball M. S. (1990) Precautionary Saving in the Small and in the Large, *Econometrica*, 58 (1): 53-73.

[15] Krasa S., Polborn, M. (2009), A Political-Economy Model of Taxation and Government Expenditures with Differentiated Candidates. Univesity of Illinois.

[16] Milgrom, P., (1994), Comparing Optima: Do Simplifying Assumptions Affect Conclusions?, J*ournal of Political Economy* 102, 607-615.

[17] Osborne, M. J., Slivinski, A. (1996), A Model of Political Competition with Citizen-Candidates, *Quarterly Journal of Economics* 111: 65-96

[18] Palfrey T.R. (1984) Spatial Equilibrium with Entry, *Review of Economic Studies* 51: 139-156.

[19] Pratt, J. W. (1964) Risk Aversion in the Small and in the Large, *Econometrica* 32: 122-136.

[20] Pratt, J. W., Zeckhauser R.J. (1987) Proper Risk Aversion, *Econometrica*, 55: 143-154.

[21] Rabinowitz G., Macdonald S.E. (1989) A Directional Theory of Issue Voting, *The American Political Science Review* 83 (1): 93-121.

[22] Roemer J.E. (2001) *Political Competition, Theory and Applications.* Harvard University Press

[23] Wittman D. (1983) Candidate Motivation: A Synthesis of Alternative Theories, *The American Political Science Review* 77 (1): 142-157.

[24] Wright, S., Riker, W. (1989), Plurality and Runoff Elections and Numbers of Candidates, *Public Choice* 60: 155-176.