Risky Political Changes: rational choice vs prospect theory

Francesco Passarelli†

January 2012

Abstract

This paper studies how preferences for political changes are distorted by the cognitive anomalies postulated by Prospect Theory. Loss aversion induces a status quo bias. However, due to the reflection effect, the bias is asymmetric: too moderate attitudes toward a good reform or a good candidate, and too low severity toward bad politics. The reflection effect also determines low loyalty in partisan voting and weak concerns about partisan issues. Preferences about nonpartisan issues are independent of wealth because people use the status quo as a reference point. Ambitious platforms have more chances to pass than incremental and detailed changes because people are risk seeking in the realm of losses.

In general, according to Prospect Theory the political conflict within the society is smoother than under full rationality. Moreover, a pure majority system yields either prolonged conservatism or a radical abandonment of the status quo.

Keywords: prospect theory, behavioral political economy, voting behavior, behavioral economics.

JEL: C9, D72, D81, H1.

---

∗This study has greatly benefited from discussions with Aldo Montesano and Guido Tabellini. I also thank Philippe Aghion, Alberto Alesina, Roland Benabou, Stefano Della Vigna, Luca Corazzini, Francesco De Sinopoli, Vincenzo Galasso, Alessandro Lizzeri and Eugenio Peluso for helpful comments and suggestions.
†University of Teramo and Bocconi University
Email: francesco.passarelli@unibocconi.it
1 Introduction

Frequently voting takes the form of a choice between the continuation of the status quo and a political change whose consequences are uncertain. This happens with reforms that may either improve or worsen the status quo, or when a challenger who promises relevant changes is opposed to an incumbent that is perceived to persist in current politics. In these cases individuals may be subject to cognitive limits, so that actual voting behavior is far from what the rational choice theory would predict. In this paper, we compare an agent who behaves according to the Prospect Theory (PT)\(^1\) with a rational agent who behaves according to the Expected Utility Theory (EU)\(^2\).

Having a closed attitude toward political changes and a certain amount of bias toward the status quo are perfectly rational if an individual just dislikes risk. By contrast, an agent who behaves according to PT is subject to several anomalies (reflection effect, loss aversion, probability weighting, certainty effect). Her attitudes toward changes are possibly more multifaceted. Our aim in this paper is tracing with some precision the role that each PT cognitive anomaly plays in determining individual preferences for a risky political change.

Since the seminal paper by Quattrone and Tversky (1988), PT has extensively entered experimental and empirical literature.\(^3\) Anomalies can be very important in political phenomena (McDermott, 2001; Jervis, 2004; Mercer, 2005). However, apart from a few noticeable exceptions (Bendor, Diermeier, Siegel and Ting, 2011), the use of PT in theoretical political models is quite limited. This is unfortunate since PT yields insights that are alien to models of rational choice, and often coincide with some of their empirical difficulties.

For example, a PT agent tends to be highly reluctant toward small changes, whereas she is, somehow paradoxically, rather inclined toward big changes. The reason is that she is very sensitive to the risk of small losses (loss aversion), and rather insensitive to potential big losses that may derive from large departures from the status quo (reflection effect; i.e. risk seeking in losses). This possibly explains why in some cases politicians take big risks, as in the case of the ambitious healthcare plan proposed by Barack Obama.

High re-election rates may denote a status quo bias.\(^4\) Under PT the bias depends on how good or bad the current situation is. Erikson (1990) and MacKuen, Erikson and Stimson (1992) show that an incumbent’s chance to be re-elected is positively affected by current economic conditions. Bloom and Price (1975) find that recessions and prosperity have an asymmetric impact on the electoral fortune of the US incumbent President; they look at

---

\(^1\)Kahnemann and Tversky (1979).
\(^2\)Von Neumann and Morgenstern (1944).
\(^3\)Hereafter we use a "He" for the EU agent and a "She" for the PT one.

\(^1\)The average re-election rate in US House over last 45 years is 95% (never lower than 85%) and in the Senate over the last 30 years is 87%, and never lower than 75% (Friedman and Holden, 2009).
this as an evidence of the reflection effect. We argue here that PT agents are relatively too indulgent toward a bad incumbent, and too demanding toward a good one. Similarly, when the current economic situation deteriorates consensus in favor of a reform increases, but the support may be irrationally too low. In fact, the relationship between crises and the adoption of economic reforms is quite controversial.\footnote{Alesina, Ardagna and Trebbi (2006) provide evidence that the deterioration of the current economic situation promote fiscal reforms and the stabilization of budget deficits. However, Bean (1988) claims that a crisis may hinder a reform in the labor market since an increase in flexibility imposes adjustment costs on workers who are already suffering from adverse conditions. For an excellent survey on crisis and reforms see Galasso (2010).}

Another puzzle in the political economy literature on reforms is why people change their mind about a reform despite its initial impact has been favorable (Rodrik, 1996). Jain and Mukand (2004) argue that this occurs if, as a consequence of the reform, future redistribution of gains becomes less likely. We offer here an alternative argument based on PT: once a favorable reform has improved the status quo, PT individuals adjust their reference point, then they become more inclined toward a reversal because they are risk seeking in losses.

PT and EU are also different in the role played by the status quo when partisan and nonpartisan issues are considered. As for nonpartisan issues, such as foreign policy, immigration, homeland security, there is large evidence of low correlation between how people vote on these issues and their income. A usual argument is that non partisan issues distract voters from their natural economic interests.\footnote{Senator Jim Webb wrote on the Wall Street Journal that “Working Americans have been repeatedly seduced at the polls by emotional issues such as the predictable mantra of ‘God, guns, gays, abortion and the flag’ while their way of life shifted ineluctably beneath their feet.” (Wednesday, November 15, 2006). In a controversial speech in April 2008, Barack Obama refers to clinging to guns or religion as a way low-income and small-town people shows their frustration about economic situation.} Another view, associated with Ronald Inglehart (1971), is that in post-materialist rich societies individuals’ concerns shift from “bread-and-butter issues” to values and cultural concerns. We provide here an alternative view. PT individuals only care about deviations from the status quo. Since deviations due to nonpartisan policies are the same for rich and poor, policy preferences for these issues are rather independent of people’s wealth.\footnote{We also show that wealth is irrelevant for rational voters if their utilities display constant absolute risk aversion. This result is of independent interest, since it establishes an important link between PT and EU that is not contingent to the present application to political choices.}

Consider now a partisan issue, such as a redistributive tax. A favorable partisan policy is viewed as a prospect in which gains are large and likely, whereas losses are low and unlikely. However, due to loss aversion, a PT voter under-evaluates gains and over-evaluates losses. A PT agent will look at this prospect less enthusiastically compared to an EU agent. This eventually explains why loyalty rates are unexpectedly low even among partisan voters.\footnote{Abramowitz (2004) reports that in the three US presidential elections between 1972 and 1980, an average of almost 30\% of democratic identifiers voted for the republican presidential candidate. Between 1972 and 2004, democratic defection rate was almost 20\%. Kernell (1977) and Lau (1985) find evidence that negative}
Observe that this is a different argument from what Fernandez and Rodrik (1991) point out. Their idea is that when an individual cannot identify himself as winner or loser beforehand, even a reform that benefits a majority gets voted down because pivotal individuals attach low probability to the event of being one of the winners. Jain and Mukand (2003) show that this might also happen when the government is able to tax winners to compensate losers. Our claim here is different. Partisan policies that are targeted to the majority might not receive adequate support because of loss aversion: in a partisan policy the large and likely gains loom smaller whereas the small unlikely losses loom larger.

Another substantial difference between EU and PT is in the way probabilities are perceived. If a favorable outcome is very likely, a PT agent over-fears the unlikely loss (probability weighting). Thus her attitude toward the change is less open with respect to a rational agent. This explains why good reforms that have clear positive prospects are frequently rejected, as it happens for market liberalization or foreign trade. On the contrary, an extremely low chance of loss (even a large loss) is disregarded by a PT agent (certainty effect). This may eventually explain why in 2003 a large majority in the US Congress authorized the Iraqi war. The losses attached to a long war were dramatically large. However, the negative outcome was perceived as extremely unlikely, so that the worst scenario was possibly discarded in the voting calculus of many senators and representatives.\(^9\)

In the second part of the paper the policy change is no longer exogenous. It emerges as a possible equilibrium of a pure majority voting game. We present a stylized extension of the seminal Meltzer and Richard’s (1981) model, in which individuals vote on income taxation with public good provision. Heterogeneity amongst individuals is due to income differences, and there is uncertainty about income distribution. Specifically, individuals do not know if their income is higher or lower than the average. Since tax proceeds would be lower in the former case than in the latter case, voters substantially ignore if they will get a low or a large amount of public good for what they pay. This kind of uncertainty yields interesting insights.

Under EU, the equilibrium tax rate, i.e. the government size, is smaller than under full information because decreasing marginal utility of the public good causes risk aversion. This implies that, differently from Meltzer and Richard (1981), a median whose income is equal to the true average income will choose a too low tax level instead of the efficient one. This suggests an explanation of why relatively poor majorities do not usually engage in large-scale expropriation and redistribution. A common argument for this evidence is the Prospect for Upward Mobility (POUM) hypothesis. Benabou and Ok (2002) formalize attitudes towards candidates have a greater impact on voting and turnout than do positive attitudes. Gelman, Kenworthy and Yu-Sung Su (2010) show that income inequality, despite it has been raising during the past decades, has not influenced partisan voting of US rich and poor people.

\(^9\)Several online gambling sites were offering odds on the Iraqi war. From that it is possible to infer that the probability associated to a long and costly war was perceived to be very low at that time (Sam Lubelly, “You Can Bet on It: Playing the Odds on War”, The New York Times, Week in Review, March 2, 2003).
the POUM but they need a relatively strong assumption: tomorrow’s expected income is an increasing and *concave* function of today’s income. The alternative argument that we propose here is possibly more natural, since it only relies on uncertainty on others’ income and concave preferences for the public good and on the assumption that individuals are unable to compute the average income from observing the amount of public goods they have access to.\footnote{Concave utility from the public good is a common assumption in political economy models since it yields single peaked policy preferences. The assumption on average income computation will be discussed further on.}

If we plug PT preferences into this model a peculiar role for the status quo emerges. We have two types of voters. First, those who are “almost satisfied” with the status quo. Despite the status quo is not rationally their ideal policy, they continue to prefer it because they strongly avert the loss they might incur if they abandon it. The second type are the “dissatisfied” voters. Their policy preferences have two maxima. One is the status quo, meaning that they would vote against *small* departures from it, because of loss aversion. The second maximum is rather far away (either above or below the status quo), and it represents their first best. This means that they would vote in favor of a *non incremental* change only. With this kind of preferences the equilibrium is still determined by the median income voter. The median sticks to the status quo if she is almost satisfied with it. She prefers a radical change as soon as her level of dissatisfaction is sufficiently high.

This possibly explains why policies survive for long time in democracies, even when the majority is not fully satisfied with them. Policy reforms are difficult to implement and, once implemented, they are resistant to changes (a sort of *political endowment effect*). Moreover, the political conflict between majority and minority is smoother than in rational choice models. Rich people do not want too small governments because they strongly avert the risk of being relatively poor, and poor people do not very big government size for the opposite reason.

The reader may find some connection between this model and the debate on gradualism of reforms.\footnote{See Roland (2002) for an excellent survey.} The debate is mainly normative. Advocates of the “big bang” argue that major reforms result from a “window of opportunity” created by the establishment of democracy (Lipton and Sachs, 1990; Balcerowicz, 1995; Boycko Shleifer and Vishny, 1995). According to this view, we should observe radical reforms in young democracies and small changes in mature ones. On the opposite side, the gradualist approach suggests an appropriate sequencing of reforms in which the constituency for further reforms results from the success of the previous ones (Dewatripont and Roland, 1995; Wei, 1997). In our model the constituency for reforms emerges endogenously as soon as the majority’s dissatisfaction about the status quo becomes sufficiently large. Thus, one should observe extended periods of conservatism followed by radical, rather than gradual, reforms which occur when the situation has sufficiently deteriorated (as in Alesina, Ardagna and Trebbi, 2006) or when the electorate preferences
have changed substantially.

The paper is organized as follows. Section 1.1 overviews PT anomalies. Section 2 presents individual policy preferences as choice between lotteries. Sections 3, 4 and 5 study how the policy choice is affected by reflection effect, probability weighting and status quo, respectively. Section 6 presents a simple open agenda voting model in which the equilibrium policy change emerges endogenously from a continuum of alternatives. Section 7 concludes. All proofs are in the Appendix.

1.1 The PT anomalies

In this Section we review the main cognitive anomalies of PT. The reader who feels familiar with this theory might consider to bypass this Section.

PT is an experimentally based theory, proposed to overcome the violations of EU without losing its explanatory power. The term “prospect” refers to a lottery or a gamble. The agent’s decision-making process is distinguished in two phases: an editing phase and an evaluation phase.

In the editing phase people organize, reformulate and possibly simplify the options. They “...normally perceive outcomes as gains and losses, rather than as final states of wealth or welfare” (Kahnemann and Tversky (1979), p. 274). Gains and losses are relative to a reference point, that is the current asset position, or the “status quo”. After fixing the reference point, other editing operations are usually taken, such as combination of probabilities associated to identical outcomes, segregation of riskless components, cancellation of components that are shared by all prospects, simplification with, for example, discarding of extremely unlikely outcomes and treatment of extremely likely event as certain (certainty effect). Many anomalies in preferences result from the editing phase; in particular, simplification may cause intransitivities of choice. Out of the editing operations, in this paper we consider the consequences of the certainty effect.

In the evaluation phase, the decision maker chooses the prospect with the highest value; the overall value is expressed in terms of two scales, $\pi$ and $v$. The first scale refers to a process of probability weighting that in general describes how individuals subjectively perceive probability, $p$. For low $p$, function $\pi(p)$ is in general subadditive and larger than $p$. We refer to this effect, as overweighting. Thus, rather unlikely events are perceived as less likely than as $p$ would dictate. This effect, together with the evidence that the sum of weights associated to complementary events is perceived to be less than one (subcertainty), yields the idea that probabilities that are not low are actually underweighted. Figure 1.a (from Kahnemann and Tversky (1979), p. 283) presents an hypothetical weighting function that is compatible with the above properties. The sharp drops of $\pi(p)$ at the endpoints is consistent with the cognitive deficiency of agents in the editing phase, that we have called certainty effect. Another important characteristic of $\pi(p)$ is subproportionality, which implies that if probabilities of events raise by the same rate, then the ratio of the corresponding decision
In this paper, we derive the idea that the anomaly due to probability weighting is not relevant when gains and losses have similar and moderate probabilities (see assumption A1 below).

The second scale is the value function, \( v \). It reflects the essential feature of PT that “carriers of value” are changes in wealth or welfare, rather than final assets. Thus, \( v \) is zero in the status quo position, that serves as reference point. Moreover, \( v \) is normally concave for positive changes of wealth, and convex for negative changes. This means that individuals are assumed to be risk averse in the realm of gains and risk seeking in the realm of losses (reflection effect). Another salient characteristic is that losses usually loom larger than gains. This causes the so-called loss aversion, which corresponds to a \( v \) function that, when gains and losses are symmetric, is steeper for losses than for gains. A tentative \( v \) that is consistent with these characteristic is the \( S \)-shape function (from Kahnemann and Tversky (1979), p. 279) reported in Figure 1.b.

2 PT vs EU

A risky political change is a prospect that presents a certain risk of worsening the current situation, but also a certain chance of improving it. There may be several circumstances in which a political change is seen as a risky choice, whereas the status quo is a “safe” alternative. For example, the consequences of a reform proposed in a legislature or in a direct

---

\(^{12}\)Observe that subproportionality represents the consequence of the violation of the EU substitution axiom; it ultimately accounts for the well known Allais’ and the St Peterbourg paradoxes.
ballot may not be easy to evaluate because of complexity, ambiguity or lack of analytical background, so that a voter might not know with certainty if he will gain or lose (Fiorina, 1981). The same kind of uncertainty may regard the platform of a challenger that is opposed to an incumbent in an electoral competition. The incumbent is perceived as the continuation of the status quo, whereas the challenger is attached a chance of success but also a risk of failure, possibly because his ability is unknown, his messages are ambiguous, his promises are not easy to evaluate (Shepsle, 1972; Kremer, 1977; Dacey, 1979).

Call $W$ the monetary equivalent of the policy outcome in case the change is successful (the “win” case). Let $S$ be the “status quo”, i.e. the monetary equivalent of not making any change. Let $L$ be the monetary equivalent of a failure (the “losing” situation). Of course we are interested in the cases where $W > S > L$. This idea that policy alternatives may be represented as lotteries is present in many papers.\(^{13}\) Rationality, however, is a common assumption in these works, as well as in the vast majority of the theoretical literature on the political economy of reforms.

Consider a representative EU agent, and let $u(\cdot)$ be his utility function. Let $u$ be increasing, continuous and twice differentiable overall. Call $p_W$ and $p_L$ the winning and losing probabilities, respectively; $1 - p_W - p_L$ is the probability that the political change does not actually change anything. An EU agent prefers the risky political change if his expected utility is larger than the utility from the status quo:

$$p_W \cdot u(W) + p_L \cdot u(L) + (1 - p_W - p_L) \cdot u(S) \geq u(S)$$

or,

$$\frac{u(W) - u(S)}{u(S) - u(L)} \geq \frac{p_L}{p_W} \quad (1)$$

We say that the EU individual has an open attitude toward a political change if inequality (1) is easy to be satisfied. This may happen when: winning is relatively likely; the winning outcome is large, compared to the status quo; the loss is small; the utility function is quite convex, or not strongly concave. In the opposite cases we will talk about closed attitudes. Notice that the factors at play are probabilities, outcomes and risk attitudes.

Consider a PT voter.\(^{14}\) Recall that PT assumes that an agent assigns a value, $v$, to gains and losses rather than to final outcomes. Thus the argument of the value function is $(W - S)$ in case she wins, and $(L - S)$ in case she loses. It is zero in the case of status quo remaining. Recall also that probabilities are replaced by decision weights, $\pi(p)$. Thus, under PT an individual prefers a risky political change if its value is higher than the value of the status quo, which is zero:

$$\pi(p_W) \cdot v(W - S) + \pi(p_L) \cdot v(L - S) \geq 0 \quad (2)$$


\(^{14}\)When it will be useful to simplify the presentation, we will use a “he” to identify the rational EU individual, and a “she” to identify the PT one.
then,

\[
\frac{v(W - S)}{|v(L - S)|} \geq \frac{\pi(p_L)}{\pi(p_W)}
\]  

(3)

We can contrast EU and PT by comparing (1) and (3). For example, we will say that an EU agent has a more open attitude toward the change if (1) is easier to be satisfied than (3). This means that there might be cases in which the EU agent votes for the change and the PT agent does not, but the contrary cannot happen.

3 The role of the Reflection effect

In order to pin down the reflection effect we must sterilize probability weighting. Thus we make the following assumption:

A1: \( \frac{\pi(p_L)}{\pi(p_W)} \approx \frac{p_L}{p_W} \),

This ensures that the evaluation of the relative likelihood of improving and worsening is not substantially different between EU and PT. In this case, the relevant anomaly consists in different evaluations of gains and losses. Requiring A1 amounts to assuming that both probabilities are not close either to zero or to one, and not disproportionately different from one another (e.g., a reform that is better than the status quo with probability \( p_W = 0.6 \), and worse with probability \( p_L = 0.4 \)).

It may help to recall that, due to the reflection effect, the PT voter is always risk averse in gains and risk seeking in losses. The EU voter, instead, may either be risk averse or risk seeking, overall. Below, we compare PT with EU risk aversion and risk seeking separately.

3.1 PT vs EU with risk aversion

A EU risk averter fears the failure of a political change a lot. This causes him a relatively strong propensity toward the status quo. A status quo bias, however, is also what we expect from a PT individual. Whom is more biased? In order to answer, we need to assume that both agents are “equally” risk averse toward favorable outcomes:

A2: \( u(W) - u(S) = v(W - S) \), for a given \( S \) and any \( W > S \).

By A2, both agents evaluate gains in the same way. Therefore any possible differences between them is only due to the way they look at unfavorable outcomes. The EU guy is highly sensitive to losses because he is risk averse. The PT agent is subject to two anomalies, loss aversion and the reflection effect, which operate in two different directions. Loss aversion implies high sensitivity to small losses. The reflection effect, i.e. risk seeking in losses, yields low sensitivity to big losses. As a consequence, the PT individual is less open than the EU individual toward a political change when the unfavorable is relatively small (\( L > L^* \) in Figure 2.a). Vice versa, when losses and gains are relatively large (\( L < L^* \)), she is more open than the EU risk averter.
Proposition 1 Under A1 and A2,

i. if the loss is sufficiently high, then it may be that PT voter prefers the political change and the EU risk averter prefers the status quo, but it cannot be the contrary.

ii. if the loss is sufficiently low, then it may be that PT voter prefers the status quo and the EU risk averter prefers the political change, but it cannot be the contrary.

Notice that both agents are rather reluctant toward political changes; thus both of them are subject to a status quo bias. However, one can say that for small political changes the bias is stronger under PT than under EU. Vice versa, when deviations from the status quo are large, the bias is weaker under PT.

Proposition 1 implies that when voters behave according to PT, a challenger has more chances to win if his platform contains big changes. A politician who takes big risks may benefit from the voters’ risk seeking attitude toward the unfavorable outcome. On the contrary, a detailed platform of small proposals would give an advantage to the incumbent, because in this case PT loss aversion generates a strong bias in favor of the status quo. The same rationale applies to a reform proposed in a committee: a radical reform is less subject to a status quo bias than an incremental one.

3.2 PT vs EU with risk seeking

Assume now that the EU individual loves risk. In order to make the comparison with PT, let us keep assumption A1 above, and let us replace A2 with the following assumption:

\[ A3: u(L) - u(S) = v(W - S), \text{ for a given } S \text{ and any } L < S. \]
Assumption A3 means that the EU and the PT individuals have the same risk seeking attitude toward the unfavorable outcome (as shown in Figure 2.b).\(^{15}\)

**Proposition 2** Under A1 and A3, an EU risk seeker has always a more open attitude toward political changes with respect to a PT agent.

The idea is simple: both individuals evaluate losses in the same way, but gains receive a higher evaluation by the EU agent. This is sufficient to ensure that a risky political change is more likely to be favored under EU than under PT. In other words, a PT agent has a bias toward the status quo, whereas a EU risk seeker has a bias against it. Thus it cannot be that the former votes for a change and the latter votes against it, whereas the opposite is likely to happen.

4 The role of probability weighting

According to PT, the sense of likelihood of an outcome is given by a weight function \(\pi(p)\) that has three important features (see Figure 1.a). First, it sharply drops at the endpoints (certainty effect); second, it is lower than \(p\) for high and medium probabilities (underweighting), and it is higher than \(p\) for small probabilities (overweighting); third, the ratio of weights decreases for equally proportional increases in corresponding probabilities (subproportionality).

We can focus on the role played by probability weighting if we assume that the relative evaluation of winning and losing is the same under PT as under EU.

\[
A4: \frac{u(W) - u(S)}{u(S) - u(L)} \simeq \frac{v(W - S)}{v(S - L)}, \text{ for given } W, S \text{ and } L.
\]

Thanks to A4 any differences between EU and PT are due specifically to probability weighting. In other words, loss aversion, reference point and reflection effect play a minor role.

4.1 Certainty effect

The certainty effect occurs when an event is either extremely likely or highly implausible. In the former case PT individuals treat it as certain, in the latter case they consider it as impossible. For example, if a reform is extremely likely to yield a positive outcome, the PT individual looks at it as a no-risk prospect which can only improve the status quo. Independently of losses, he will support that reform. A rational voter behaves differently: despite a high likelihood of winning, he would not accept the change if in the unlikely event of a failure the losses would be huge. On the contrary, if winning is very unlikely, then a PT voter always prefers the status quo, whereas, for sufficiently large gains or low losses, a rational EU voter would prefer the change.

\(^{15}\)Observe that since by loss aversion \(v\) is kinked in \(S\), it follows that \(u\) is higher than \(v\), for any \(W\).
Proposition 3  A: If the favorable outcome is extremely likely, then:
- a PT individual always prefers the political change;
- an EU individual prefers the status quo if losses are very high compared to gains.
B: If the unfavorable outcome is extremely likely, then:
- a PT individual always prefers the status quo;
- an EU individual prefers the political change if losses are very low compared to gains.

Interestingly, Proposition 3 does not make use of assumption A4. This means that the behavior of the PT individual is invariant to anomalies regarding outcome evaluations. In other words, the certainty effect fully explains differences between PT and EU; thus, it prevails on the reflection effect, the reference point effect and loss aversion.

This Proposition suggests that there is a strong temptation to pass bills on, say, natural resource exploitation, nuclear plants, rearmament policies, or even bills on small minorities expropriation because the majority may disregard the unlikely huge costs associated with an environmental disaster, a war, or a revolt.

4.2 Underweighting and overweighting

Let us now consider non-extreme probabilities. In this case agents tend to underestimate the difference between failure and success probabilities. For example, if $p_w$ is high and $p_l$ is low a PT individual has the tendency to underweight $p_w$ and to overweight $p_l$. As a result, the risky political change appears less attractive. Vice versa, if losing is substantially more likely than winning, the PT individual is less opposed to the change.

Proposition 4 Under A4, if the success chance is substantially higher than the failure risk, a PT individual is less open than a EU individual toward the political change. Vice versa holds.

Under PT there is a status quo bias specifically due to probability weighting, but it works asymmetrically: when winning is more probable than losing the bias is in favor of the status quo; when losing is the most likely outcome the bias is toward a change. This means that a PT agent is over-cautious when challengers or reforms have good chances of success, and she is too hazardous when a loss is the most likely outcome.

5 The role of the reference point

In general we expect that people with different status quo wealth react to a political change differently. Under EU this happens because risk attitudes may change along the utility function. Under PT this mechanism disappears because the status quo represents the reference point. However, for different individuals the same policy may give rise to different deviations
from their status quo. This is what usually happens for partisan policies, which yield larger gains for some people and lower gains for others. In this Section we study the role of the status quo by considering nonpartisan and partisan policies separately. All over the Section we assume that probability weighting does not play a major role; thus A1 is satisfied.

5.1 Nonpartisan policies

A nonpartisan policy, such as foreign policy or homeland security, yields the same gains and the same losses to different people, independently of their wealth. Consider two individuals, \( r \) is rich and \( s \) is poor. Their status quo incomes are, say, \( S_r = 1000 \) and \( S_p = 100 \), respectively. They are proposed a nonpartisan policy that might increase their status quo incomes, say, by 50 or decrease it by 30. Thus, the rich one has the chance to get \( W_r = 1050 \), but he faces the risk to end up with \( L_r = 970 \). The poor one might get either \( W_p = 150 \), or \( L_p = 70 \).

The chance of winning and losing are the same for the two individuals. Does the rich one evaluate the political change differently from the poor one? Are their “relative” evaluations different under EU rather than under PT?

Let us consider PT first. Recall that PT postulates that the status quo is taken as a reference point and the value function is the same for all people. This is sufficient to say that the nonpartisan risky policy is equally desirable to all people, independently of their status quo incomes.

\[ \text{Proposition 5 } \text{PT individuals have the same attitudes toward nonpartisan political changes.} \]

Therefore voting behavior on nonpartisan issues is independent of income. Is this what we expect also from rational people? In fact, under EU things change. Since the evaluation concerns differences in utilities, risk attitudes matter. Suppose that \( r \) and \( p \) are both risk averse. The rich one is less attracted by the perspective gain, but also less discouraged by the possible loss. Thus, without further information we cannot say if \( r \) is more or less attracted by the change with respect to \( p \).\[ ^{16} \] What matters is not only risk aversion but how risk aversion changes as a function of the status quo point. Intuitively, \( r \) is more attracted if his “degree” of risk aversion is lower than the \( p \)’s degree of risk aversion. Interestingly, Proposition 6 shows that the “degree” that we are taking about is exactly the measure of absolute risk aversion proposed by Pratt (1964) and Arrow (1965).

\[ ^{16} \text{More precisely, since utility is concave, } u(W_r) - u(S_r) < u(W_p) - u(S_p), \text{ but also } u(S_r) - u(L_r) < u(S_p) - u(L_p). \text{ Under A1, individual } r \text{ would be more attracted by the change if } \frac{u(W_r) - u(S_r)}{u(S_r) - u(L_r)} > \frac{u(W_p) - u(S_p)}{u(S_p) - u(L_p)}. \]

However we do not have sufficient information to say if this inequality is satisfied or not.
**Proposition 6** Under EU, if the Arrow-Pratt degree of absolute risk aversion is decreasing, then wealthier individuals have more open attitudes toward a nonpartisan political change. Vice versa holds.

From Proposition 6 we can say that a rich individual is rationally less conservative toward nonpartisan issues than a poor one if absolute degree of risk aversion decreases, and vice versa. If the Arrow-Pratt coefficient is constant, attitudes toward nonpartisan policies are independent of individuals’ wealth. In this case, there is no difference between EU and PT.

**Corollary 1** Rational individuals have the same attitudes toward nonpartisan political changes if and only if their Arrow-Pratt degree of absolute risk-aversion is constant.

There are two common alternative arguments to the evidence of low correlation between income and voting behavior, in particular when voting concerns “social issues”. The first one is the idea that lower-income voters should be more sensitive to their natural economic interests, however social issues distract them. The second one, is that in post-materialist rich societies values and cultural concerns jeopardize “bread-and-butter” issues (Inglehart, 1971). Our analysis shows that this second view, however, requires that the way people react to those issues is independent of their wealth. This always happens if people behave according to PT (Proposition 5 above). This may happen under EU, but only provided their absolute risk aversion is constant (Corollary 1).

5.1.1 A more general result

Observe that the result of Corollary 1 is of independent interest, since it may be applied to a general problem of rational choice under uncertainty. A standard interpretation of constant absolute risk aversion (CARA) in finance theory is “…that the amount of wealth one is willing to expose to risk remains unchanged as wealth increases or decreases.”

In this case an agent’s evaluation of random gains or losses is independent of his wealth. Corollary 1 suggests that this occurs if the ratio between the utility increase in case of gain and the utility decrease in case of loss is independent of their wealth. Observe that taking into account utility increases and decreases is exactly the mental process assumed by PT. Lemma 1 presents this idea, setting up an interesting correspondence between PT and EU.

**Lemma 1** If $u$ is CARA, then the lottery $L(s_0) = ((w + s_0), p_W; (s_0 - l), p_L)$, with $w, l > 0$, is preferred (not-preferred) to $s_0$, if and only if the lottery $L(s_1) = ((w + s_1), p_W; (s_1 - l), p_L)$, is preferred (not-preferred) to $s_1$; for any $s_1 \neq s_0$.

This means that if $u$ is CARA, only the relative size of monetary gains and losses matters. Thus, the PT use of the status quo as a reference point does not necessarily represent an anomaly since the same mental process is followed by a EU agent when his absolute risk aversion is constant.

5.2 Partisan policies

Consider now a partisan policy with a given amount of uncertainty attached to the final outcome. Suppose a fiscal reform with redistributive effects in favor of poor people. Uncertainty arises because both the rich individual, $r$, and the poor one, $p$, are not sure if they will be net payers or net recipients, possibly because they ignore the exact income distribution over the population, or because they are unable to make complex computations.\(^\text{18}\) Realistically, we can assume that $r$ assigns a low probability to the event of receiving a net transfer, that in any case will be small. Vice versa, $p$ is quite likely to end up with a positive net transfer, whose amount is large. Of course the two individuals’ preferences are rather different: $p$ is more inclined toward the reform, whereas $r$ looks at it with reluctance. However, this is not our concern here, but rather we want to see if any of the two individuals’ attitude toward the reform changes if they behave according to PT instead of EU.

Observe that in this case more than one anomaly comes into play. First, $r$ overweights the (low) chance of being a net receiver and she underweights the (high) probability of being a net payer, whereas $p$ does the contrary. Second, due to the reflection effect, $r$ is less sensitive to the large loss and more sensitive to the small gain. Third, loss aversion causes $p$ to be very sensitive to the small loss. All these anomalies operate in the same direction: $r$ is more open toward the reform under PT than under EU, and $p$ is less open. Somehow, under PT $p$’s and $r$’s preferences are “less different”.

**Proposition 7** The degree of policy conflict on partisan issues is lower under PT than under EU.

Under PT, preferences about partisan issues are less polarized. In addition to the arguments in Section 5, Proposition 7 provides a further rationale to the common view that low-income voters are not sufficiently concerned about economic policies that turn to their own advantage. This idea that PT yields low political conflict within the society also emerges as a result in the voting model of Section 6.

5.3 Satisfaction about the status quo

We want to see now if people’s inclination toward a challenger is affected by their level of satisfaction about the incumbent; or if their attitude toward a reform depends on their

\(^{18}\)In the voting model of Section 6 we will get back to this idea that uncertainty arises because people ignore the exact income distribution over the population.
feeling about the current situation. When the incumbent is good, the challenger becomes a prospect with low gains and large losses. In this case, both PT and EU individuals are reluctant toward a change. However, due to risk seeking in losses, the PT individual is less sensitive to large losses. Thus we expect that the PT individual is less averse toward the challenger. Vice versa, when the incumbent is bad, choosing the challenger would yield small losses or large gains. In this case loss aversion prevails. Thus the PT agent is more reluctant toward the challenger. In synthesis, when the status quo is good, a change is less unlikely under PT; and if it is bad, a change is more likely.

Proposition 8 Under A1,
i. if the status quo is good a PT agent is less reluctant toward a political change than a risk averse EU agent;
ii. if the status quo is bad a PT agent is less open toward a political change than a EU agent.

In other words, PT individuals are too conservative when the current situation is bad, and too progressive if the situation is good. Somehow, the status quo bias plays asymmetrically: when $S$ gets better, the bias gets stronger and when $S$ worsens the bias is weaker.\(^{19}\) This may be read as a weakening of the relationship between the performance of the incumbent and his chance to be re-elected, and it is consistent with the evidence that re-election rates are very high in reality (Friedman and Holden, 2009).\(^{20}\)

Proposition 8 also provides an argument for the evidence of low loyalty rates in partisan vote. A PT partisan supporter of the incumbent has a high status quo and possible low gains and high losses from voting for the challenger. Despite this, she is less unlikely to vote for the challenger with respect to an EU supporter.\(^{21}\)

6 PT preferences and open agenda voting

So far we have analyzed how PT anomalies affect individuals’ preferences for an exogenous political change. In this Section we plug PT preferences into a simple open agenda voting model and let the policy emerge endogenously. The aim is exploring how the equilibrium policy changes as a result of PT cognitive distortions.

\(^{19}\)This result changes if we assume that the rational agent is risk seeking. In this case, differences between PT and EU would be due to different perceptions of risk in the realm of gains. We omit to consider this case, that is an easy variation of our analysis in this Section.

\(^{20}\)Achen and Bartels (2004) find that voters withdraw their support for politicians even though their discontent is based on events that are clearly beyond the control of public officials.

\(^{21}\)Bendor, Diermeier, Siegel and Ting (2011) adopt a behavioral notion of “aspiration” to justify citizens’ retrospective voting rules in a model that generates endogenous partisan affiliations and ideological polarization.
We present here a basic public finance model with full information. In the next two Sub-sections, first we introduce uncertainty, keeping full rationality; then, we study PT distortions. These two extensions yield non-trivial predictions.

Since PT is a general theory with non-parametric functions we opt for a non-parametric model here. The policy consists in the provision of a non-excludable public good financed by a proportional income tax. The policy is either proposed by the legislators within a committee under an open agenda procedure (as in Black, 1948), or by two candidates in elections (as in Downs, 1957). The society is made by potentially a continuum of individuals of different types, indexed by \( i \). Type heterogeneity refers to individual income. Agents enjoy utility from the consumption of a private good, \( c_i \), and the public good, \( g \), that we measure here in per capita terms. Let the utility function be quasi-linear in \( c_i \), and concave and increasing in \( g \):

\[
u(c_i, g) = c_i + H(g)
\]

\((H' > 0, H'' < 0)\).

Let \( y_i \) be \( i \)'s income and denote by \( \bar{y} \) the average income. Let \( m \) be the individual with the median income. Assume that the government’s deficit is zero and both the prices of \( c \) and \( g \) are one. The policy preferences of voter \( i \) are:

\[
U(y_i, g) = y_i + H(g) - y_i \bar{y} g
\]

Thus, \( i \)'s most preferred level of \( g \) is:

\[
g^i = H^{-1}_g(\frac{y_i}{\bar{y}})
\]

Policy preferences are single peaked and the bliss points negatively depend on individual incomes: richer individuals want a smaller government because the private cost of one unit of public good, \( \frac{y_i}{\bar{y}} \), is higher for them.

The standard result is that the equilibrium is the median voter’s most preferred policy, \( g^m \). The normative implication is that majority voting or downsian electoral competition implement the social optimum only if the median voter’s income equals the average income. In this case, \( g^m = H^{-1}_g(1) = g^* \). If instead the income distribution is skewed toward the right (i.e. \( y_m < \bar{y} \)), the voting outcome is overspending and overtaxation. Underprovision and undertaxation occur in the opposite case (Roberts, 1977; Meltzer and Richard, 1981).

Are these results still valid if we introduce uncertainty about the consequences of a policy? What happens if individuals are not rational in dealing with uncertainty?

---

\( ^{22} \)This is a stylised version of Meltzer and Richard (1981) as presented in Persson and Tabellini, 2000, pp. 48-50.

\( ^{23} \)We will see below that the concavity of \( H \) has a crucial role when we consider uncertainty. This is however a standard and reasonable assumption, which yields single peaked policy preferences and unique equilibrium.
6.1 The voting outcome under EU

Suppose that uncertainty concerns income distribution within the society. Specifically, an individual ignores if his income is above or below the average income. In a sense, he ignores if he is relatively rich or poor. This is consistent with the fact that most people are unaware of the actual income distribution in the society. Many have little information about their relative positions in the income scale.

This kind of uncertainty fits into the model because the ratio between private and average income represents the unit private cost of the public good. Lack of information about the average income determines voters’ uncertainty about the cost of $g$. Suppose an individual is proposed a unit increase in $g$. If the average income is high, his private cost for the public good is low because the others pay more. Vice versa, if the average income is low, then he is relatively rich; in this case he has to pay more because the amount paid by the others is low on average. How does he react to that proposal? Which are his policy preferences? Which is the equilibrium policy? Can we still apply the median voter theorem? Let us answer these questions by looking directly at voters’ policy preferences.

Call $g^S$ the status quo amount of the public good. Individuals ignore the true average income, $\bar{y}$, and they subjectively believe that the average may either be low or high. With probability $p_l$ the average is low and equal to $\hat{y}$, and with probability $p_h$ the average is $\hat{y}$ (with $\hat{y} < \bar{y} < \hat{y}$). The priors are the same for all individuals and are common knowledge. As in Meltzer and Richard (1981) the only source of heterogeneity is individual income. Agents share the same kind of uncertainty regarding income distribution.\footnote{This framework is a compromise between simplicity and realism. An alternative model in which agents have heterogeneous priors would be more realistic, with a huge cost in terms of complexity.}

An important assumption here is that individuals are unable to infer the true $\bar{y}$ from observing $g^S$. There might be several reasons for this. For example, this calculus may require an excessive amount of sophistication. Another reason is that individuals may not have access to all public goods provided by the government, but only to subsets of them; thus they cannot infer the average income because they do not perfectly observe total government’s expenditures.

The expected utility change, $U^e$, from choosing a policy $g$ that is different from the status quo is the following:

$$U^e(g, y_i, \cdot) = H(g) - H(g^S) - y_i (p_h \frac{\hat{y}}{\bar{y}} + p_l \frac{\hat{y}}{\bar{y}}) \cdot (g - g^S)$$

Observe that, due to the concavity of $H$, also $U^e$ is concave. Thus, $i$’s most preferred policy, call it $g^{ie}$, is unique and solves the following FOC:

$$g^{ie} = H^{-1}_g \left[ y_i \left( \frac{p_h}{\bar{y}} + \frac{p_l}{\bar{y}} \right) \right]$$

\footnote{This framework is a compromise between simplicity and realism. An alternative model in which agents have heterogeneous priors would be more realistic, with a huge cost in terms of complexity.}
As far as beliefs are the same for all players, bliss points are negatively related to individual income. This means that the median voter theorem still applies and that the median income individual is also the median voter. The status quo policy does not play any role in this model; i.e. a constituency for a new equilibrium $g$ emerges endogenously as soon as the median’s most preferred policy differs from the status quo.

Observe that if,

$$\left( \frac{p_h}{\bar{y}} + \frac{p_l}{\bar{y}} \right) > \frac{1}{\bar{y}} \tag{7}$$

then all voters’ bliss points are lower with respect to the full information case (i.e. $g^{ie} < g^i$, for all $i$). In this case all individuals want lower taxes and a lower amount of public good. In fact, the left-hand and the right-hand sides of (7) represent the expected and the true private cost of the public good, respectively. Notice that the LHS is high when the expected average income is low. Thus condition (7) means that if the expected average income is rather low, then any individual expects to pay a high private cost for the public good; as a consequence, any individual’s ideal size of government is lower than under full information.

Let us use this idea to analyze what happens when individuals have correct expectations about the average income, i.e. $p_h \cdot \bar{y} + p_l \cdot \bar{y} = \bar{y}$. It is easy to see that in this case condition (7) is satisfied. Interestingly, despite all individuals expect the true average income, uncertainty induces the majority to prefer a smaller government size.

**Proposition 9** Despite all individuals have correct expectations about the true average income, the majority selects an amount of public good that is smaller than the amount that it would otherwise select under full information.

The reason of this result is the concavity of $H$, which determines risk aversion. All individuals, included the median, are more sensitive to the risk of being above the average than to the chance of being below.

What happens when expectations are correct and, in addition, the median income equals the expected income? We know that a perfectly informed median would prefer the socially efficient level. With uncertainty, this is no longer true.

**Proposition 10** When expectations are correct and the expected average income equals the median’s income, the majority fails to select the social optimum and chooses a lower amount of public good.

As pointed out earlier this result provides a simple and perhaps reasonable argument supporting the evidence that even a median whose wealth is substantially lower than the average may oppose policies with large scale redistributive effects.

In this model, uncertainty derives from the fact that the average income is not observable. Similar results can be drawn in the case uncertainty is due to other unobservable factors,
such as the quality of the public good, the rents extracted by politicians, the amount of tax avoidance or a random shock on private income. The common idea is that, because of risk aversion induced by decreasing marginal utility, citizens are less inclined to pay taxes when they do not perfectly observe some relevant variable.

6.2 The voting outcome under PT

Let us now consider how the voting scenario changes under PT. In order to simplify things we start with two anomalies: reflection effect and loss aversion. Further on we discuss probability weighting. Therefore let assumption A1 hold for the time being (i.e., \( p_l \) and \( p_h \) have similar values).

We also assume that \( y_i < \hat{y} \), for any \( i \). This assumption actually implies a quite large amount of uncertainty regarding the average income. It however simplifies the exposition without any significant loss of generality. More realistically, one could imagine that there are two other groups of agents in the society. Those who do not have any chance of being richer than the average (for them, \( y_l = \hat{y} \)), and those who do not bear any risk of being poorer than the average (for them, \( y_l = \hat{y} \)). For the people in the first (second) group demanding for more (less) public good is always a gain, thus PT anomalies do not play a significant role for them. Moreover, these are groups with extreme income values, which are unlikely to be decisive in a democratic system. Thus we can simplify exposition by disregarding them.\(^{25}\)

6.2.1 Loss aversion and reflection effect

Starting from the \( v \) function, we have to build agent \( i \)'s policy preference function, call it \( V_{ei}(g, y_i, g^S, \ldots) \). Some preliminaries: first, \( g^S \) is an argument of \( V_{ei} \) because the agent evaluates any level of \( g \) as a departure from the status quo. Second, due to the reflection effect the agent is risk averse in gains and risk seeking in losses. Third, because of loss aversion, preferences are kinked in the status quo. Apart from this, PT does not give any further detail about the value function. Nonetheless, this information is sufficient to study the shape of \( V_{ei} \).

The preference function \( V_{ei} \) is determined by averaging between two events: high vs low average income. Preferences are different when either event occurs. Call \( \hat{V}_i \) and \( \tilde{V}_i \) the policy preference functions when the average income is high and low, respectively. We will compute \( V_{ei} \) as the mean of these two functions.

Let us start with \( \hat{V}_i \). Recall that utility is reference dependent, thus benefits and costs of \( g \) are computed by the difference between \( g \) and the status quo. Namely, the benefits are

\(^{25}\)Observe that the assumption does not necessarily imply that the two “extreme income” groups do not exist, it rather implies that they are equally sized so that the median of the entire population is the median of the “central income” group. If we give up the assumption, the model remains the same, with the only exception that the median of entire population might not coincide. The model becomes a bit more complicated without any additional insight.
Figure 3: An almost satisfied agent prefers the status quo

$H(g - g^S)$ and the costs are $\frac{y_i}{y}(g - g^S)$. According to PT costs and benefits are “curved” by the $v$ function:

$$\hat{V}_i = v(H(g - g^S) - \frac{y_i}{y}(g - g^S))$$

The intuition about the shape of $\hat{V}_i$ is the following. The average income is high, thus $i$ thinks she is “relatively poor”. Her costs for the public good are low. $\hat{V}_i$ is zero in the status quo. Suppose $g^S$ is not too high. Demanding for some more $g$ is a good idea because the benefits are as high as $H(g - g^S)$ whereas the private costs are low. This means that $\hat{V}_i$ is positive above the status quo. However, since $H$ is concave and costs are linear, $\hat{V}_i$ remains positive only up to a certain level, call it $\hat{g}_i$. Above that level the benefit of more public good does not justify the cost, despite the latter is low. Thus demanding more than $\hat{g}_i$ would be a loss. Summing up, $\hat{V}_i$ is zero in $g^S$ and $\hat{g}_i$ it is positive in $(g^S, \hat{g}_i)$, and it is negative elsewhere. Because of loss aversion, there are two kinks in $g^S$ and $\hat{g}_i$. Because of the reflection effect, $\hat{V}_i$ is concave when negative and convex when positive. A tentative shape for $\hat{V}_i$ is the dashed curve in Figure 3.a.

Below we will be interested in the relation between the level of $\hat{V}_i$ and $i$’s income. The following Lemma states that this relationship is negative for any $g$ above the status quo.

**Lemma 2** When $y_i < \hat{y}$, if $y_i$ increases, then:

i) $\hat{V}_i$ decreases for any $g \in (g^S, \hat{g}_i)$, and

ii) $\hat{g}_i$ decreases

The idea behind this Lemma is that when an individual becomes richer she enjoys lower utility (or higher disutility) from demanding more public good. In the case $y_i$ is slightly
lower than $\hat{y}$, $\check{V}_i$ is quite low in $(\hat{g}_i, \hat{y})$, and it becomes negative soon. On the contrary, if $i$ feels substantially poorer than $\hat{y}$, her demand for more public good is strong (this case is represented by the dashed curve in Figure 4.a).

Consider now $\check{V}_i$, the preferences when the average income is low:

$$\check{V}_i = v(H(y - g^S) - y_i(y - g^S))$$

Loosely speaking, $\check{V}_i$ somehow mirrors $\hat{V}_i$. The agent is relatively rich, so she faces a large private cost for the public good. If $g^S$ is not too low, she prefers lower amounts of it. Therefore $\check{V}_i$ is negative for values which are larger than $g^S$ and it becomes positive if $g$ is reduced under $g^S$. Reducing $g$ is convenient because cost savings are larger than marginal benefits form public goods. This lasts until a certain level, $\check{g}_i$, where the marginal benefits of $g$ are so high that further reductions are not justified by savings.

Summing up, $\check{V}_i$ is positive in $(\check{g}_i, g^S)$; it is zero in $g^S$ and $\check{g}_i$, and it is strictly negative elsewhere. A tentative $\check{V}_i$ is the solid curve in Figure 3.a. Because of loss aversion, $\check{V}_i$ is kinked in $g^S$ and $\check{g}_i$, and because of the reflection effect, $\check{V}_i$ is concave when positive and convex when negative. The following Lemma states that the demand for less public good is strong when an individual is substantially richer than the average.

**Lemma 3** When $\hat{y} < y_i$, if $y_i$ increases, then:

i) $\check{V}_i$ increases for any $g \in (\check{g}_i, g^S)$ and

ii) $\check{g}_i$ decreases.

**Proof.** The proof parallels the proof of Lemma 2, thus we omit it. ■

Obviously, the Lemma can be read also in the opposite direction: when an agent’s income is only slightly above the average her demand for less public good is weak. An illustration of this case is the solid curve in Figure 4.a.

Let us now derive the averaged policy preference function, $V^e_i$. With probability $p_h$ the high average income occurs and the preference function is $\hat{V}_i$. With probability $p_l$ the average income is low and the preference function is $\check{V}_i$. Therefore,

$$V^e_i = \pi(p_h) \cdot \hat{V}_i + \pi(p_l) \cdot \check{V}_i$$

This function yields interesting insights about the agent’s voting behavior. Recall that we are abstracting from probability weighting for the moment. High and low income are almost equally likely, then $\pi(p_h) \simeq \pi(p_l)$. Therefore $V^e_i$ is a non-weighted mean between $\hat{V}_i$ and $\check{V}_i$.

Broadly speaking, the idea that we are building up here is the following. $\hat{V}_i$ and $\check{V}_i$ reflect contrasting tendencies towards more or less public good due to the fact that the individual may find herself in two opposite situations: being either relatively poor or relatively rich. If
neither of these tendencies prevail the agent just prefers to stick to the status quo. In fact, in this case $V_i^e$ is single peaked in $g^S$. This happens when the agent’s income is close to the middle point between $\hat{y}$ and $\tilde{y}$ (see Figure 3). If this is not the case, then either one of the two tendencies (i.e. more $g$ or less $g$) is much stronger. Then the most preferred level of $g$ is different from the status quo. Interestingly, still the status quo continues to be preferred “locally”; i.e., $g^S$ is preferred to small departures from it. $V_i^e$ has two peaks, one is a local peak in the status quo and the other one is $i$’s most preferred level of $g$ (see Figure 4 for one example). A crucial role is played by loss aversion. These insights are formally stated by Lemma 4.

**Lemma 4**

1. **Almost satisfied agents and single peaked preferences.** Consider part $i$) of Lemma 4. For individuals whose income is about in the middle point between $\hat{y}$ and $\tilde{y}$, $\hat{V}_i$ and $\tilde{V}_i$ functions are symmetric. Gains from demanding more or less $g$ are slightly larger than losses. However, due to loss aversion, losses loom larger. Thus agents stick to $g^S$ in any case. Figure 3.b provides a graph for this situation.

All agents whose income is sufficiently close to the middle between $\hat{y}$ and $\tilde{y}$ will have the same bliss point in the status quo. Call these agents, “almost satisfied” with the status quo and let us give a formal definition.

**Definition 11** An agent is almost satisfied with the status quo if her most preferred policy is the status quo, and $g^S = g^{ie}$, as defined by (6).

All almost satisfied PT prefer the status quo even thought they would have preferred a different policy under EU. This is a major difference between PT and EU in this model. Under EU even a small difference in personal income yields a difference in the preferred amount of $g$. Under PT there is a host of individuals who have the same preference for the status quo despite their income heterogeneity and despite their discontent.

2. **Bimodal preferences and dissatisfied agents.** Consider part $ii$) of Lemma 4. The agent has an equal chance of ending up being either much poorer than the average or a little richer. Her demand for more public good is much stronger than her demand for less. Overall, she is dissatisfied with the current level of public good. It is too low. Therefore, if she is proposed a substantially higher level, she would go for it. Her preferences display a global maximum in $g^*_i > g^S$ in which her $V_i^e$ is larger than the status quo (see Figure 4 for
(a) Preferences in case of low and high average income

(b) Averaged policy preferences

Figure 4: A dissatisfied-poor agent prefers more public good

an illustration). However, for small increases of $g$ loss aversion prevails: the small gains (in case she is poorer than the average) are not sufficient to overcome her fear of losing (in case she is richer). Thus she prefers the status quo to small increases of $g$. This is why her preferences have two maxima.

Of course the opposite is true. Consider part $iii)$ of Lemma 4. If an individual’s income is so high the her chances are either being much richer than the average or being just slightly poorer, her preferences will be double peaked, but the global maximum is far below the status quo. More formally,

**Definition 12** An agent is **dissatisfied** with the status quo if her $V^e_i$ is double peaked. She is **dissatisfied-rich** if $g^S >> g^e_i$; the most preferred policy is a drastic decrease of $g$. She is **dissatisfied-poor** if $g^S << g^e_i$; the most preferred policy is a drastic increase of $g$. $g^e_i$ is defined by (6).

It is the case to stress here that the assumption that $\hat{y} < y_i < \hat{\hat{y}}$ for all individuals in the society is with no significant loss of generality. As already pointed out earlier, if we remove this assumption, we get a more realistic picture, but we have to deal with other two “extreme” groups of agents with single peaked preferences. However, as far the median does not belong to these extreme groups, the insights of the model do not change.

\[ g^*_i = H^{-1}\left(\frac{y_i}{2y} + \frac{1}{y}\right) + g^S \]

and there is a monotone negative relationship between the most preferred $g$ and income (see Appendix).
6.2.2 The voting equilibrium with loss aversion

There are three novelties with respect to the rational model. First, there is a concentration of *almost satisfied* individuals who prefer the status quo despite their income levels are not the same. As we will see this makes the status quo an outcome that is difficult to beat, a good candidate for a “stable” equilibrium. Second, for some groups of *dissatisfied* agents preferences are double peaked. Third, consider that nobody is favor of a small change of the status quo. Thus we expect radical changes, if any.

Given the premises about the policy preferences, the voting equilibrium is simple. The Lemma below formally states that the relationship between income and bliss points is monotonic: higher income voters weakly prefer lower amount of public good. Moreover the $V_i^e$ functions built in the previous Section meet the single crossing property (Gans and Smart, 1996). Under these conditions there is a unique Condorcet winner and it is the median’s first best.

**Lemma 5** i) $g_i^*$ is weakly negatively related to $y_i$;  
ii) If Lemma 4 holds, $V_i^e$ defined in (8) satisfies the Gans and Smart’s single crossing property.

Proposition below characterizes the equilibrium outcome.

**Proposition 13** Under PT,  
i) if the median income voter is almost satisfied with the status quo, then the majority sticks to the status quo.  
ii) If the median income voter is dissatisfied with the status quo then the majority chooses the median’s first best, $g_m^*$. In this case, a drastic policy change occurs.

Let us explain what is going on. Given a status quo $g^S$, the electorate is split in three groups. First, those who are almost satisfied with the status quo but would not move away from it. Second, those who are dissatisfied-rich and would move only if there is a substantial reduction of $g$. Third, those who are dissatisfied-poor but would like to change only if there is a substantial increase of $g$. As long as the median belongs to the first group no change occurs. This case is illustrated in Figure 5.a where one voter per group is represented; $r$ and $p$ stand for dissatisfied-rich and dissatisfied-poor, respectively.

If the median belongs to the second group, then a new policy is implemented and it consists in a drastic decrease or of $g$, as shown in Figure 5.b. Finally, if the median is the third group, the equilibrium is a substantial increase of $g$.

Let us list the main differences between this model and the standard rational model of Section 6.1.

- Under PT the policy outcome is contingent to the status quo even in an open agenda scenario. Small changes in the income distribution do not yield any change in the status quo policy.
A bias operates in favor of the status quo as far as the median is “almost satisfied” with it. This shows that majorities tend to keep on taking their policies or their politicians once they have them (a sort of political endowment effect). This explains why fiscal policy reforms are difficult to implement and, once implemented, they are resistant to changes. If applied to Downsian electoral competition, this model also explains why incumbents remain in charge for long time even when people’s satisfaction rates are not high.

A change occurs as soon as the median is sufficiently dissatisfied. This may happen, for example, because priors regarding income distribution have changed substantially or because the median’s income has changed with respect to her priors. Figure 5.b illustrates that a jump from $g^S$ to $g^*_m$ occurs when the median switches from the group of the almost satisfied ones to the group of the dissatisfied-rich ones. Arguably, the new equilibrium government size is smaller than under full information and rationality. This result is similar to the EU case, but the reason is different: loss aversion instead of risk aversion.

This model suggests that political changes in democratic systems are infrequent but when they occur, they are non-incremental. It also suggests that the political conflict between majority and minority is smoother than under EU. Because of loss aversion, rich people do not prefer a very small government, because they strongly avert the small loss of being relatively poor, and the poor people do not prefer a very big one.
for the opposite reason. In other words, the extremes of the political space are less far apart.

- Finally observe that the reflection effect does not play any role in this model. It affects the concavity of the functions, but not their peaks. This is consistent with the logic of this kind of spatial models: only bliss points matter, not the shape or the intensity of preferences. A role for the reflection effect might eventually emerge in a more complex setting. But we leave this to future research.

As pointed out earlier, these insights do not change substantially if, instead of an open-agenda voting procedure, the policy is proposed by two candidates in a Hotelling-style electoral competition.

The model can also be extended to multidimensional policy issues. We do not carry out this extension here. Our hunch, however, is that since with loss aversion preferences are spiked in the status quo, the latter becomes a good candidate for the equilibrium. The intuition would be that once a policy has been passed by the majority and it has become the status quo, it is difficult to beat it in pair-wise voting because more than a majority starts preferring it. Therefore, with multidimensional issues, a majority voting may fail to generate a Condorcet winner if voters are rational. This is less likely to happen if voters behave according to PT.\textsuperscript{27}

### 6.2.3 Probability weighting

Let us now briefly consider the role of probability weighting, which becomes relevant when $p_h$ and $p_l$ are rather different. In this case, differences between rich and poor are smaller than under EU. This strengthen the idea that PT behavioral distortions reduce the political conflict between majority and minority.

Suppose that $p_h >> p_l$, i.e. a high average income level is considered much more likely than a low level. For any agent the risk of paying more than the average is limited, whereas the chance of paying less is quite large. Then there will be more people who want more public good and less people who want less of it. However, this effect is weaker with probability weighting than without it because people underweight the chance of the positive event (i.e. a high average income) and overweight the risk of the negative one (i.e. a low average income).

**Proposition 14** Compared to EU, under PT agents’ political preferences and the equilibrium outcome are less sensitive to changes in probabilities.

\textsuperscript{27}Bendor, Diermeier, Siegel and Ting (2011) introduce bounded rationality in a downsian setting with possible multiple dimensions. They assume a different cognitive anomaly, namely satisficing. The equilibrium is a kind of median voter policy which is selected as a result of a dynamic Markov process.
This picture is consistent with the idea of Proposition 4 that a political change is less likely when individuals are subject to probability weighting.

If probabilities take extreme values a certainty effect might occur. If, for example \( p_h \) is close to one, individuals just consider the event of an high average income as certain; then \( V_i^e = \hat{V}_i \) for all \( i \). All policy preference functions are single peaked and the equilibrium is not subject to any status quo bias.

7 Conclusion

In this paper we traced the impact that the anomalies postulated by PT have on political choices with uncertain consequences. In the first part of the paper our work has been greatly simplified by the use of a reduced form of a political model: fixed status quo and one exogenous policy alternative with given probabilities of success or failure. At the cost of extreme simplification, this made it possible to compare rational choice with PT in a quite stylized way. We showed that the latter provides credible predictions for a wide set of political phenomena which can hardly be reconciled with EU models. For example, according to PT, voters tend to irrationally like large and ambitious platforms rather than small and detailed changes. They are too conservative toward good reforms, and possibly too hazardous toward bad ones. They irrationally discard huge potential costs from their voting calculus when those costs are associated to quite unlikely scenarios. They are also too indulgent toward bad politicians and too demanding toward those who have performed well. Their preferences for nonpartisan issues are irrationally independent of their wealth.

We showed that these predictions help better understanding of political puzzles such as low turnover in legislatures, weak concern about partisan issues in electoral campaigns, low loyalty rates by partisan voters.

The second part of the paper provides an example of how PT policy preferences may be introduced into an open agenda voting model or a downs-hotelling electoral competition model. Also in this case the setting is very simplified: unidimensional fiscal policy issue; exogenous priors on two alternative income distributions only; no heterogeneity except individual income. Despite simplicity, results are non-trivial. Differences among voters regarding the partisan policy are less sharp than under rationality. Although the pivotal voter is the median, the equilibrium does not necessarily coincide with her ideal point. The same policy may persist as an equilibrium even if the majority of people is discontent with it. The evolution toward new equilibria may take place through sudden and drastic changes.

Some of these results are alien to political models of rational choice, and often coincide with some of their empirical difficulties.

The model that we used may serve for studying other sources of uncertainty, such as the incumbent performance, rents extracted by politicians, the amount of tax avoidance or a random shock on private income. It may be extended quite easily to more realistic settings,
such as multidimensional policy issues, dynamic or multi-party electoral competition. We expect that, because of PT, predictions are likely to be rich and interesting also in these cases.
References


[34] Lipton, David and Jeffrey Sachs (1990): “Creating a Market Economy in Eastern Europe: the Case of Poland”, *Brookings Papers on Economic Activity*, 1, pp. 75-133.


8 Appendix

Proof. Proposition 1. We have to prove that when \( L \) is sufficiently low, (1) is sufficient but not necessary for (3). By A.1, the right hand sides of (1) and (3) are equal. By PT loss aversion, \( v'(x) < v'(-x) \) for any positive \( x \). Thus there exists a \( L^* \) such that \( v(L - S) < u(L) - u(S) \), for any \( L > L^* \); or equivalently \( |v(L - S)| > u(S) - u(L) \). Thus, for \( L < L^* \) it may be that (3) holds while (1) does not, but it cannot be the contrary. For \( L > L^* \) (3) is only sufficient for (1). Observe that, the loss level \( L^* \) is represented in Figure 2.a. ■

Proof. Proposition 2. By PT, \( v'(x) < v'(-x) \), for any \( x > 0 \). If A3 holds, \( v(W - S) < u(W) - u(S) \), for any \( W \). Thus (3) is sufficient but not necessary for (1).

Proof. Proposition 3. Let us prove part A of the Proposition. In this case, \( p_W \) is very high, and \( p_L \) is very low.
Consider a PT individual. Due to certainty effect, \( \pi(p_W) = 1 \) and \( \pi(p_L) = 0 \); thus \( \pi(p_L)/\pi(p_W) = 0 \). This implies that (3) is always satisfied. Thus, the risky political change prospect is always preferred to the status quo.
Consider the EU voter. In this case, \( p_L/p_W \) is very low. However, if losses are sufficiently large with respect to gains, then \( \frac{u(W) - u(S)}{u(S) - u(L)} \leq \frac{p_L}{p_W} \) and the status quo is preferred.
The proof of part B of the Proposition parallel the proof of part A. ■

Proof. Proposition 4. Let \( p_W > p_L \). Due to subcertainty, \( \pi(p_W) < p_W \), and due to overweighting, \( \pi(p_L) > p_L \). Therefore, \( \pi(p_L)/\pi(p_W) > p_L/p_W \). If A4 holds, the left-hand sides in (1) and in (3) are the same. Therefore, there might be cases in which (1) is satisfied while (3) is not, but it cannot be the contrary.
The proof of vice versa follows from the same rationale. ■

Proof. Proposition 5. Consider two individuals, \( r \) and \( p \), with \( S_r > S_p \), and consider a political change that yields the same gains and losses to both individuals; i.e. \( (W_r - S_r) = (W_p - S_p) \), and \( (S_r - L_r) = (S_p - L_p) \). The winning and losing probabilities and the \( v \) functions are the same for both individuals.
Since,
\[
\frac{v(W_r - S_r)}{|v(L_r - S_r)|} = \frac{v(W_p - S_p)}{|v(L_p - S_p)|}
\]
then condition (3), that makes the risky political change desirable with respect to the status quo, is the same for the two individuals. ■

Proof. Proposition 6. Recall that the Arrow-Pratt degree of absolute risk aversion is given by \(-\frac{u''(x)}{u'(x)}\). Thus, we have to show that, if \( u''(x)/u'(x) \) is increasing in \( x \), then
\[
\frac{u(W + d) - u(S + d)}{u(S + d) - u(L + d)}
\]
is increasing in \( d \); i.e. the sign of the first derivative of (9) with respect to \( d \) is positive.

It is easy to see that if this is true for \( d = 0 \), then it is true for any strictly positive \( d \). Thus, just to save notation, take \( d = 0 \). The sign of the derivative of (9) with respect to \( d \) is positive if

\[
[u'(W) - u'(S)] [u(S) - u(L)] > [u(W) - u(S)] [u'(S) - u'(L)]
\]

or

\[
\begin{align*}
\frac{u'(W) - u'(S)}{u'(S) - u'(L)} > \frac{u(W) - u(S)}{u(S) - u(L)} & \quad \text{if } u'(S) - u'(L) > 0 \\
\frac{u'(W) - u'(S)}{u'(S) - u'(L)} < \frac{u(W) - u(S)}{u(S) - u(L)} & \quad \text{if } u'(S) - u'(L) < 0
\end{align*}
\]

which is true if \( u' \) is a convex transformation of \( u \); i.e. if \( u'(x) = t(u(x)) \), and \( t \) is a convex function.

We now show that \( t \) is convex if and only if \( \frac{u''(x)}{u'(x)} \) is increasing. Consider that \( u''(x) = t' \cdot u'(x) \); from which,

\[
t' = \frac{u''(x)}{u'(x)}
\]

From the convexity of \( t \), it follows that \( \frac{u''(x)}{u'(x)} \) is increasing. The inverse is also true.

Summing up, if \( \frac{u''(x)}{u'(x)} \) decreases, then (9) increases in \( d \). This implies that the left-hand side of (1) increases; which means that the risky political change becomes more attractive.

With the same rationale, vice versa can be proved. ■

**Proof. Corollary 1.** This proof parallels the proof of Proposition 6. Only observe that in this case we require that \( u' \) is a linear transformation of \( u \). Thus we can write \( u'(x) = t(u(x)) = h \cdot u(x) + k \); where \( h \) and \( k \) are two constants. Therefore, \( u''(x) = h \cdot u'(x) \). As a consequence, if \( t(.) \) is a linear transformation, then the Arrow-Pratt coefficient is constant. The inverse is also true. ■

**Proof. Lemma 1.** Observe that \( L(s_0) \) is preferred to \( s_0 \) iff

\[
\frac{u((w + s_0)) - u(s_0)}{u(s_0) - u((s_0 - l))} > \frac{p_L}{p_W}
\]

(10)

Consider that if \( u \) is a CARA, it must have the following form:

\[
u(x) = u_0 + \frac{1}{r} u_1 (1 - e^{-rx})
\]

where \( u_0 \) and \( u_1 \) are two constants, and \( r \) is the deFinetti-Arrow-Pratt measure of risk aversion. It follows that we can write the left-hand side of (10) as,

\[
\frac{u((w + s_0)) - u(s_0)}{u(s_0) - u((s_0 - l))} = \frac{1 - e^{-rw}}{1 - e^{-rl}}
\]

35
which is independent of $s_0$. Thus, if $L(s_0)$ is preferred to $s_0$ then also $L(s_1)$ is preferred to $s_1$, and vice versa.

**Proof. Proposition 7.** The proof parallels the Proofs of Propositions 1 and 4, thus we omit it.

**Proof. Proposition 8.** Denote by $S_l$ and $S_h$ two alternative status quo situations, such that $S_l < S_h$. Suppose that A2 holds for $S = S_l$, and that $S_l$ is sufficiently lower than $S_h$, so that we can write:

$$u(W) - u(S_h) < v(W - S_h)$$
$$u(S_h) - u(L) > |v(L - S_h)|$$
$$u(W) - u(S_l) = v(W - S_l)$$
$$u(S_l) - u(L) < |v(L - S_l)|$$

It follows that

$$\frac{u(W) - u(S_l)}{u(S_l) - u(L)} - \frac{u(W) - u(S_h)}{u(S_h) - u(L)} > \frac{v(W - S_l)}{|v(L - S_l)|} - \frac{v(W - S_h)}{|v(L - S_h)|}$$

(11)

The right-hand side of (11) measures by how much the political change is more desirable when the status quo is $S_l$ rather than $S_h$, according to EU. The left-hand side measures this change in desirability, according to PT. It cannot be that when the status quo worsens the PT individual prefers the political change and the EU does not.

**Proof. Proposition 9.** With little algebra it is easy to verify that if $p_h \cdot \tilde{y} + p_l \cdot \tilde{y} = \tilde{y}$, then $\frac{p_h}{\tilde{y}} > \frac{p_l}{\tilde{y}} > 1$. We already know that if the latter inequality holds, then $g^{ie} < g^i$ (for all $i$); i.e. all players’ bliss points are lower when there is uncertainty than under full information. In addition, from (6) it is easy to see that the bliss points are monotonically related to types. Thus the median income individual is also the pivot in the voting game. The majority chooses the median’s most preferred amount of public good, $g^{me}$, with $g^{me} < g^m$.

**Proof. Proposition 10.** Under full information if median income and average income are equal the policy outcome is socially efficient. By Proposition 9, if there is uncertainty the median selects a lower level in this case. Thus the policy outcome cannot be efficient.

**Proof. Lemma 2.** i) Consider that for any $g \in (g^S, \hat{g}_i)$, then $\hat{V}_i > 0$ by definition. Moreover, $H(g - g^S) - \frac{y_i}{g}(g - g^S)$ is concave for any $g > g^S$. Thus, when $y_i$ is larger, $H(g - g^S) - \frac{y_i}{g}(g - g^S)$ is lower and $\hat{V}_i$ is lower.

ii) By definition, $\hat{g}_i$ is such that

$$H(\hat{g}_i - g^S) - \frac{y_i}{g}(\hat{g}_i - g^S) = 0$$

(12)
By implicit differentiation of (12),

\[
\frac{\partial \hat{g}_i}{\partial y_i} = \frac{\frac{\hat{g}_i - g^S}{y}}{H'(\hat{g}_i - g^S) - \frac{w_i}{y}} \tag{13}
\]

Recall that \(H(g - g^S)\) is concave and \(\frac{w_i}{y}(g - g^S)\) is linear for any \(g > g^S\). Thus, \(H'(\hat{g}_i) < \frac{w_i}{y}\). Thus the denominator of (13) is negative. Since the numerator is positive, then \(\frac{\partial \hat{g}_i}{\partial y_i} < 0\).

**Proof. Lemma 4.** Recall that \(\pi(p_h) - \pi(p_l) \simeq 0\).

\(i)\) \(y_i - \hat{y} \simeq \hat{y} - y_i\) then \(\hat{V}_i\) are symmetrical \(\hat{V}_i\) with respect to \(g^S\) thus

\[
\hat{V}_i(|g - g^S|,.) \simeq \hat{V}_i(-|g - g^S|,.)
\]

\[
\hat{V}_i(-|g - g^S|,.) \simeq \hat{V}_i(|g - g^S|,.)
\]

Because of loss aversion, for any \(g \neq g^S\),

\[
\hat{V}_i(|g - g^S|,.) + \hat{V}_i(-|g - g^S|,.) < \epsilon
\]

\[
\hat{V}_i(|g - g^S|,.) + \hat{V}_i(-|g - g^S|,.) < \epsilon
\]

where \(\epsilon\) is a small strictly negative number. Thus,

\[
\hat{V}_i(-|g - g^S|,.) + \hat{V}_i(|g - g^S|,.) < \epsilon
\]

This implies that \(\hat{V}_i^e\) is strictly negative for any \(g \neq g^S\). Since \(\hat{V}_i^e\) is zero in \(g^S\) then \(\hat{V}_i^e\) is single peaked in the status quo.

\(ii)\) In this case \(y_i\) is quite low with respect to \(\hat{y}\). By part \(ii)\) of Lemma 3, \(\hat{V}_i\) is rather low; by part \(ii)\) of Lemma 2, \(\hat{V}_i\) is high. This implies that \(\hat{V}_i\) and \(\hat{V}_i\) are not symmetrical. In particular,

\[
\hat{V}_i(|g - g^S|,.) \gg \hat{V}_i(-|g - g^S|,.)
\]

\[
\hat{V}_i(-|g - g^S|,.) \gg \hat{V}_i(|g - g^S|,.)
\]

Because of loss aversion, for any \(g \neq g^S\),

\[
\hat{V}_i(|g - g^S|,.) + \hat{V}_i(-|g - g^S|,.) < \epsilon
\]

\[
\hat{V}_i(|g - g^S|,.) + \hat{V}_i(-|g - g^S|,.) < \epsilon
\]

This implies that there exists some interval \((g_1, g_2)\) with \(g^S < g_1 < g_2\) such that, for any \(g \in (g_1, g_2)\),

\[
\hat{V}_i(|g - g^S|,.) + \hat{V}_i(|g - g^S|,.) > -\epsilon
\]
$V_i^e$ is strictly positive in that interval. Since it is also concave, $V_i^e$ reaches a maximum, $g_i^*$, within the interval.

Outside $[g_1, g_2]$, $V_i^e$ is zero in $g^S$ and it is strictly negative elsewhere. Moreover, the left hard derivative of $V_i^e$ in $g^S$ is negative by loss aversion. This implies that $g^S$ is a local maximum. Summing up, $V_i^e$ has two maxima: one local maximum in $g^S$, and a global one in $g_i^* > g^S$.

$iii)$ The proof of this part is a simple variation of the proof of part ii), thus we omit it.

**Proof. Lemma 5.**

i) For almost-satisfied agents, $g_i^*$ is insensitive to income.

For the dissatisfied agents, let

$$g_i^* \in \arg \max_g \pi(p_h) \cdot v(H(g - g^S) - \frac{y_i}{y}(g - g^S)) + \pi(p_l) \cdot v(H(g - g^S) - \frac{y_i}{y}(g - g^S))$$

For dissatisfied agents the FOC and the SOC are satisfied. Moreover, since $\pi(p_h) \simeq \pi(p_l)$ the FOC can be approximated with

$$v' \cdot (H'(g - g^S) - \frac{y_i}{y}) = -v' \cdot (H'(g - g^S) - \frac{y_i}{y})$$

which yields,

$$g_i^* = H^{-1}(\frac{y_i}{y} \cdot \frac{1}{y} + \frac{1}{y}) + g^S$$

It is easy to see that $g_i^*$ is negatively related to $y_i$. For all agents m bot almost-satisfied and dissatisfied, the relationship between income and most preferred policy is weak negative monotonic.

ii) For individuals with single peaked preferences in $g^S$ the property is immediately satisfied. For those with bimodal preferences, the property stems from the fact that the only source of asymmetry here is income. Let us work out the Take two “dissatisfied rich” individuals (as in Lemma 4 $iii$). Call them $r1$ and $r2$, and let $y_{r1} > y_{r2}$. They have bimodal preferences. For any $g < g^S$, we have that $V_{r2}^e > V_{r1}^e$ and for any $g > g^S$, $V_{r2}^e < V_{r1}^e$. In words, $r1$ is “less unsatisfied” than $r1$ for any level of $g$ lower than the status quo and “less satisfied” for any positive level above the status quo. Therefore the only crossing point between their preference functions is the status quo. The same argument applies to any two “dissatisfied poor” agents and to a rich vs a poor dissatisfied agents.

**Proof. Proposition 13.** The proof is trivial given Lemma 5; i.e., given the monotonic relationship between income and bliss points, and the Gans and Smart’s single crossing property.

38
**Proof. Proposition 14.** Let \( k = h, l \). According to PT probability weighting, for \( p_k \) not too close to zero or one, \( \pi(p_k) \geq p_k \) if \( p_k \) is sufficiently low and \( \pi(p_k) \geq p_k \) if \( p_k \) is sufficiently large. The probability weighting idea can be captured by writing

\[
\pi(p_k) = \alpha + \beta p_k
\]

with \( 0 < \alpha, \beta < 1 \). Recall that \( p_l = 1 - p_h \). Thus the randomized policy preference function in (8) can be written as

\[
V^e_i = (\alpha + \beta p_h) \cdot \hat{V}_i + (\alpha + \beta (1 - p_l)) \cdot \tilde{V}_i
\]

Consider the change in \( V^e_i \). If probability weighting occurs according to (14), we have

\[
\frac{\partial V^e_i}{\partial p_h} = \beta \cdot (\hat{V}_i + \tilde{V}_i)
\]

It is easy to see that in the absence of probability weighting (\( \alpha = 0 \) and \( \beta = 1 \)) this change would have been larger. Thus, due to probability weighting, agents’ (and median voter’s) preferences are less sensitive to changes in probabilities. 

■