The Perverse Consequences of Policy Restrictions in the Presence of Asymmetric Information*

Rafael Hortala-Vallve
London School of Economics and Political Science
r.hortala-vallve@lse.ac.uk

Valentino Larcinese
London School of Economics and Political Science
v.larcinese@lse.ac.uk

Stephanie Rickard
London School of Economics and Political Science
s.rickard@lse.ac.uk

December 2, 2013

Abstract. Institutions can limit governments' policy options. Such restrictions are usually commended as solutions to time inconsistency problems or coordination failures. However, policy constraints can have important drawbacks and these disadvantages have generally been overlooked to date. When institutional constraints tie the governments' hands, citizens have fewer incentives to be informed about politics and participate in collective decision-making. In effect, policy restrictions lower the private returns from political information. A fiscal policy restriction, for example, may decrease redistribution by lowering poorer voters' acquisition of political information. We find support for our prediction in a controlled laboratory experiment.

*For helpful comments we thank Torun Dewan, Simon Hix, Aniol Llorente-Saguer, Rosemarie Nagel, Cristiana Vitale, Alexei Zakharov and audiences at various seminars and conferences.

1. Introduction

Governments' policy options are often restricted by institutions. Institutional constrains exist both domestically and internationally across myriad issue areas. The European Union (EU), for example, is responsible for a wide range of policy areas over which member-country governments have little discretion. International institutions, such as the International Monetary Fund (IMF) and the World Trade Organization (WTO), also constrain sovereign governments' policy decisions. The WTO, for example, limits the barriers to trade that member countries can impose on foreign goods and services and the IMF often requires specific policies as a condition of accessing their funds. Many governments also face domestic limitations on their policy choices. Some policy areas, for example, are the exclusive responsibility of unelected bodies, such as central banks. Other policies may be written directly into a country's constitution making them particularly immune to government action. Additional domestic constraints can include a super-majority requirement for changes to the status quo or automatic rules to replace the discretion of elected representatives.

Such institutional restrictions are often commended as solutions to perennial political challenges. Restrictions can help solve time-inconsistency problems on the part of policy-makers, thus generating credible commitments (Kydland and Prescott 1977, Persson and Svensson 1989, Alesina and Tabellini 1990). Policy restrictions can also generate higher levels of general welfare by reducing political business cycles (Nordhaus 1975). In the case of international institutions, coordinating the action of member states is often the very reason for the existence of policy restrictions. The benefit of such restrictions is to overcome coordination failures thus helping to reach more desirable outcomes for all members. A monetary union like the euro area, for example, could be subject to free-riding by individual member states if fiscal policies are not restrained.

Although policy restrictions are usually commended as solutions to fundamental political problems, such restrictions can have important disadvantages. One drawback is that they may generate a "democratic deficit", whereby policies are not chosen by citizens through a process of democratic deliberation and decision-making (Dahl 1999). The existence and consequences of a democratic deficit have been debated predominantly in the case of the EU (Hix 1997, Moravcsik 2004, Follesdal and Hix 2005) but similar arguments have been made for many international organizations.[1] Independent central banks have also been criticized for concentrating vast powers "in a body free from any kind of direct, effective political control".[2]

[1] Using the words of Moravcsik, it is hard to "think of a single application of democratic standards to an international organization – whether the European Union, the International Monetary Fund (IMF), the World Trade Organization (WTO), or even the United Nations – that does not conclude with a serious criticism of the organization"(Moravcsik, 2004, p. 337).

[2] Friedman (1968), p. 188.

Our study attempts to take seriously the idea that democratic deficits matter for public policy. Specifically, we investigate the effects of policy restrictions imposed on sovereign governments by unelected international institutions. We focus particular attention on restrictions imposed by the IMF on borrowing governments.

To this end, we develop a theoretical model of the consequences of IMF mandated spending floors for voter turnout and government spending. Although the IMF has historically mandated cuts to government spending, in recent years it has sought to preserve expenditures on pro poor programs.[3] In fact, a majority of IMF programs now require a minimum amount of governmental spending on pro poor budget items, such as school feeding programs. The IMF mandated as a condition of their loan to Dijbouti, for example, that the government sustain social spending equal to 6 per cent of GDP in 2011 (IMF 2013). Over 80 per cent of IMF programs agreed in 2011 included floors on pro poor spending. Half of these floors required governments to spend more on pro poor programs than they did before the IMF program. The effect of such spending floors remains unknown.

We aim to address this oversight by theorizing about the role of domestic politics in countries that borrow from the IMF. The key insight of our model is that, although spending floors were intended to help the poor, they may have the perverse effect of making them worse off in the long run. This result is obtained in three steps. First, requiring elected governments to spend above a certain threshold reduces the value voters place on acquiring political information because the range of policies elected governments can implement is reduced. Second, we show that decreasing returns to information generate an asymmetric response to the policy restriction: poor voters will acquire less political information and consequently vote at lower rates than better off citizens. Third, given the reduced responsiveness of poor voters, electorally minded governments may withdraw pro poor policies once the IMF has left town. The core insights of our model are tested in a controlled laboratory experiment. The laboratory results raise concerns about the effects of spending floors on the poor. First, spending floors induce subjects to acquire information less frequently. Second, under certain conditions, minimum spending thresholds can have perverse consequences. The implication is that IMF-mandated spending floors may reduce the amount of money governments spend on pro poor programs in the long run because voters devote less attention to the policies enacted by governments. Consequently, IMF-mandated minimum spending floors may not be the panacea for which anti-poverty campaigners had hoped. More generally, policy restrictions may worsen existing democratic deficits by reducing citizens' incentives to acquire political information and participate in collective-decision making.

[3]The World Bank also imposes minimum levels of social and pro-poor spending as a condition of some aid programs.

2. Political information as a private good

Our point of departure is the idea that information about politics can be useful for private decision-making and not just for voting. In his classic work *An Economic Theory of Democracy*, Anthony Downs (1957) suggests that, "since the odds are that no election will be close enough to render decisive the vote of any one person, or the votes of all those he can persuade to agree with him, the rational course of action for most citizens is to remain politically uninformed".

Downs' argument, like all the subsequent literature on *rational ignorance*, separates the *homo oeconomicus* from the *homo politicus*, neglecting that many pieces of information that may be relevant for voting decisions are acquired for other purposes. For example, information about tax rates can be used to determine one's optimal labour supply and investments; information on the quality of public services can be useful to decide whether it is worthwhile using privately available alternatives. At the same time, being informed on these matters, and on the reforms that are being discussed and/or implemented, generates awareness of current policy-making, and helps citizens evaluate the performance of current administrators. Political information can also be acquired before elections to form more accurate expectations on future taxes, spending, regulations etc. In sum, the collective action problem behind the *rational ignorance* paradox may not be as severe as envisaged by Anthony Downs because political information is, to a certain extent, a private good.

In our view, ordinary citizens may be informed on political matters because (1) political information can be useful for political decision-making and because (2) political information can be useful for private decision-making (e.g. market interactions). The existing literature has widely considered and analyzed the first motive but has largely neglected the second motivation, in spite of its potential importance.

The implications analyzed in this paper stem from the fact that acquiring a piece of information has fixed costs yet it yields higher returns to richer individuals. This generates an asymmetric distribution of political knowledge whereby richer voters can be expected, *ceteris paribus*, to be better informed. Empirical studies support this claim: income is an important explanatory variable for political knowledge, even controlling for age, education and other variables that are positively correlated with it. [4]

[4]See for example Hortala-Vallve and Esteve-Volart (2011) on American voters and the article by Larcinese (2007) on British voters.

3. Political information, turnout and public policies

Heterogeneous returns to information is a key part of our argument. The idea that information generates different returns for various individuals is not new. Arrow (1986), for example, provides a model where heterogeneous incentives to acquire information lead to an increase in income inequality via portfolio allocation choices.[5] The idea that increasing returns to information can alter political equilibria has been introduced by Larcinese (2005), who derives some novel theoretical results on the politics of redistribution and, in particular, that an increase in inequality does not imply an increase in redistribution since it induces more dispersion in political awareness and responsiveness.

Our model builds on Meltzer and Richard (1981). We think of voters as individuals that vote upon their preferred level of redistribution and simultaneously adopt optimal labor decision when acknowledging the equilibrium taxation level and equilibrium redistribution. When choosing the optimal size of government, voters rationally anticipate the dissuasive effect of taxation on fellow citizens' decision to work. To that model we introduce the role of information: it is costly for voters to be perfectly informed.[6]

Another important building block for our argument is the idea that political participation affects public policy. While we focus on information and responsiveness to platforms, most previous research has been dedicated to turnout and consistently finds a relationship between turnout patterns and public policy. Starting with the seminal study of Wolfinger and Rosenstone (1980), a vast empirical literature consistently finds positive correlations between turnout and individual characteristics such as income and education. Hence, low voter turnout is likely to imply a socioeconomically biased turnout (Rosenstone and Hansen, 1993) which, in turn, can influence the identity and responsiveness of public policy-makers. Evidence in support of this hypothesis has been found by numerous scholars who have shown, for example, that social spending is positively affected by aggregate turnout (Peterson and Rom,1989; Hicks and Swank, 1992; Levitt and Snyder, 1995; Lindert, 1996; Stromberg, 2004), by lower-class mobilization (Hill and Leighley, 1992, and Hill, Leighley and Hinton-Andersson, 1995), and by the extension of the voting franchise (Husted

[5]Verrecchia (1982) analyzes a model where agents may acquire private signals about the returns of stocks on top of what equilibrium prices already reveal.

[6]This aspect relates to a number of papers that consider asymmetric information in spatial models of voting. Ledyard (1984), for example, presents a model of spatial electoral competition where each voter is uncertain about the preferences and cost of voting of other voters, and where abstention is admitted. In McKelvey and Ordeshook (1984) some voters are uninformed about the candidates' positions, but they know the preferences of the various subgroups in the population so perfect information is not a necessary condition to apply the median voter theorem. Stromberg (2004) introduces mass media as information sources in a probabilistic voting model: since some voters are more valuable than others to advertisers they get better coverage of the issues of their interest.

and Kenny, 1997). Empirical research has also established a causal link between political knowledge and turnout, hence lending further credit and providing empirical support to the mechanism illustrated in this paper (Lassen, 2005; Larcinese, 2007).

4. International Monetary Fund: minimum spending thresholds

We develop our theoretical model with a substantive policy restriction in mind, namely IMF loan conditions. Loan conditions stipulate policy reforms and actions that borrowing countries must undertake in order to receive IMF funds. Failure to fulfil loan conditions may result in the suspension of a loan program. Alternatively, the IMF may withhold of the next tranche of the loan until the government undertakes the required action. While loan conditions differ across countries (Caraway, Rickard and Anner 2012), virtually all IMF programs share an emphasis on reducing fiscal deficits. Deficits are regarded as one of the central causes of macroeconomic imbalances (Mahdavi 2004). To reduce fiscal deficits, the IMF often mandates government spending cuts (Cornia 1987; 50-51; Edwards 1989). Although mandatory spending cuts are often stipulated as a condition of IMF lending, the IMF rarely dictates which programs should be cut. Only three of 105 IMF agreements studied by Bienen and Gersovitz (1985) required cuts to specific budget items. Instead, the IMF stipulates aggregate spending targets and leaves it to the government to decide precisely where in the budget to make the necessary cuts.

Aggregate spending targets give governments' leeway to decide how budgetary cuts are to be distributed. Electorally minded governments will tend to cut spending on programs associated with the least organized interests and the least powerful citizens. Thus, IMF-mandated spending cuts may fall disproportionately on the poorest and most vulnerable sectors of society (Remmer 1986; Garuda 2000). Indeed, Nooruddin and Simmons (2006) find evidence that democratically elected leaders cut spending on health and education in order to meet IMF-mandated aggregate spending targets.

Cognizant of these political dynamics, the IMF introduced non-binding language to many countries' loan programs that explicitly stated social spending should be protected from cuts. However, such general statements were deemed to be largely ineffective (IEO 2003). The IMF subsequently introduced binding minimum spending targets on pro poor programs. The first such condition was included in a loan made to Kenya in 2000. This loan condition required that social spending be no less than 3.4 per cent of total spending (Clegg 2013, p. 28). Failure to comply with this condition risked the suspension of the loan program.

The number of such minimum spending floors rose slowly during the rest of the decade. In 2009, the IMF Executive Board issued explicit instructions to staff stating that pro poor spending should

be maintained or increased in loan programs and that this should be monitored through explicit program targets wherever possible (IMF 2009, p. 6). The 2009 communique was a watershed moment and by the end of the decade, nearly all IMF loan programs included minimum spending floors. In Lesotho's 2011 loan program, for example, the IMF set minimum spending levels on key pro poor programs, such as the school feeding program, old age pensions and HIV/AIDS programs (IMF 2013; Clegg 2013, p. 24). In 2013, the pro poor spending floor was increased to M732 million, equivalent to 3.5 per cent of GDP (IMF 2013). Similarly, Mozambique's IMF loan program includes target spending floors on priority pro poor spending, which reflects about half of all spending (IMF 2013). The government of the Solomon Islands has agreed to keep spending on health and education at no less than 32 per cent of government funded recurrent expenditure (IMF 2013). In Afghanistan, the IMF set a floor on pro poor spending at $400 million for FY2012/13.

Half of the spending floors mandated by the IMF are above pre-program spending levels (Clegg 2013). In theory, these thresholds should make the poor better off. However, this expectation may be naïve as it fails to take into account the rational responses of voters and politicians to the IMF-mandated spending floor. In the following section we develop a theoretical model of voters' and subsequently governments' responses to internationally mandated spending floors, like those included in nearly all IMF loans made today.

5. A simple model

We build on Meltzer and Richard (1981) model on the rational theory of the size of government: two parties electorally compete to be elected and redistribute income according to the majoritarian will of the population, voters decide on their labor-leisure choice anticipating the disincentive of taxation on the overall labor decisions of the population. To this classic model we add asymmetric information: voters only learn about the exact policies advocated by the political parties and the overall economic/political conditions if they incur in costly information acquisition.

There is a continuum of voters with strictly concave utility function for consumption and leisure, $u(c, l)$. In order to keep things simple, we further assume that the utility function is Cobb-Douglas with marginal rate of substitution $\alpha \in (0, 1)$. Formally,

$$u(c, l) = \alpha \ln c + (1 - \alpha) \ln l.$$

Voters are endowed with a unit of time which they need to allocate between labor and consumption. They differ in their marginal productivity: a unit of labour yields w units of consumption (we are assuming the wage w is equal to the marginal productivity of the voter). Given a leisure level l, disposable income is equal to $y = w(1 - l)$. A fraction $t \in (0, 1)$ of every voter's income is paid

in taxes in order to finance a lump-sum per capita transfer T. There is no saving so an individual with marginal productivity w has the following disposable income:

$$c = (1-t)\, w\, (1-l) + T.$$

Voters maximise their utility given a tax rate t and redistribution T:

$$\max_{l \in [0,1]} U_w\,(l,t,T) = \alpha \ln\left((1-t)\, w\, (1-l) + T\right) + (1-\alpha) \ln l.$$

Following the work by Meltzer and Richards we know that disposable income is increasing in the productivity of the voter. Redistribution is produced with constant returns at unitary cost and, assuming that the budget of the public sector is balanced, we have

$$T = t \int w(1-l) f(w) dw$$

where $f(w)$ is the density function of the wage/productivity rate in the population.

The assumption of balanced budget implies that the policy space is unidimensional, since each level of T corresponds to a unique tax rate and vice-versa. Given that leisure is a normal good we have that there is a unique equilibrium in which the individual choice of leisure, the tax rate and the lump-sum redistribution are uniquely determined. Following Roberts (1977), we know that if redistributive preferences of voters are monotonically related to their wage rate (which is the case given that pre-tax income is monotonically increasing with productivity), then a Condorcet winner exists and coincides with the preferred tax rate of the voter with median wage rate.

We extend Meltzer Richards model by assuming that there are two possible wage rate distributions: f_1 with probability p_0 and f_2 with probability $(1-p_0)$. Voters know their own w but can only form expectations on the wage rate distribution. After observing her own wage rate each voter updates the probability of distribution f_1 to $p\,(w)$. Describing the updating process used by the voters is not important for our analysis. Nevertheless, predicting or knowing the wage distribution is important for individual voters because the distribution of preferences determines the equilibrium tax rate which is key to determine the individual's optimal choice of leisure.

The size of government is determined by majority voting. There are two parties (L and R) competing for office. They can commit to their platforms and maximize expected plurality. Parties' platforms, t_L and t_R respectively, are announced publicly but any voter observes it only if it incurs

costs $k > 0$. By incurring these costs, voters also become informed about the wage distribution and so can anticipate the level of redistribution of each platform. This cost is not necessarily a monetary cost, and can reflect the time and effort, as well as the money, required to acquire information. Parties always learn the distribution of the wage rate.

We find the Perfect Bayesian Equilibrium of a game with the following timing:

(1) Nature selects one of the two wage distributions. Political parties observe the wage distribution. Voters privately observe their own wage realization (and update their beliefs on the wage distribution following Bayes rule).
(2) Parties simultaneously announce their platforms. Citizens decide whether they become informed at a cost k. They then supply labour and cast their votes on the basis of the information they have. We assume that uninformed voters either abstain or vote for either party with equal probability
(3) The winning party implements the announced platform and citizens' payoffs are realized.

5.1. **The private value of political information.** In solving backwards the individual decision problem of a voter, the central question is to compare the utility of an informed citizen with that of an uninformed one. The difference is that an informed citizen can make her labour supply contingent on better information. Instead, an uniformed citizen can only base her decision given her posterior belief of the current distribution. Since this model retains all the classic assumptions of the Downsian electoral competition model, it should not be surprising that, as will be shown later, the parties in equilibrium propose identical platforms. Hence, informed voters know the tax rate and the level of the public transfer, and can optimally supply labor.

We denote the optimal leisure decision of an informed voter when the wage distribution is f_i as l_i (for $i = 1, 2$). Instead, a voter that does not acquire information faces a different maximisation than the one described above: the optimal leisure decision of the uninformed voter, l_u, depends on his posterior belief about the wage distribution and her rational anticipation of the equilibrium policies chosen by political parties:[7]

$$\max_{l\in[0,1]} p\left(\alpha \ln\left(\left(1-t_1\right) w\left(1-l\right)+T_1\right)+\left(1-\alpha\right)\ln l\right)+\left(1-p\right)\left(\alpha \ln\left(\left(1-t_2\right) w\left(1-l\right)+T_2\right)+\left(1-\alpha\right)\ln l\right)$$

[7]For notational simplicity we drop w when denoting the posterior p and the optimal decisions l_1, l_2,and l_u.

where t_i and T_i are the equilibrium government decision when the wage distribution is f_i. The following definition formally describes the value of information.

Definition. *The expected value of observing the platform announcements is given by*

$$\Delta(w) = p[U_w(l_1, t_1, T_1) - U_w(l_u, t_1, T_1)] + (1-p)[U_w(l_2, t_2, T_2) - U_w(l_u, t_2, T_2)]$$

The value of information is always non-negative: when informed, the voter is maximising two objective functions perfectly knowing the size of government while, when non-informed, the voter is maximising a convex combination of the previous two objective functions. Given that information is not freely available, only voters whose value of information is above the cost k will acquire information and vote. The key result of our paper is showing that the value of information is increasing in the wage rate of the voter.

Proposition 1. *The value of observing the platform announcements is increasing in the marginal productivity of the voter,* $\frac{\partial \Delta(w)}{\partial w} > 0$. *This implies that (1) only sufficiently productive voters acquire information; (2) all other things being equal, decreasing the value of information decreases voter turnout.*

The proof can be found in the Appendix. It relies on comparing the first order conditions that determine the optimal leisure decisions with the partial derivative of the value of information with respect to the marginal productivity of the voter. The intuition behind the result is much simpler than the algebraic intensive proof: more productive voters have more to lose from not knowing the exact tax rate when deciding upon their optimal leisure decision. This implies that there is a threshold $\hat{w}$ that partitions the uninformed ($w < \widehat{w}$) from the informed ($w > \widehat{w}$) voters. The second part of the proposition follows immediately from the fact that voters only vote when they acquire information and they acquire information only when the benefits from doing so outweigh the costs.

Knowing the optimal behaviour of voters we can solve for the political competition stage of our game. Recall that with full commitment to platforms, the policy proposed by the winning party is implemented after the election. If both parties obtain an equal vote share, their policies are implemented with equal probability.

An informed voter always votes for the party whose policy, given the optimal leisure decision, yields maximum utility. Recall that the assumptions we made on the utility function implies that there exists a Condorcet winner among informed voters (Roberts, 1977). In other words, both political parties converge to the preferred policy of the median informed voter. In equilibrium there may be some voters that, perfectly anticipating the platform proposed by political parties in the different

states of the world, realize it is not worth for them to acquire information. Given the results in Proposition 1, we know that there is a threshold in the marginal productivity ($\widehat{w}$) below which voters abstain.

Two conclusions follow immediately from the above analysis. The first is that *if the costs of acquiring information are high enough, full information equivalence does not occur*: the equilibrium tax rate is lower than the tax that would be chosen by a fully informed electorate. The second is that an increase in the cost of information k decreases the tax rate, by reducing the share of informed voters (which by construction are always poorer than informed ones). Hence, obstacles to the free circulation of information that increase acquisition costs, induce lower redistribution.

5.2. **The value of information in the presence of a policy restriction.** A policy restriction in our setting is modeled as a reduction in the range of feasible policies –a reduction in the choice set of policy-makers just like the ones mentioned in Section 4. We are interested in those cases in which an external enforcer (e.g. an international organization or a federal government) may restrict the set of policies that can be implemented by elected officials in order to protect the welfare of poorer citizens. One such restriction could be establishing a lower bound in the lump-sum redistribution that the elected government needs to implement. In many circumstances this restriction may only be binding in some states of the world. Being that the case, the variance in the possible tax rates by an elected government decreases and, as a consequence, also does the value of information.

Indicating with $\Delta_r(w)$ the value of information on platforms under a policy restriction, we have that $\Delta_r(w) \leq \Delta(w)$ for all w. In the limit, when policy restriction imposes a a unique level of lump-sum redistribution T (and therefore a level of t), the value of political information is zero.

We consider a policy restriction that imposes a minimum level of lump-sum redistribution, i.e. an $R \geq 0$ such that an elected government can never set $T < R$.[8] Denote (T_i, t_i) the equilibrium size of government when there is no policy restriction under the distribution of marginal productivities f_i, for $i = 1, 2$, and, without loss of generality, assume $T_1 \leq T_2$. There are three possible scenarios. First, when $R \leq T_1$, the policy restriction changes nothing because the elected government is implementing a higher level of lump-sum redistribution in both states of the world. Second, when $R \geq T_2$, the government is bound by the restriction in all states of the world and voters that prefer higher redistribution are strictly better off.[9] Finally, the interesting case occurs when $T_1 < R < T_2$. In this case the government is only constrained in one state of the world. The constraint favours

[8]Given some distributions of marginal productivities, analysing restrictions on lump-sum redistribution may yield different result than analysing restrictions on taxes. The implications of such differences are indeed interesting but out of the scope of the current paper.

[9]Under these circumstances all voters would abstain and there is the possibility of multiple equilibria (given appropriate beliefs on parties' actions). Most usual refinements select the equilibrium in which all parties redistribute exactly R.

poorer voters who wish higher redistribution but also has a negative impact on such voters: given that the value of information is marginally decreased, there are less poor voters that cast their vote thus the median voter under the restriction is richer. The lump-sum transfer under distribution f_2 is therefore lower and there are parameter values for which the poorer voters are *ex-ante* worse off. The following proposition summarizes our main conclusion:

Proposition 2. *Introducing a policy restriction in situations in which voters need to acquire costly information about the policies advocated by political parties can impact negatively on the voters that are supposed to benefit from such policy restriction. More specifically, forcing elected government to redistribute above a certain threshold can reduce the value voters associate to acquiring political information and decrease turnout among poorer citizens. The decrease in turnout can impact negatively on poorer voters when the policy restriction is not binding. This last effect may overcome the positive effects of the policy restriction on poorer voters.*

In the appendix we prove the Proposition by showing parameter configurations in which the ex-ante effect of a minimum transfer on poorer voters is negative.

6. Experimental design

It is not possible to directly test our predictions by identifying the effect of policy restrictions on voters' incentives to acquire information and how this modifies the incentives of policy makers. For this reason, we design a laboratory experiment where we test whether the introduction of a restriction that *a priori* benefits the recipients of a particular policy backfires due to the fact that these agents no longer have incentives to acquire information and *discipline* policy makers.

As is usual in laboratory settings, we need to strip down our model and test our key insight. For this reason we consider a bargaining game in which the least informed party needs to accept or reject an offer made by the informed party. We show that by constraining the informed party, the least informed party has less incentives to acquire costly information which benefits the informed party.

More specifically, we consider the classical ultimatum game (for an excellent survey see Roth, 1995) in which the receiver has to pay a cost $k > 0$ to learn the offer of the proposer.[10] In the first half of the session, the proposer is able to offer any share. In the second half, we restrict the offers the proposer can make. All offers must now be above a certain threshold. Following the analysis

[10]There is a vast literature introducing asymmetric information in ultimatum games (see for instance Roth Murnighan 1982, Mitzkewitz and Nagel 1993 or Croson 1996) but, to the best of our knowledge, ours is the first in which the receiver needs to pay a fee to learn the offer made by the proposer.

from previous sections, we anticipate that the restriction reduces the incentives for the receiver to acquire information and this will in turn push down the proposers' offers.[11]

Our sessions had 36 periods. At the beginning of the experiment subjects were assigned the role of proposer or receiver. In each period subjects were randomly matched with a subject with the opposite role. In the first 18 periods they played a modified version of the ultimatum game in which the proposer could offer any quantity between £0 and £10 being multiples of £0.50. The receiver could learn the proposer's offer at a cost $k = £0.50$.[12] In the following 18 periods the same procedures were maintained however, proposers could no longer offer anything below £2.

6.1. **Procedures.** In total 46 subjects participated in 2 sessions with 22 and 24 subjects per session. No subject participated in more than one session. Students were recruited through the online recruitment system ORSEE (Greiner, 2004) and the experiment took place on networked personal computers in the Centre for Experimental Social Sciences (CESS), Nuffield College (Oxford, UK), in December 2011. The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007). The data and program code for the experiment will be made available online upon publication.

The same procedure was used in all sessions. Instructions (see Appendix) were read aloud and questions answered in private. Students were asked to answer a questionnaire to check their full understanding of the experimental design (if any of their answers was wrong the experimenter referred privately to the section of the instructions where the correct answer was provided). Students were isolated and could only communicate through the computer terminals.

The final payment of the session was computed by adding the payoff obtained in two (randomly selected) periods. Additionally subjects received a show up fee of £3. At the end of each session participants were asked to fill in a questionnaire on the computer and were given their final payment in private. Session length, including waiting time and payment, was around an hour. The average payment was £11.87.

[11] The unique subgame perfect Nash equilibrium of this game has the sender offering the minimum possible amount, the receiver never acquiring information and always accepting offers. When adding inequity aversion to this simple model (Fehr and Schmidt, 1999), the equilibrium has analogous comparative statics to the ones described in our model.

[12] We assumed that subjects did not have to pay the costs of acquiring information when they rejected the offer. Not having this assumption implies that the only equilibria in the presence of inequity aversion has all offers being rejected (there is a hold-up problem). When we tested our experimental design with a pilot session, we observed no differences in subjects' behavior when we introduced (or failed to introduce) this assumption.

7. Experimental results

The main objective of the experiment is to test two key predictions of our theoretical contribution: (1) on the receiver's side, policy restrictions reduce information acquisition; (2) on the sender's side, policy restrictions reduce the amount offered . Table 1 reports the key summary statistics of our experiment. Below we discuss these results in the light of our theoretical findings.

	No Restriction	Restriction	Difference (p-value)
Information Acquisition	0.433	0.271	0.162 (0.000)
Offers	3.525	3.597	-0.072 (0.449)

Table 1: Aggregate experimental results.
(in brackets we report the p-value of the one sided t test)

7.1. **Information acquisition.** Table 1 reports receivers' average information acquisition respectively with and without a policy restriction. Introducing the restriction reduces average information acquisition from 0.43 to 0.27. The two sessions differ in their baseline levels of information acquisition but display a similar pattern regarding the impact of the restriction: in session 1 we move from 0.54 to 0.34, and in session 2 from 0.32 to 0.2 – in both cases there is a 37% reduction in information acquisition. As expected, the imposed restriction reduces information acquisition.

Table 2 reports our regression coefficients: Columns 1 shows the coefficient of a simple linear probability model (OLS). Column 2 introduces a dummy variable for session 2. In column 3 we include a cubic polynomial of $Time$, a variable that ranges between 1 and 18 (there are 18 periods in each regime), to take into account potentially different learning patterns across the two regimes. These controls are orthogonal to the restriction and therefore, in a linear setting, do not change the estimated parameter of interest. They may, however, make a difference on the estimated standard errors. In all cases the effect remains significant at 1% level. The estimated impact of the restriction is equal to -0.16. We then replicate this exercise by using logit, which is arguably more appropriate given the binary nature of the dependent variable. Columns 4-6 report the logit marginal effects at the mean, which are practically equal to the OLS estimates. We can safely conclude that the policy restriction induced subjects to acquire information less frequently. The impact is sizable.

dependent variable	information acquisition					
	(1)	(2)	(3)	(4)	(5)	(6)
restriction	-0.1620***	-0.1620***	-0.1620***	-0.1620***	-0.1667***	-0.1680***
	(0.032)	(0.032)	(0.031)	(0.032)	(0.032)	(0.032)
experiment 2		-0.1759***	-0.1759***		-0.1802***	-0.1816***
		(0.032)	(0.031)		(0.032)	(0.032)
time			-0.0305			-0.0317
			(0.035)			(0.036)
time squared			-0.0029			-0.0032
			(0.004)			(0.004)
time cubic			-0.0001			-0.0001
			(0.0001)			(0.0001)
constant	0.4329***	0.5208***	0.6391***			
estimation method	OLS	OLS	OLS	logit	logit	logit
observations	864	864	864	864	864	864
R2 (pseudo R2 for logit)	0.0288	0.0627	0.0721	0.0223	0.0495	0.0573

Table 2: The impact of the policy restriction on information acquisition.
Note: for logit estimates we report the marginal effect at the mean,
standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

dependent variable	offers made by senders					
	(1)	(2)	(3)	(4)	(5)	(6)
experiment	1	2	all	all	all	all
restriction	0.2639*	-0.1204	0.0718	0.0718	0.0718	0.0718
	(0.1540)	(0.1103)	(0.0949)	(0.0949)	(0.0945)	(0.0751)
experiment 2				0.0810	0.0810	-0.8056***
				(0.0949)	(0.0945)	(0.2600)
time					-0.3225***	-0.3225***
					(0.1048)	(0.0833)
time squared					-0.0382***	-0.0382***
					(0.0126)	(0.0100)
time cubic					-0.0013***	-0.0013***
					(0.0004)	(0.0003)
constant	3.3889***	3.6620***	3.5255***	3.4850***	4.1687***	4.9812***
	(0.1089)	(0.0780)	(0.0671)	(0.0822)	(0.2456)	(0.2628)
ind fixed effects	no	no	no	no	no	yes
observations	432	432	864	864	864	864
R2	0.0068	0.0028	0.0007	0.0015	0.0130	0.3931

Table 3: The impact of restriction on offers.
Note: standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

7.2. **Offers.** Table 1 reports senders' average offer under the two regimes. Average offers (3.53 without restriction and 3.6 with the restriction) are statistically indistinguishable, contrary to our expectation. Regression coefficients in Table 3 confirm that this null finding is robust to various specifications. Although the sign of the regression coefficient is positive (and 10% statistically significant) in session 1, it is negative (and statistically insignificant) in session 2. We also report estimates when we include individual fixed effects (column 6).[13]

Figure 1 reports histograms of offers under the two regimes. It is immediately clear that the restriction fulfils the purpose of pushing offers up to the minimum level. The density corresponding to an offer of 2 poundss now absorbs offers that would have otherwise been below 2. However, as discussed above, the average offers are not different under the two regimes. Taken together, these two observations imply that the increase at the bottom of the distribution must be compensated by a decrease in other parts of the distribution. Indeed, a closer inspection of figure 3 reveals that the restriction reduces the density of offers in the range 4-5.[14]

FIGURE 1. Histograms of offers under the two regimes

We then perform an analysis of heterogeneous effects. A restriction may have different effects depending on the average offer made before the restriction. In Table 4 we distinguish between *selfish* and *altruistic* senders according to whether their average offer without a restriction is below or above a certain threshold. We then report the effect of imposing a restriction (third and fourth columns) as we move the threshold progressively from 2 to 4 (first column).

[13]Since we have experimental data, individual fixed effects are not needed to correct bias but they help to reduce sample variability and have more efficient estimates.

[14]This result (as well as all results that follow) are preserved when we drop the initial observations in each part. In other words, results are not driven by the initial periods in which subjects may be learning the functioning of the experiment.

Threshold		No Restriction	Restriction	Difference (p-value)
2	selfish	0.917	3.028	2.111 (0.000)
	altruistic	3.763	3.649	- 0.114 (0.108)
2.5	selfish	1.576	2.792	1.216 (0.000)
	altruistic	3.915	3.758	-0.157 (0.038)
3	selfish	1.963	2.796	0.833 (0.000)
	altruistic	4.046	3.864	-0.182 (0.002)
3.5	selfish	2.544	3.211	0.667 (0.000)
	altruistic	4.226	3.873	-0.353 (0.000)
4	selfish	2.889	3.091	0.202 (0.054)
	altruistic	4.417	4.306	0.111 (0.115)

Table 4: Average offer by type
A subject is classified as a selfish (altruistic) type if her average offer in the non-restriction regime is below (above) the threshold. We report p-values of one-sided tests: for selfish agents the null hypothesis is that the difference is negative, for altruistic agents the null is that the difference is positive.

dependent variable	offers made by senders				
	(1)	(2)	(3)	(4)	(5)
threshold	**2**	**2.5**	**3**	**3.5**	**4**
restriction	-0.1136	-0.1569**	-0.1821**	-0.3532***	-0.1111
	(0.0749)	(0.0746)	(0.0770)	(0.0787)	(0.0854)
experiment 2	-0.8056***	-0.8056***	-0.7639***	-0.8056***	-0.1250
	(0.2485)	(0.2358)	(0.2310)	(0.2082)	(0.1910)
time	-0.3453***	-0.2641***	-0.1972**	-0.1732**	-0.1764*
	(0.0831)	(0.0827)	(0.0854)	(0.0873)	(0.0948)
time squared	0.0415***	0.0324***	0.0250**	0.0231**	0.0223*
	(0.0100)	(0.0100)	(0.0103)	(0.0105)	(0.0114)
time cubic	-0.0014***	-0.0011***	-0.0009**	-0.0008**	-0.0008*
	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)
Constant	5.0906***	4.9060***	4.7869***	4.7906***	4.6965***
	(0.2569)	(0.2502)	(0.2526)	(0.2458)	(0.2527)
Observations	792	720	648	504	360
R2	0.3520	0.3091	0.2630	0.3412	0.1801

Table 5: the impact of the restriction on offers: heterogeneous effects.
Note: standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

When the threshold is set equal to 2.5, 3 and 3.5 we have statistically significant differences both for the selfish and the generous senders. The table reports p-values of one-sided t-tests (see table for details). The 2.5, 3 and particularly the 3.5 thresholds show that the generous senders significantly reduce their offers when the restriction is imposed. Table 5 reports regression coefficients corresponding to thresholds ranging from 2 to 4 (and including cubic polynomial for time plus individual fixed effects). The impact of the restriction on the offer is always negative, ranging from a minimum effect of -0.11 in the case of a threshold equal to 2, to a maximum effect of -0.35 in the case of a threshold equal to 3.5. The coefficient is statistically significant at 5% level when the threshold is set to 2.5 and 3 and at 1% level when it is set at 3.5. The coefficients are not statistically significant when the threshold is either 2 or 4, although the t-statistics (1.5 and 1.3, respectively) indicate that we are not facing pure noise.

Our analysis of heterogeneous effects supports the central prediction of our theory, namely that policy restrictions may reduce senders' offer. If the no-restriction offers are particularly meagre, the imposition of the restriction trivially increases the magnitude of the offers. In contrast, if the sender is sufficiently generous, and consequently not constrained by the restriction, then *the restriction has the perverse consequence of reducing the offers made.* This effect disappears when we consider senders that make particularly generous offers, on average, (equal or greater than four) in the no-restriction regime.

By distinguishing between types of senders we find support for the key insights of our model: (1) senders that are *selfish* are forced to raise their offers by the restriction (case $R \geq T_2$ in Section 5.2); (2) senders that are *genuinely altruistic* are not affected by the restriction because their offers are consistently well above the restriction (case $R \leq T_1$ in Section 5.2); and finally, (3) senders that make *generous* offers not necessarily because of altruism or in the name of fairness but because they anticipate the possibility of a rejection of an informed receiver reduce their offers after the restriction is imposed. Arguably, they do so because they anticipate lower information acquisition under the restriction-regime thus a lower probability of their offer being rejected. This latter type captures the perverse consequences of policy restrictions in the presence of asymmetric information (Proposition 2).

In the Appendix we report further results regarding our experiment that are not immediately related to our theoretical contribution.

8. Conclusion

Whether externally imposed by international institutions, or self-imposed by laws and constitutions, the democratic deficit induced by policy restrictions can have perverse consequences. This

paper illustrates how a policy restriction can induce lower information acquisition and reduced participation by voters, with relevant consequences for social spending and income redistribution. The argument is based on an analysis of the incentives to acquire political information and highlights the importance of political awareness for private decision-making.

Like for other goods, rational voters acquire political information only as long as its marginal benefit is larger than its marginal cost. Restrictions to the range of policies that governments can implement reduce the decision-making value of political information while leaving unaffected its cost. Hence, when governments' hands are tied, citizens have lower incentives to be informed on political matters. This mechanism provides a micro-foundation for the idea that the so-called "democratic deficit" induces low participation in political life. The model presented in this paper shows that an exogenous restriction on the amount of transfers a government can supply (or on the taxes that can charge) may induce less transfers (less taxation) with respect to its no-restriction equilibrium level.

While we framed our contribution in terms of internationally-imposed minimum spending requirements, we believe that our theoretical argument has more general applications: the advantages of policy restrictions have been defended at large [15] yet the drawbacks have rarely been analysed. The purpose of this paper is not to claim that restrictions are always a bad idea but, rather, that they might have unintended consequences that are worth considering. The merits and drawbacks of policy restrictions should be considered case by case. Current research, however, has devoted no attention to such potential drawbacks and tends, therefore, to be biased in favor of rules, independent agencies, constitutional restrictions and, in general, limitations to the range of policies that governments can implement at their discretion. Having in place fully empowered governments has some important advantages that have been ignored for too long in the literature on "rules versus discretion". Particularly important is the possibility for citizens to be involved in public deliberation and decision-making, with the added benefit of a public discussion of policy-issues that, when delegated to technocrats, are instead often removed from public attention. The framework presented in this paper shifts the terms of this trade-off more in favour of having empowered governments whose actions are transparently communicated to its voters instead of using policy restrictions.

References

Alesina, A. and Tabellini, G. 1990. A Positive Theory of Fiscal Deficits and Government Debt, *The Review of Economic Studies* , Vol. 57, No. 3, pp. 403-414

[15] For a recent example, see Wyplosz (2005), who proposes the creation of independent Fiscal Policy Committees, with a clear target in terms of debt level, similarly to what happens in the UK with the Monetary Policy Committee.

Arrow, K.J. 1986. The Demand for Information and the Distribution of Income, *Institute for Mathematical Studies in the Social Sciences, Stanford University, Technical Report n. 494.*

Bienen, H. S. and Gersovitz, M. 1985. Stabilization, Conditionality, and Political Stability, *International Organization*, 39, 729-754.

Caraway, T.L. Rickard, S. J. and Anner, M. S. 2012. International Negotiations and Domestic Politics: The Case of IMF Labor Market Conditionality, *International Organization*, 66, 27-61.

Clegg, L. 2013. Social-Spending Targets at the IMF: Hierarchical Bureaucracy and the Rapid Operational Change in Global Economic Governance. Paper presented at the 6th Annual Conference on the Political Economy of International Organizations Universities of Mannheim and Heidelberg, February, 2013.

Cornia, G. A. 1987. *Adjustment Policies 1980-1985: Effects on Child Welfare, in Adjustment with a Human Face*, vol.1, eds. Cornia, G., R. Jolly and F. Stewart. Oxford, England: Oxford University Press: 48-72.

Croson, R. 1996. "Information in Ultimatum Games: An Experimental Study", *Journal of Economic Behavior and Organization*, 30, 197-213.

Dahl, R. 1999. *Can International Organizations Be Democratic? A Skeptic's View*, in Ian Shapiro and Casiano Hacker-Cordon (eds. "*Democracy's Edges"*. Cambridge: Cambridge University Press, pp. 19–36.

Downs, A. 1957. *An Economic Theory of democracy.* New York, Harper & Row.

Edwards, S. 1989. "The International Monetary Fund and the Developing Countries: A Critical Evaluation" in Karl Brunner and Allan Meltzer, eds., *Carnegie-Rochester Conference Series and Public Policy*, Amsterdam: Elsevier Science Publishers.

Fehr, E. and Schmidt, K.M. 1999. A theory of fairness, competition, and cooperation. *The Quarterly Journal of Economics* 114 (3): 817–868

Fischbacher, U 2007. z-Tree - Zurich Toolbox for Readymade Economic Experiments - Experimenter's Manual, *Experimental Economics*, 10, 171-178.

Follesdal, A and Hix, S. 2005. Why there is a democratic deficit in the EU, *European Governance Papers*, No. C-05-02

Friedman, M. 1968. *Dollars and Deficits.* Englewood Cliffs, NJ: Prentice-Hall.

Garuda, G. 2000. The Distributional Effects of IMF Programs: A Cross-Country Analysis, *World Development*, 28, 1031-1051.

Greiner, B. 2004. The Online Recruitment System ORSEE 2.0 - A Guide for the Organization of Experiments in Economics, *University of Cologne WP Series in Economics* 10

Hicks, A.M. and Swank, D.H. 1992. Politics, Institutions, and Welfare Spending in Industrialized Democracies, 1960-1982, *American Political Science Review*, **86**, 658-674.

Hill, K.Q. and Leighley, J.E. 1992. The Policy Consequences of Class Bias in State Electorates, *American Journal of Political Science*, **36**, 351-365.

Hill, K.Q., Leighley, J.E. and Hinton-Andersson, A. 1995. Lower Class Mobilization and Policy Linkage in the US States, *American Journal of Political Science*, **39**, 75-86.

Hix, S. 2007. *What's Wrong with the EU and How to Fix It*. Polity Press.

Hortala-Vallve, R. and Esteve-Volart, B. 2011. Voter Turnout in a Multidimensional Policy Space, *Economics of Governance*, Volume 12, Number 1.

Husted, T.A. and Kenny, L.W. 1997. The Effect of the Expansion of the Voting Franchise on the Size of Government, *Journal of Political Economy*, **105**, 54-82.

Independent Evaluation Office (IEO) of the International Monetary Fund. 2003. Evaluation Report: Fiscal Adjustment in IMF-Supported Programs, *International Monetary Fund*, Washington, DC.

International Monetary Fund (IMF) 2009. "A New Architecture of Facilities for Low-income Countries", *IMF Policy Paper*. Available at http://www.imf.org/external/np/pp/eng/2009/ 062609.pdf (accessed 31 October 2012).

International Monetary Fund (IMF). 2013. "The IMF's Role in Helping Protect the Most Vulnerable in the Global Crisis", Factsheet. Available at http://www.imf.org/external/np/exr/facts/protect.htm (accessed October 30, 2013).

Kydland, F.E. and Prescott, E.C. 1977. Rules Rather Than Discretion: The Inconsistency of Optimal Plans. *Journal of Political Economy*, **85**3. 473-92.

Larcinese, V. 2005. Electoral Competition and Redistribution with Rationally Informed Voters. *Contributions to Economic Analysis and Policy*, vol.4, n. 1, art. 4.

Larcinese, V. 2007. Does Political Knowledge Increase Electoral Turnout? Evidence from the 1997 British General Election. *Public Choice*, **131**, 387-411.

Lassen, D.D.. 2005. The Effect of Information on Voter Turnout: Evidence from a Natural Experiment. *American Journal of Political Science*, **49**: 103-118.

Ledyard, J. 1984. The pure theory of large two-candidate elections, *Public Choice* 44: 7-43.

Levitt, D. Steven, and James J. Snyder. 1995. Political Parties and the Distribution of Federal Outlays. *American Journal of Political Science* **39**: 958-980.

Lindert, P. 1996. What Limits Social Spending?, *Explorations in Economic History*, **33**, 1-34.

Mahdavi, S. 2004. Shifts in the Composition of Government Spending in Response to External Debt Burden, *World Development*, 32, 1139-1157.

McKelvey, R.D. and Ordeshook, P.C. 1984. Rational Expectations in Elections: Some Experimental Results Based on a Multidimensional Model, *Public Choice*, **44**, 61-102.

Meltzer, A. and Richards, S. 1981. A Rational Theory of the Size of Government, *Journal of Political Economy*, **89**, 914-927.

Mitzkewitz, M. and R. Nagel 1993. "Experimental Results on Ultimatum Games with Incomplete Information", *International Journal of Game Theory*, 22, 171-198.

Moravcsik, A. 2004. Is there a 'Democratic Deficit' in World Politics? A Framework for Analysis, *Government and Opposition,* **39** (2. 336–363.

Nordhaus, W. 1975. The Political Business Cycle, *Review of Economic Studies*, **42**, April, 169-90.

Nooruddin, I. and Simmons, J. 2006. The Politics of Hard Choices: IMF Programs and Government Spending, International Organization, 60, 1001-1033.

Peterson, P.E. and Rom, M. 1989. American Federalism, Welfare Policies, and Residential Choices, *American Political Science Review,* **83,** 711-28.

Persson, T and Svensson, L. 1989. "Why a stubborn conservative would run a deficit: Policy with time–consistent preferences," *Quarterly Journal of Economics* 104, 325–345.

Remmer, K. 1986. The Politics of Economic Stabilization: IMF Stand-by Programs in Latin America, 1954-1984, *Comparative Politics*, 19, 1-24.

Rickard, S. J. and Caraway, T. 2014. International Negotiations in the Shadow of National Elections, *International Organization*

Roberts, K. 1977. Voting over Income Tax Schedules, *Journal of Public Economics*, **8**, 329-340.

Rosenstone, S. and J. M. Hansen. 1993. *Mobilization, Participation, and Democracy in America.* New York: MacMillan Publishing Company.

Roth, A. E. & J. K. Murnighan 1982. The role of information in bargaining: An experimental study, *Econometrica*, 50, 1123-1142.

Roth, A.E. 1995. Bargaining Experiments, *Handbook of Experimental Economics*, John Kagel and Alvin E. Roth, editors, Princeton University Press, 253-348.

Stromberg, D. 2004. Mass Media Competition, Political Competition and Public Policy, *Review of Economic Studies, **71**,* 265-284.

Verrecchia, R.E. 1982. Information Acquisition in a Noisy Rational Expectations Economy, *Econometrica,* **50**, 1415-1430.

Wolfinger, R.E. and Rosenstone, S.J. 1980. *Who Votes?,* New Haven: Yale University Press.

Wyplosz, C. 2005. Fiscal Policy: Institutions versus rules, *National Insitute Economic Review*, No. 191.

9. Appendix A: proof of Proposition 1

The optimal choice of leisure for an informed voter with productivity w given the equilibrium size of government (T_i, t_i) is:

$$l_i = \arg\max_{l\in[0,1]} U_w(l, t_i, T_i) = \alpha \ln\left((1-t_i)\, w\,(1-l) + T_i\right) + (1-\alpha)\ln l_i.$$

Assuming that l_i is an interior solution, it can be uniquely characterised by the first order conditions (second order conditions ensure that this is indeed a maximum):

$$0 = \frac{-\alpha\,(1-t_i)\, w}{(1-t_i)\, w\,(1-l_i) + T_i} + \frac{1-\alpha}{l_i} \Leftrightarrow \frac{(1-t_i)\, w l_i}{(1-t_i)\, w\,(1-l_i) + T_i} = \frac{1-\alpha}{\alpha}.$$

The optimal choice of an uninformed individual that rationally anticipates the equilibrium size of government is:

$$\begin{aligned} l_u &= \arg\max_{l\in[0,1]} p\left(\alpha \ln\left((1-t_1)\, w\,(1-l) + T_1\right) + (1-\alpha)\ln l\right) + \\ &\quad + (1-p)\left(\alpha \ln\left((1-t_2)\, w\,(1-l) + T_2\right) + (1-\alpha)\ln l\right) \end{aligned}$$

Assuming that l_u is an interior solution, it can be uniquely characterised by the first order condition:

$$\begin{aligned} 0 &= p\left(\frac{-\alpha\,(1-t_1)\, w}{(1-t_1)\, w\,(1-l_u) + T_1} + \frac{1-\alpha}{l_u}\right) + (1-p)\left(\frac{-\alpha\,(1-t_2)\, w}{(1-t_2)\, w\,(1-l_u) + T_2} + \frac{1-\alpha}{l_u}\right) \Leftrightarrow \\ &\Leftrightarrow \frac{p\,(1-t_1)\, w l_u}{(1-t_1)\, w\,(1-l_u) + T_1} + \frac{(1-p)\,(1-t_2)\, w l_u}{(1-t_2)\, w\,(1-l_u) + T_2} = \frac{1-\alpha}{\alpha}. \end{aligned}$$

Using the first order conditions for the informed citizens we can rewrite the first order condition of the uninformed as follows:

$$p\frac{l_u - l_1}{l_1 - (1-\alpha)\, l_u} + (1-p)\,\frac{l_u - l_2}{l_2 - (1-\alpha)\, l_u} = 0.$$

We need to show that $\frac{\partial \Delta(w)}{\partial w} > 0$. Whenever our solutions are interior we can apply the envelope theorem (i.e. we can disregards the effect of a change of w in the optimal solutions l_1, l_2, and l_u). It follows that:

$$\begin{aligned} \frac{\partial \Delta(w)}{\partial w} &= p\alpha\left(\frac{(1-t_1)\,(1-l_1)}{(1-t_1)\, w\,(1-l_1) + T_1} - \frac{(1-t_1)\,(1-l_u)}{(1-t_1)\, w\,(1-l_u) + T_1}\right) + \\ &\quad + (1-p)\,\alpha\left(\frac{(1-t_2)\,(1-l_2)}{(1-t_2)\, w\,(1-l_2) + T_2} - \frac{(1-t_2)\,(1-l_u)}{(1-t_2)\, w\,(1-l_u) + T_2}\right) \end{aligned}$$

Using the first order conditions for the informed and uninformed citizens we can rewrite the expression above as follows:

$$\frac{1-\alpha}{w l_u}\left(p\frac{l_u - l_1}{l_1} + (1-p)\,\frac{l_u - l_2}{l_2}\right) \tag{1}$$

We define $\hat{l}$ as the value of l_u for which expression (1) is equal to 0. This value is uniquely determined because the expression is increasing in l_u and when evaluated at $l_u = l_1$ or at $l_u = l_2$ expression (1) takes different signs. For any $l > \hat{l}$, expression (1) is greater than 0.

We now want to evaluate the first order condition of the uninformed citizen at $\hat{l}$ (instead of l_u). Our proof concludes by realising that this evaluation (given the definition of $\hat{l}$) is always greater than 0: given that the first order condition defines a maximum, we can conclude that the value that satisfies the first order condition is larger than $\hat{l}$. In other words, $l_u > \hat{l}$ and expression (1) is greater than 0.

10. Appendix B: proof of Proposition 2

There is a continuum of citizens with mass one with three productivity types: low, medium and high. Low and high types constitute a 35% of the population each, and the rest (30%) are medium types. There is uncertainty about the exact productivity of the high types: with probability p_0 their productivity is w_1^H and with probability $(1 - p_0)$ productivity is w_2^H. In this simplified example, high types perfectly know the state of the world when they learn their productivity so never have incentives to acquire information. Instead, low and medium types' posterior belief on the true state of the world is exactly equal to their prior (learning their productivity does not improve upon their initial information).

We assume that the marginal rate of substitution is $\alpha = 0.9$, and that $p_0 = 0.5$. Figure 1 depicts the optimal leisure decisions and the preferred tax rates when the productivities of three types are $w^L = 1.5$, $w^L = 1.9$, and $w_1^H = 2.8$.

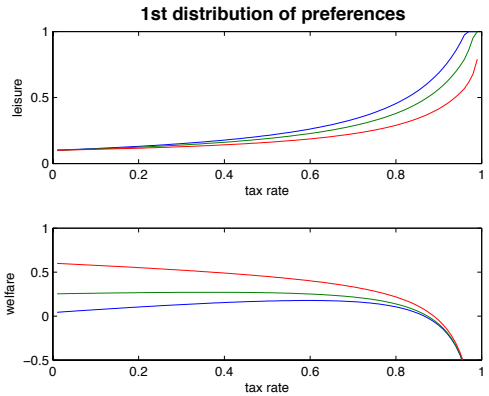

Figure A 1. Optimal leisure decisions and welfare functions when w_1^H

The above graph in Figure 2 shows the optimal leisure decision at different levels of the tax rate for the three types of voters; high, medium and low types are represented by red, green and blue

curves, respectively. More productive agents work more and as the tax rate increases, voters decide to devote less resources to productive means (enjoy their leisure time).

The graph below in Figure 2 shows the utility level each type of voter derives at different tax rates – it requires each agent rationally anticipating the equilibrium leisure decisions of other voters. We can see that the richest individuals (red curve) derive maximum utility when the tax rate is $t = 0$. Instead, the other two types of voters prefer larger tax rates: the medium type's preferred tax rate is $t = 0.36$, while the low type prefers a higher tax $t = 0.59$.

Figure 3 depicts a different situation in which the productivity of the high type is $w_2^H = 25$ and the productivities of low and medium types remain the same.

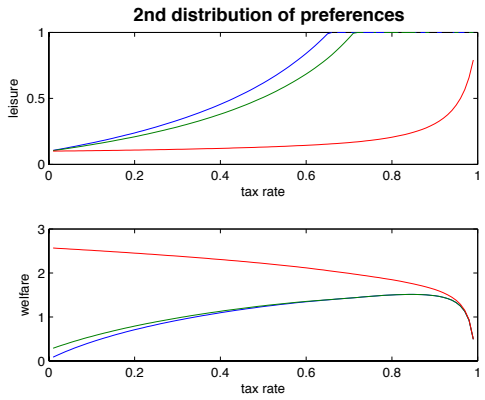

FIGURE A 2. Optimal leisure decisions and welfare functions when w_2^H

The optimal leisure decisions now change dramatically. The very productive type devotes little time to leisure but the other two types now *free-ride* on the very productive citizens. It is now apparent why citizens have private incentives to acquire political information: in order to appropriately choose their balance between labour and leisure. Given the presence of very productive types, it is not surprising to observe that low and medium types both prefer a much higher tax rate $t = 0.85$.

When the costs of information k is equal to 0.05 we have that everyone has incentives to acquire information and the equilibrium tax rate for each distribution of preferences is the one preferred by the median citizen (which is a citizen with median productivity).[16] In the first case the equilibrium tax rate is 0.36 and in the latter case it's 0.85.

What would happen when we introduce a lower bound? Imagine that the elected government is forced to at least tax income at 50% in order to finance enough lump-sum redistribution. In such scenario the unique equilibrium has low type voters abstaining (the value of information no longer

[16]The value of information for a low type is 0.0598 and the one for the medium type is 0.0601.

compensates the costs of acquiring information). Given these abstainers, the high types are pivotal and set the tax rate at the minimum possible in both states of the world. That is, they keep the tax rate at 50%. It follows that the policy restriction increases taxes rate in the first state of the world (from 0.36 to 0.5) but it decreases them in the second state of the world (from 0.85 to 0.5). The overall effect for the low types is negative: their expected utility when there is no policy restriction is 0.78 (0.83 minus the costs of information); instead their expected utility with the policy restriction is 0.69.[17]

11. Appendix C: instructions

Thank you for agreeing to participate in our experiment. The sum of money you will earn during the session will be given privately to you at the end of the experiment. From now on (and until the end of the experiment) you cannot talk to any other participant. If you have a question, please raise your hand and one of the instructors will answer your questions privately. Please do not ask anything aloud!

This experiment has two parts and each part has 18 periods. At the moment you will receive the instructions for the first part.

At the beginning of the experiment you will be randomly assigned the role of subject A or subject B such that half of the participants will be A subjects and the other half will be B subjects. Your role will not change throughout the experiment!

At the beginning of each period each A subject is randomly matched with a subject B so that the person you will interact in each period will always be different. None of you will know who the other participant is.

Each period consist of three phases

(1) *Subject A decides how to distribute £10 with subject B*

Subject A can offer £0, £0.50, £1, £1.50, ..., £9.50 or £10 to subject B. When subject B accepts the offer he receives the offered quantity and subject A receives the rest; when subject B rejects the offer they both receive zero.

(2) *Subject B can invest £0.50 to learn the offer of subject A.*

When subject B invests £0.50, he learns the offer of subject A; the amount is only paid when the offer is accepted. When subject B does not invest £0.50, he does not learn the offer of subject A.

(3) *Subject B accepts or rejects the offer of subject A.*

[17]The matlab code used to compute this example is available from the authors upon request.

When subject B accepts the proposal he receives the offered quantity and subject A keeps the rest of the £10; £0.50 are discounted from player B when he invested in learning the offer of subject A and accepted it.

At the end of each period both players receive the following information: (1) subject A's offer, (2) whether subject B paid to learn the proposal of subject A, and (3) whether the proposal has been accepted.

At the end of the experiment, the computer randomly selects 2 periods and you will obtain your earnings on those periods. Additionally you will be paid three poundss for having taken part in the experiment.

12. Appendix D: Further experimental results

Results concerning acceptance rates and payoffs are specific to the ultimatum game and not immediately related to our theoretical contribution. We report them for the sake of completeness and also because of the broader interest of our ultimatum game with asymmetric information.

We first see that the policy restriction unambiguously rises average payoffs. This is true of both senders and receivers. We know that offers are statistically indistinguishable in the absence or presence of restrictions so the increase in payoffs should be due due to other factors.

The first factor is that under the restriction regime there is less information acquisition, hence less resources are wasted (i.e.taken away from final payoffs). The second factor concerns acceptance rates: acceptance rates are significantly higher under the restriction-regime (last row in Table 6). It is this second factor that causes most of the payoff increase. The total difference in payoffs between the two regimes amounts to £433, of which only £35 are due to less information acquisition. Given that offers are, on average, not statistically different, we must conclude that about 92% of the increased payoff is due to higher acceptance rates.

	No Restriction	Restriction	Difference (p-value)
Payoffs (all)	3.781	4.282	-0.501 (0.000)
Sender's payoffs	4.800	5.396	-0.595 (0.001)
Receiver's payoffs	2.762	3.169	-0.407 (0.001)
Acceptance	0.766	0.863	-0.097 (0.000)

Table A1: Subjects' payoffs

(in brackets we report p-value of the one sided t test)