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What are the best quorum rules?
A Laboratory Investigation

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Abstract

Many political systems with direct democracy mechanisms have adopted rules preventing decisions from being made by simple majority rule. The device most commonly added to majority rule in national is a quorum requirement. The two most common are the participation and the approval quora. Such rules are a response to three major concerns: the legitimacy of the referendum outcome, its representativeness (the concern with the outcome representing the will of the whole electorate), and protection of minorities regarding issues that should demand a broad consensus. Guided by a pivotal voter model, we conduct a laboratory experiment to investigate the performance of different quora in reaching such goals. We introduce two main innovations in relation to previous work on the topic. First, part of the electorate goes to the polls out of a sense of civic duty. Second, we test the performance of a different quorum, the rejection quorum, recently proposed in the literature. We conclude that, depending on the preferred criterion, either the approval or the rejection quorum is to be preferred.

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1. Introduction

Many political systems where direct democracy mechanisms are employed have also adopted rules preventing decisions from being made by simple majority rule. "The two quorums — turnout requirement and approval requirement" (Qvortrup 2014: 130) are the devices most commonly added to majority rule in national, state/cantonal, and local referenda and initiatives across the world. Under a turnout or participation quorum[1], for a particular measure to pass and the result to be considered binding, it is required not only that the measure collects the support of a majority of those who vote but also that the overall turnout surpasses a particular threshold (typically, one half of the electorate). Conversely, under an approval quorum, those who vote in favor of a proposal must not only be more than those who oppose it but also represent, at least, a pre-defined share of the electorate (commonly between 25 and 40%; sometimes more when the referendum concerns constitutional or sovereignty issues).[2]

The introduction of quorum rules is avowedly a response to three major concerns. First, demanding a high turnout for the outcome of a referendum to be binding is linked to the fact that "low turnout rates [in referenda] (…) raise the question of legitimacy" (He 2002: 78). "If citizens are simply not interested in the referendum then the very legitimacy of the process comes into question" (Tierney 2016: 62). Second, differential turnout on the part of supporters and opponents of proposals raises the specter of "distorted" outcomes (LeDuc 2003: 172; Qvortrup 2005: 173 and 2014: 132), where "an activated minority can defeat a position held by the majority of citizens," creating a situation "in which the final verdict on the proposal, had all citizens voted, would have been different" (Kobach 1994: 139). Finally, quorum rules have also been proposed as a device with which to protect minorities against simple majority rule in issues that are thought to demand a broad societal consensus. For example, when matters of sovereignty are involved, given the fundamental importance of the issue at stake, or when there are ethnolinguistic minorities requiring protection from majority decisions, turnout or approval quora have been described as a way of making it difficult to change the status quo in the absence of a broad consensus (Şen 2015: 236), or even as mechanisms with a fundamental affinity with "consensual democracy" (Vatter 2000: 185).

Understandably, the issue of quorum rules came to the fore in the aftermath of the June 23rd, 2016 Brexit referendum. It has been noted how "it is highly unusual that, particularly on issues of great constitutional significance, a simple majority of those

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[1] We use both terms interchangeably.
[2] For a detailed treatment of existing quorum rules across the world, see, for example, Kaufmann, Büchi, and Braun (2010).

who happened to vote on a particular day should be regarded as binding" (Donnelly 2016). A widely circulated petition for a second referendum demanded, besides a qualified majority rule, a 75% participation quorum.[3] Under such rules, the outcome of a simple majority for Leave might be regarded, at most, as provisional. However, "although with hindsight such protective and legitimizing rules might seem justified, no consideration was given to them in advance" (Whitehead 2017: 223).

However, the true counterfactual of a situation where a referendum occurs in the absence of quorum rules must also consider how the presence of quorum requirements would have changed the incentives of strategic actors, be they voters or politicians. Anecdotal evidence and some in-depth cases studies suggest that, in the presence of a participation quorum, opponents of measures proposed in referenda have incentives to abstain, in order to render a possible majority for Change non-binding, and cases of mass demobilization under approval quora have also been reported.[4]

Rigorous theoretical work exploring the potential consequences of quora and the differences between them has attempted to address these effects systematically. Several models generate the prediction that adding a turnout requirement incentivizes abstention on the part of supporters of the status quo (Côrte-Real and Pereira 2004; Aguiar-Conraria and Magalhães 2010a; Hizen and Shinmyo 2011) or lead status quo parties and interest groups to lose incentives to mobilize voters (Herrera and Mattozzi 2010).

Concerning approval quora, theoretical results are less consistent, ranging from treating them as fundamentally equivalent to turnout quora (Herrera and Mattozzi 2010) to seeing them as producing less distortionary effects (Laruelle and Valenciano 2011 and 2012). Aguiar-Conraria and Magalhães (2010a) suggest the possibility that approval quora, like turnout quora, also depress overall levels of turnout, and that both types of quorum may produce the "false majorities" they were supposed to prevent, generating equilibria where the probability of outcomes undesired by a majority in the electorate is very high.

Nevertheless, empirical evidence remains very scarce. To our knowledge, only two works have taken this subject to the data. However, they use different methodologies and reach different findings, particularly regarding the effects of approval quora. Aguiar-Conraria and Magalhães (2010b), in a study based on observational data for

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[3] "EU referendum petition signed by more than 2.5m", BBC News, 25 June 2016. Available at: https://www.bbc.com/news/uk-politics-eu-referendum-36629324.

[4] For a variety of historical and contemporary examples, see among many, West (1985), Suksi (1993), Uleri (2002), Kaufmann et al. (2008), International IDEA (2008: 182). See also Offe (2017) on the hypothetical consequences of a participation quorum in the Brexit referendum. For cases of demobilization under approval quora, see Suksi (1993: 211), Svensson (1996: 38-40), and Verhulst and Nijeboer (2007: 19–21).

referenda held in current European Union countries from 1970 until 2007, conclude that the existence of a participation quorum does increase abstention rates significantly, while no such effect is associated with approval quora. Conversely, Aguiar-Conraria, Magalhães, and Vanberg (2016), in an experimental setup, confirm the results of the observational study for the participation quorum, but not for the approval quorum. They find that, in the lab, both types of quorum lead to lower participation rates, dramatically increasing the likelihood of full-fledged electoral boycotts on the part of those who endorse the Status Quo. The main difference is that the demobilizing effect of an approval quorum is less pronounced than that of the participation quorum.

In this paper, we present the results of a new empirical study, using a novel set of experiments. We introduce two innovations to the existing empirical work. First, we consider the possibility that electors obtain a benefit from voting besides the one derived from casting the decisive vote. In particular, we allow for negative voting costs, representing, for example, members of the electorate that are driven to the polls out of a sense of civic duty. The main consequence of adding this feature to our model and experimental setup — thus making it more realistic (Blais and Galais 2016; Blais and Achen forthcoming) — is that it reconciles the results of previous observational and experimental approaches: we show that the participation quorum still demobilizes electors who favor the Status Quo, but that such effect basically disappears for the approval quorum. Thus, a clear message emerges for institutional designers: if a need to impose a quorum in referenda is felt, for example, to prevent a measure from passing with low overall participation from voters, a participation quorum is a wrong way to go about it. An approval quorum is preferable.

The second innovation of this study is to consider the consequences of a third type of quorum besides the turnout and approval quora: the *rejection* quorum (Laruelle and Valenciano 2011). While the approval quorum requirement defines a share of the electorate that must support a measure in order for it to pass, the rejection quorum requirement defines a share of the electorate that must not oppose a measure in order for it to pass. In other words, this type of quorum implies that if opponents of a measure can mobilize a certain number of electors to vote against Change, then the Status Quo automatically prevails, even if Change receives the majority of votes. We analyze the effects of this type of quorum (and compare its effects with those of other quora) both from a theoretical perspective (using a pivotal voter model as our theoretical base) and from an experimental perspective. Both approaches lead to the same conclusion: if the objective of introducing a quorum is to make it harder for majorities to change the Status Quo against the opposition of minorities, then the rejection quorum is the best option, with the advantage of not leading to the demobilization of electors (a feature it shares with the approval quorum).

In section two, we present the different quora and illustrate the incentives they generate through a visual and geometrical representation. Section three presents a pivotal voter model, including quorum requirements and negative voting costs. Section four describes the Nash equilibria. Section five presents our experimental setup, while section six presents the experimental results. Section seven concludes.

2. The geometry of different quora

The different quora provide quite different sets of incentives to voters. In Figure 1 we present the different quora and the possible outcomes for an electorate of 9 people (the number we use in our experiments). Let the horizontal axis represent the people who vote for the "Status Quo" — call them "Conservatives" — while the vertical axis represents the number of people who vote for "Change" — call them "Changers". The black squares represent the combinations of results that will give victory to the Status Quo; the white ones represent a victory for Change; and grey squares represent the ties, with Change and Status Quo having both a 50% chance of winning.
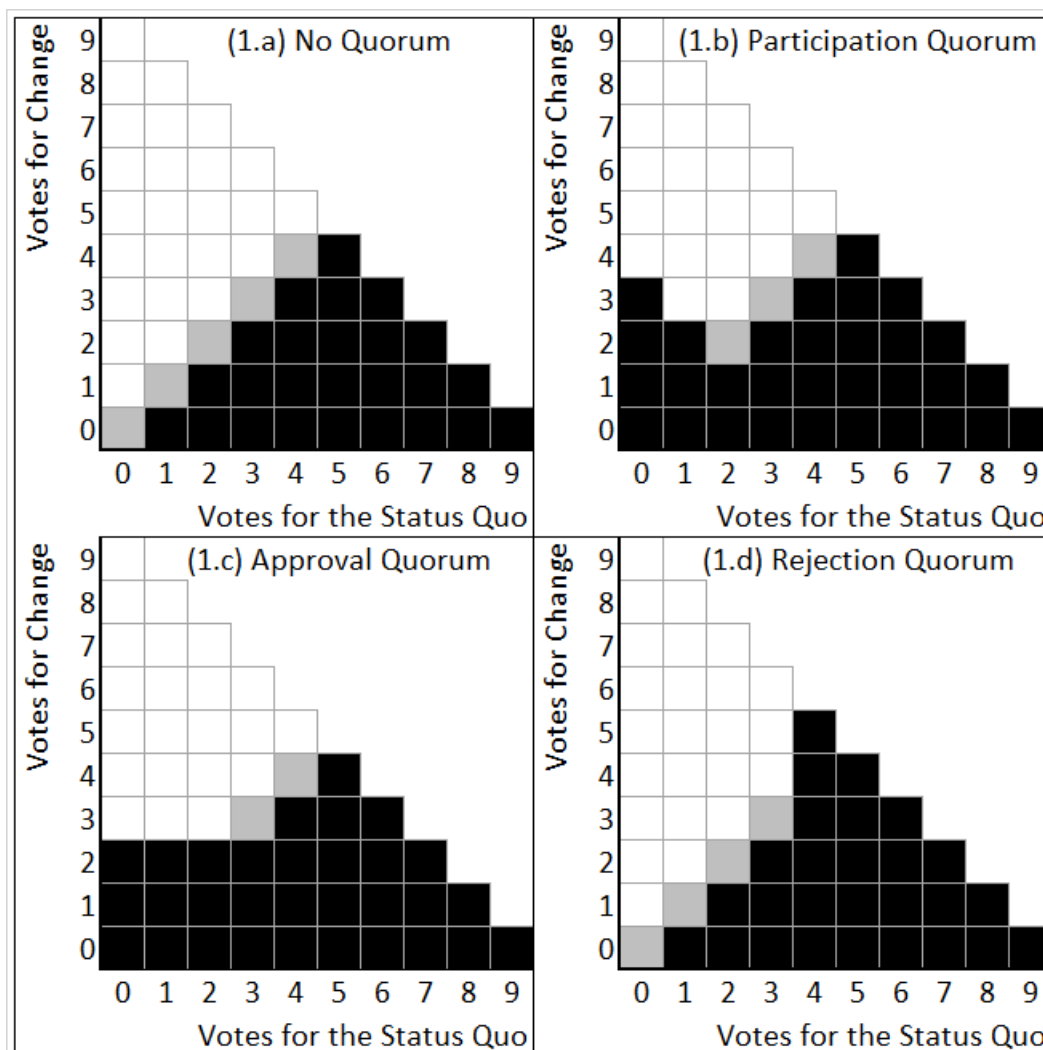

Figure 1: Change regions (white) and Status Quo regions (black)

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One noticeable effect of the introduction of any quorum is the increase of the "Status Quo" region. In other words, quora increase the set of possible results that will result in a victory for Conservatives. To understand that, let us look first at Figure 1.a, which depicts the situation with **no quorum**: whoever gets the majority of the votes wins. Then, Figure 1.b represents the most common type of quorum, the **participation quorum**. In our setup, to meet the quorum, turnout must be at least four. If participation is below that threshold, then the Status Quo wins. This, as we can see, implies increasing the Status Quo region. However, another implication is that this creates asymmetric incentives for Changers and Conservatives. Imagine that you believe that without your vote, the result will be (1, 2) — 1 for Conservatives and 2 for Changers. If you are a Conservative, by deciding to vote you also increase the probability that your preferred choice will be defeated. This is so because your vote will be decisive to meet the quorum. So, once the quorum is met, with a (2, 2) result, Change has 50% changes of winning. If you do not vote, the quorum will not be met and Status Quo, i.e., your preferred choice, prevails. That means that if you believe that the result will be (0, 3) or (1, 2), you also believe that you will be pivotal in an undesirable way: your vote will be pivotal to defeat your preferred option. On the other hand, if you are a Changer, you have a strong incentive to vote, as your vote is pivotal to guarantee the quorum and a victory — (3, 1). Thanks to your vote, you move from a sure defeat to a sure victory.

Figure 1.c represents the second most common type of quorum, the **approval quorum**. In our setup, the quorum is met if at least three electors vote for "Change". In this case, the participation of Conservatives does not affect the quorum. Therefore, the disincentive to vote disappears. Conversely, if you are a Changer, this quorum adds some incentive to vote. Not only you have to vote in order to reach the majority of the votes, but also to meet the quorum requirement. Note that there is a crucial change in the incentives: the approval quorum rule eliminates the possibility of being pivotal in an undesirable way.

Finally, Figure 1.d represents the **rejection quorum**. In this case, if at least four conservatives vote, Status Quo wins, no matter if Change got four or even five votes. Note that this is not a mere relabeling of the approval quorum: the decision to meet the quorum is entirely in the hands of conservatives, and not changers. It is also not a mirror of the approval quorum. Take the result (5,4) under an approval quorum: changers meet the quorum, and, nevertheless, they are defeated. Conversely, under a rejection quorum, a (4,5) result means that although changers have more votes, conservatives meet the rejection quorum and, by doing so, win the referendum.

In sum, the three different quora have asymmetric effects on incentives. The participation quorum is very different from the approval quorum, as it creates an

incentive for conservatives to abstain. The rejection quorum is also very different from the other two because the enlargement of the status quo region that we can see in Figure 1.d is achieved thanks to the increased mobilization of status quo supporters, instead of an increased demobilization, as in the other two. That means that the historical examples of massive demobilization by status quo supporters under participation (and sometimes also under approval) quorum requirements would probably not had happened if there was a rejection quorum instead.

3. The pivotal voter model with negative voting costs and quorum requirements.

Our experiments are an extension of that implemented by Aguiar-Conraria, Magalhães and Vanberg (2016), who built on Palfrey and Rosenthal (1985), Levine and Palfrey (2007), and Coate et al. (2008) to extend the pivotal voter model to include participation and approval quora.

As discussed, we depart from previous work in two ways. On the one hand, we consider a new type of quorum, the rejection quorum described in the preceding section. Second, and more fundamentally, we allow for negative voting costs, capturing the possibility that some electors enjoy voting (for example, they might vote by some sense of civic duty). This means that electors have an incentive to vote that is not purely instrumental, adding some realism to the model and increasing the external validity of the results.

In our setup, we have nine electors ($i = 1, …, 9$) who decide, using majority rule, between two options labeled "Change" and "Status Quo". Before voting, each player is randomly assigned a preference for one of the two options. μ denotes the ex-ante probability that an individual prefers Change . This probability is known and common to all players, while the preference assigned to each player is private knowledge.

We call "Conservatives" to those who want to keep the Status Quo and "Changers" to the others. After learning her own preference, each player decides to either *vote* or to *abstain*.

Each voter faces a cost of voting given by c_i, where c_i is the realization of a uniformly distributed random variable, $c_i \sim U[\underline{c}, \overline{c}]$. We choose $\underline{c} = -25$ and $\overline{c} = 75$. Note that with this setup, on average, one-quarter of the electors will have a negative voting cost, meaning that they derive utility just from the act of voting. Electors with a negative cost will vote even if they believe that the probability of being pivotal is zero. An equivalent way to look at this model, which is more intuitive and, hence, easier to implement in the lab, is to consider that $c_i \sim U[0,100]$ and that every voter derives a

utility of 25 just by the act of voting. This means that, on average, one out of every four electors will have a utility of voting higher than the cost of voting.[5]

After votes are cast and depending on the quorum rule that is in place, the outcome is determined. We will consider four different treatments:

1. In the case of **No Quorum**, the option receiving the larger number of votes is chosen. In case of a tie, each option wins with 50% probability.
2. In the case of an **Approval Quorum** or **Participation Quorum**, the Status Quo option wins unless one or the other quorum is met *and* "Change" receives the majority of votes cast. In case of a tie, each option wins with 50% probability, provided that the quorum is met.
3. In the case of a **Rejection Quorum**, the "Status Quo" option wins if it meets the quorum threshold. If it is not met, then whoever gets the majority of the votes wins (and, in case of a tie, there is a 50% chance for each side).

If "Change" wins the election, Changers obtain a benefit 425. Otherwise, Conservatives have a benefit of 425.[6] An individual voter's payoff is equal to the realized benefit minus voting costs incurred. Finally, we consider a participation quorum of 4, an approval quorum of 3 and a rejection quorum of 4. By choosing such a high value for the rejection quorum — note that a requirement of 5 would imply a majority of electors, making it irrelevant — we are giving this rule a good chance of not interfering with electors' behavior. Therefore, the results that we will achieve imply that the change in the structure of incentives is meaningful. Finally, we work under different scenarios of the distribution of preferences among the electorate. The probability of supporting change, μ, is varied in order to implement two "borderline majority" — $\mu = \frac{5}{9}$ and $\mu = \frac{4}{9}$ — and two "clear majority" — $\mu = \frac{6}{9}$ and $\mu = \frac{3}{9}$ — conditions.

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[5] Although it is, of course, impossible to determine the "true" share of the electorate for whom this is the case, the evidence suggests that 25% is not entirely implausible. On the one hand, in the United States, turnout in state, local or special elections that aren't concurrent with national ballots have shown turnout levels below 30% and sometimes even below 20% (Hajnal and Lewis 2003). On the other hand, the percentage of survey respondents who disagree with the statement "If a person doesn't care how an election comes out, then the person shouldn't vote in it" has hovered on 50%, in spite of signs of a generational decline in the attachment of a sense of duty to voting (Blais and Rubenson 2013).

[6] With this calibration, the results of this experiment are directly comparable to Aguiar-Conraria, Magalhães, and Vanberg (2016): if we eliminate consumption voters and keep the total benefits, the two models will be equivalent.

4. Nash Equilibria

In order to derive benchmark predictions and study the likely effects of introducing quora, we first calculate the Symmetric Bayes Nash Equilibrium (SBNE). Equilibrium predictions for these conditions are derived in Appendix 1.

Table 1: Probability of voting for different quorum rules, odds and profiles (Nash Equilibria)

Treatment		Clear majority for Status Quo ($\mu = 3/9$)		Borderline majority for Status Quo ($\mu = 4/9$)		Borderline majority for Change ($\mu = 5/9$)		Clear majority for Change ($\mu = 6/9$)	
No Quorum	eq1	72	85	83	87	87	83	85	72
Participation quorum	eq1	71	88	82	88	87	83	-	-
	eq2	28	100	27	99	35	85	-	-
	eq3	0	100	0	100	0	99	0	87
Approval Quorum	eq1	70	92	82	89	85	84	68	74
Rejection quorum	eq1	71	70	84	65	99	62	100	64

n = 9; Participation quorum = 4, Approval Quorum = 3, Rejection Quorum = 4

Legend:	**Conservatives**	**Changers**

One first result of having a fraction of voters with negative voting costs is the reduction in the multiplicity of equilibria. In a similar game without negative costs, Aguiar-Conraria, Magalhães, and Vanberg (2016) found five different Nash equilibria when either a Participation or an Approval Quorum were introduced. Table 1 shows that allowing 25% of electors to derive utility from the act of voting is enough to eliminate all the multiple equilibria in the case of the Approval Quorum, and reduce from five to three equilibria in the case of the Participation quorum.[7] By itself, this justifies the usefulness of adding this realistic twist to the model and to the experiment.

With the equilibria implying no show by either Conservatives or Changers now gone under the Approval Quorum, the second result is that turnout predictions for that case become very similar to the No Quorum benchmark case — the exception being the in the case of "Clear majority for Change". This suggests the possibility that, if a quorum aims at legitimizing the referendum result by ensuring a high level of turnout without distorting the electorate's behavior, the Approval Quorum might be a better choice than the Participation quorum.

The third result relates to the effects of the Rejection Quorum, which, to our knowledge, have never been analyzed before. On the one hand, even in the absence of negative voting costs (result not shown here), a Rejection Quorum does not

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[7] With No Quorum or with a Rejection Quorum, we have always found unique equilibria, with or without negative costs.

generate multiple Nash equilibria. This feature makes it unique in comparison with other quora. On the other hand, the Rejection Quorum, in three of the four scenarios, is expected to increase the participation of Conservatives in comparison with the No Quorum benchmark (the exception is the $\mu = 3/9$ scenario, clear majority for the Status Quo, where turnout for Conservatives is expected to decrease slightly while Changers are expected to demobilize more significantly). Therefore, if introducing a quorum aims at biasing the referendum results in favor of the Status Quo (as Figure 1 suggests), the Rejection Quorum may be a good — as yet unexplored by legislators — alternative. For example, a popular initiative called to reverse a law from the parliament would face a more challenging hurdle with such quorum.

Finally, it should be clear that the existence of a participation quorum may have a set of perverse effects. It may promote boycotts from Conservatives (note that Conservatives not voting at all is always an equilibrium) and it is even possible that it biases the results against the Status Quo by further stimulating turnout among Changers.[8]

5. Experimental design

The experiment follows a 4 x 4 design to investigate outcomes under the four quorum conditions (no quorum, participation quorum, approval quorum, rejection quorum) within each of the four preference scenarios (clear/borderline majority for/against Change). More specifically, we employed three different *between subject* (or between group) treatments: a *Participation quorum of 4*, an *Approval Quorum of 3*, and a *Rejection Quorum of 4*. Within each of these treatments, we conducted two *within-subject* (or within group) treatments, comparing one of the quorum rules with a *no quorum* baseline condition. Finally, within each of these four conditions (i.e., within each group), we varied the probability that an individual voter is a "Changer" to implement the four preference scenarios.

Table 2. Within- and between subject treatments

	Between-group/subject comparisons		
Within-group/subject comparisons	Approval Quorum (4 scenarios)	Participation quorum (4 scenarios)	Rejection Quorum (4 scenarios)
	No Quorum (4 scenarios)		

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[8] To check if we could narrow down, even more, the set of equilibria and to add new layer of realism to the model, we also considered the Quantal Response Equilibria (QRE). However, given the equilibria were similar to the SBNE in Table 1 we do not include those results here.

The experiment was conducted at the experimental laboratory of the Alfred Weber Institute of Economics at the University of Heidelberg, Germany. It involved 216 subjects, all of whom were students of the University of Heidelberg.[9] We conducted a total of 12 sessions (4 TQ, 4 AQ, and 4 RQ) involving 18 subjects per session. Within each session, subjects were randomly assigned to one of two groups of size 9. These groups remained fixed throughout the experiment, which lasted for 48 rounds.[10] Payoffs in the game were expressed as "points," with 1 point = 0.06 EUR.

At the start of each round, subjects were randomly assigned to one of two teams, labeled "A" and "B." Although neutrally labeled, one of these options represented the "Status Quo" while the other represented "Change." Next, subjects were informed about the existence of the quorum rule (if any), and asked to state a *willingness to pay* (WTP), between 0 and 100 points, to cast a vote in favor of their team. Each subject was then randomly assigned a 'voting cost' (VC) uniformly distributed between 0 and 100 points. If the VC was smaller than or equal to the WTP, the subject was said to cast a vote, and the randomly determined VC was subtracted from her earnings in the game. If the VC exceeded the WTP, the subject was said to abstain and no cost was subtracted. After all subjects submitted their decisions, the votes actually cast were counted and the winning option determined as per the quorum rule in effect. Subjects belonging to the winning team earn 450 points if they voted or 425 if they have not voted. Subjects belonging to the losing side earn 25 points if they voted or 0 if they have not voted. Therefore, just by the act of voting, the subject receives 25 points.

At the end of the experiment, participants were paid the average of 10 randomly chosen rounds, in addition to a €5 show-up fee.[11] Sessions lasted between 70 and 90 minutes. On average, each participant received 18.50 EUR.

Within an experimental session, the probability of favoring Change varied over the course of 48 independent elections (experimental rounds), implementing the four different within-group treatment conditions: a clear majority for the Status Quo (6/3); a borderline majority for the Status Quo (5/4); a borderline majority for Change (4/5); and a clear majority for Change (3/6). In addition, the quorum rule varied, from round

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[9] The experiment was organized and recruited with the software hroot (Bock, Nicklisch, Baetge 2012). The experiment was programmed using the software z-Tree (Fischbacher 2007). Students came from various disciplines (28% economics, 24% other social sciences, 15% natural sciences, 10% humanities, 23% other). 59% of our subjects were female.

[10] Subjects were not explicitly informed that they would repeatedly interact with the same set of participants. It is important to note that despite this "fixed matching" scheme, subjects were randomly assigned to the two "teams" at the beginning of each round.

[11] This method of payment was chosen as a good compromise between avoiding paying all rounds (introducing wealth effects) and paying only one round (introducing additional risk). See Morton and Wiliams (2010: 399) for a discussion of this methodological choice.

to round, between no quorum (NQ) and *either* an approval quorum of 3 (AQ) *or* a participation quorum of 4 (PQ) or a rejection quorum of 4 (RQ).[12]

As these conditions varied within the sessions, we can conduct within-subject and within-group comparisons between NQ and either AQ or PQ or RQ, as well as between-subject and between-group comparisons between AQ, PQ, and RQ. Note that, in the case of no quorum, the game is perfectly symmetric and, therefore, there is no distinction between the "Status Quo" and "Change." Experimental instructions are provided in Appendix 4.

6. Results

6.1 Descriptive statistics and non-parametric tests

As indicated above, we conducted 12 sessions, involving 24 groups of 9 participants. Since the composition of groups remained fixed throughout each session, we have 24 statistically independent observations. When conducting non-parametric tests, we, therefore, use the group as our basic unit of observation and concentrate on group-level averages. Eight groups were subjected to the "No quorum" and to each of the quorum treatments. All comparisons between each quorum rule and the "no quorum" benchmark will use data only from the eight groups who were exposed to the particular quorum type. We used Wilcoxon signed-rank tests to assess the significance of any differences observed.

Table 3: Probability of voting for different quorum rules, odds and profiles (experimental averages)

Treatment	Clear majority for Status Quo: μ = 3/9		Borderline majority for Status Quo: μ = 4/9		Borderline majority for Change: μ = 5/9		Clear majority for Change: μ = 6/9	
No quorum	66	31	67	46	46	67	31	66
Participation quorum	39***	40*	40***	57**	25***	69	20**	76**
Approval Quorum	58**	33	64	46	43	69	31	69
Rejection Quorum	63	27	68	35**	61***	53***	43***	61

Legend	**Conservatives**	**Changers**

Wilcoxon test between No Quorum and each quorum: *** p<0.01, ** p<0.05, * p<0.1

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[12] In all sessions, the probability of favoring change cycled deterministically as follows: 3/9, 6/9, 4/9, 5/9. The sequence of no quorum / quorum conditions was counterbalanced. In half of the sessions, the sequence was: 8 rounds with quorum, 4 without, 8 with, etc. In the other sessions, we began with 4 rounds no quorum, 8 with, etc. (we conduct twice as many rounds with quora because in that case the game is not symmetric and so we acquire fewer observations when distinguishing between changers and conservatives.) All random team assignments were drawn once prior to the first session and kept constant in all sessions. I.e. the realized numbers of Changers and Conservatives were the same in all treatments.

Table 3 shows the mean willingness to pay (WTP) per treatment. For ease of comparison, it mimics Table 1, merely replacing the equilibrium strategies by averages per treatment, also performing some non-parametric tests that help us establish the first set of results.

To compare two different quorum types, we use all 16 observations, eight independent observations per condition. Significance will be based on the Mann-Whitney U test for independent samples (also known as the Wilcoxon rank sum test). The results are in Table 4.

Table 4: Mann-Whitney test

Treatment	Clear majority for Status Quo: $\mu = 3/9$		Borderline majority for Status Quo: $\mu = 4/9$		Borderline majority for Change: $\mu = 5/9$		Clear majority for Change: $\mu = 6/9$	
Participation vs Rejection Quorum	***	***	***	***	***	***	***	***
Participation vs Approval Quorum	***	*	***	**	***	ns	***	**
Approval vs Rejection Quorum	ns	ns	ns	**	***	***	***	*

Legend:	**Conservatives**	**Changers**

Mann-Whitney test between different quora: *** p<0.01, ** p<0.05, * p<0.1, **ns** p>0.1

The main predictions of our theoretical model are confirmed, and Table 4 confirms that the asymmetric implications of the different quora are statistically significant.

Table 3 shows, first of all, that the participation quorum leads to a sizeable decline of overall turnout. The mechanism through which this takes place is easy to see: the participation quorum, as predicted, severely decreases turnout among Conservatives in all cases, with the corresponding increase of turnout among Changers insufficient to compensate for the demobilization of Conservatives (except in the fourth scenario). Finally, the increased turnout among Changers takes place in all but one of the scenarios, but including those where there is a majority in the electorate favoring the Status Quo.

Concerning the approval quorum, the results in Table 3 confirm that only in the case where there is a clear majority for the Status Quo do we find a lower turnout propensity among Conservatives. No other significant differences in relation to the benchmark results are detected, and overall turnout levels remain close to those of the No Quorum benchmark. Finally, under a rejection quorum, all statistically significant differences consist either in increases in turnout among Conservatives or decreases among Changers.

Consider the implications. First, participation quora show the potential to generate peculiar outcomes. On the one hand, by decreasing turnout among Conservatives, they create the possibility that, although Changers are a majority of the electorate and end up constituting a vast majority of those who vote, the quorum is not met and the Status Quo prevails. On the other hand, by increasing the turnout of Changers, they can also increase the odds of Change prevailing even when most of the electorate prefers the Status Quo. Second, and in contrast, the approval quorum seems to be the one that interferes the least with the behavior of electors when compared to the 'no quorum' benchmark. Finally, in what regards the rejection quorum, the combination of increasing the turnout of Conservatives, decreasing that of Changers, and enlarging the Status Quo region (Figure 1.d) increase the probability of a Status Quo outcome. Particularly for toss-up elections, the rejection quorum may tilt the election in favor of the Status Quo.

Table 5: Probability that the Status Quo wins for different electorate preferences in the no quorum benchmark; and changes in that probability induced by the different quora.

Electorate realized preference	Clear majority for Status Quo (6,3)	Borderline majority for Status Quo (5,4)	Borderline majority for Change (4,5)	Clear majority for Change (3,6)
No quorum	**89**	**66**	**34**	**11**
Participation quorum bias	-5	-5	+4	+11
Approval Quorum bias	+4	+4	+4	+4
Rejection Quorum bias	+7	+15	+18	+9

We can look at this more closely in Table 5, where we convert strategies under different quorum rules into probabilities of victory for the Status Quo. Note that in this table the preference scenarios are realized scenarios, not expected ones. We take the No Quorum as a benchmark, and then compute the effect on that probability of introducing a quorum. For example, in the column of "Borderline majority for Change", there are four conservatives and five changers in the electorate and, without a quorum, the probability that the Status Quo prevails is 34%. This probability

increases to 38%, 38%, and 52%, under a turnout, approval, and rejection quorum, respectively.

The perversity of the participation quorum can be appreciated here. Besides contributing to decreasing overall turnout levels, it increases the probability of a Status Quo outcome when Conservatives are a minority while favoring Change when Conservatives are a majority. Therefore, in every scenario, it increases the probability that the outcome is against the will of the majority of the electorate.

Conversely, the approval quorum has a very homogeneous effect across the scenarios: it slightly favors the Status Quo in every single scenario. Finally, the rejection quorum has a similar effect to that of the approval quorum although a more pronounced one, particularly when the electorate is evenly divided between Status Quo and Change.

6.2 Turnout rates

We now introduce regression-based estimates of the probability of voting for the different treatments. In Appendix 2.A., we show the results of a regression model where WTP ("willingness to pay") is the dependent variable. The explanatory variables are dummies for the combinations between the different quorum treatments, the different preference scenarios, and whether subjects are Conservatives or Changers. Given the nature of our data, we treat it as a panel, where the round number corresponds to time. We control for individual random effects and for a third order polynomial in the round number. Standard errors are robust to intragroup correlation.

Figure 2 displays the results for the probability of voting (for these computations, we considered Round=25, about the mean value). To each probability, we added a 95% confidence interval.
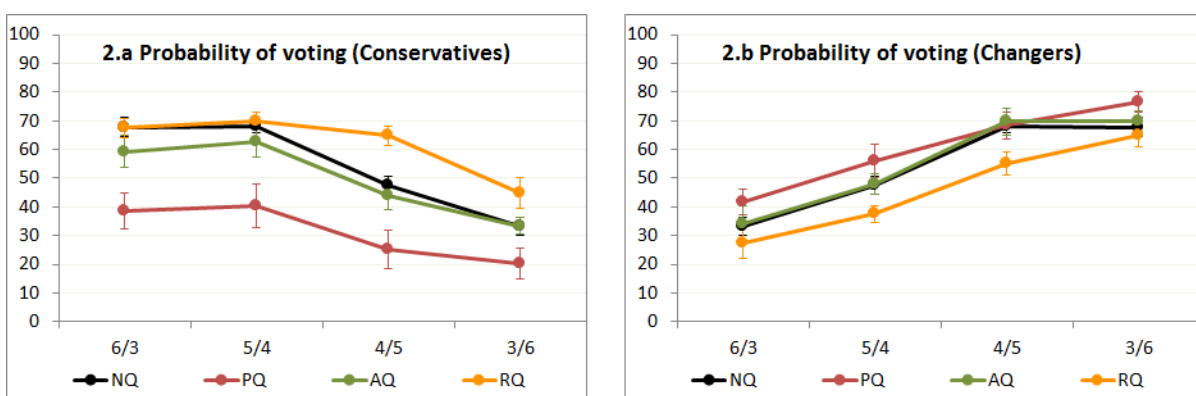

Figure 2: Experimental results depending on the (decreasing) probability that elector is conservative. (a) The effects on the behavior of conservatives. (b) The effects on the behavior of changers. Note that in the NQ treatment, there is no distinction between changers and conservatives. Error bars denote 95% confidence intervals.

The results basically reinforce our analysis of the previous subsection:

1. In every scenario, a participation quorum substantially reduces the participation of Conservatives. Among Changers, except in the case of an expected "Borderline majority for Change", in which there is no impact, their participation slightly increases (although slight, this result is always significant at 1%).

2. The approval quorum has no statistically meaningful impact on the behavior of Changers. Among Conservatives, it decreases their participation when they expect to be in the majority (probably because they believe that Changers will not meet the quorum). This decrease is statistically significant at 5 and 1%, for the expected 5/4 and 6/3 scenarios, respectively.

3. Finally, the rejection quorum increases the participation of Conservatives when they expect to be in the minority, and decreases the participation of Changers. This decrease in the participation of changers is significant at 1% in both competitive scenarios, and significant at 5% (10%) when there is the expectation of a landslide majority for Conservatives (Changers).

6.3 Quorum busting strategies

Discussing the effects of quorum rules in what concerns referenda leads us to discuss the possibility of boycotts, i.e. electors who decide to abstain with the firm objective of helping the quorum not to be met. These are electors that will abstain no matter how low the voting costs are. In our setup, that corresponds to choosing a willingness to pay equal to zero. Therefore, we created a dummy variable, call it Boycott, that takes the value one if WTP = 0 and zero otherwise. Then, we estimate a binary choice model, with the help of a random effects probit model, with the same exogenous variables as in the previous regression.
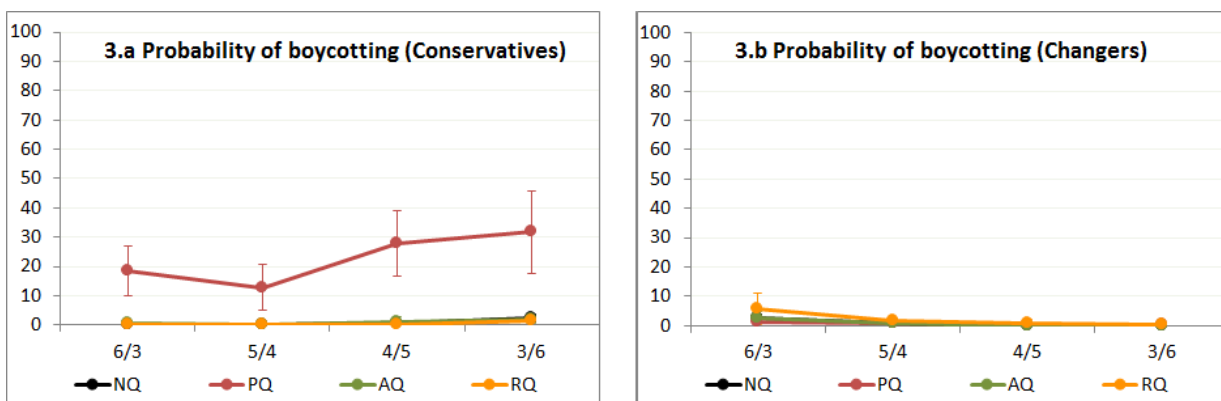

Figure 3: Probability of boycotting the election depending on the (decreasing) probability that elector is conservative. (a) The effects on the behavior of conservatives. (b) The effects on the behavior of changers. Note that in the NQ treatment, there is no distinction between changers and conservatives. Error bars denote 95% confidence intervals.

The table with the results is presented in Appendix 3, while Figure 3 shows them in a visual format. It is clear that the only quorum rule that has a significant effect on the probability of an outright boycott is the participation quorum. All the others have no such effect, as one would expect from the previous discussion. This result is also different from that of Aguiar-Conraria, Magalhães, and Vanberg (2016), who concluded that approval quora also increased the probability of boycotts. Once again, it is clear that considering negative voting costs in the model (as well as in the experiment) leads to the elimination of the previously detected perverse effects of approval quora.

7. Conclusions

The adoption of quorum rules is one general aspect of direct democracy design. Although the empirical literature on their consequences is scarce, the existing evidence point towards very significant effects of such requirements. In this paper, we introduce two innovations to the current empirical/laboratory work.

First, we allowed for a fraction of the electorate to have negative voting costs, capturing the well-known feature that, for some people, voting is not a merely instrumental decision, but also a civic duty. Adding this feature to the model adds realism and, hence, it increases the external validity of our results. As a result, we were able to reconcile seemingly contradictory results of previous observational and experimental approaches: we show that the participation quorum still demobilizes electors who favor the Status Quo, but that such effect disappears for the approval quorum, just like previous observational empirical work suggested.

A clear message emerges for institutional designers: if a need to impose a quorum in referenda is felt, for example, to prevent a measure from passing with low overall participation from voters, an approval quorum is preferable to the participation quorum. Moreover, our results also show that while the participation quorum has an asymmetric impact on the incentives of conservatives and changers, the approval quorum is much less distortionary. Therefore, if differential turnout on the part of changers and conservatives is a concern, the approval quorum is preferable.

Second, we added an analysis of a new type of quorum, the rejection quorum. To our knowledge, we are the first to analyze the effects of such quorum either with the help of a game-theoretic pivotal voter model or in a lab experiment. This quorum had a negligible impact on overall turnout; however, its effect is asymmetric among changers and conservatives. While it increases turnout among conservatives, it disincentivizes the vote of changers. The main consequence is that the probability that the status quo does not change increases considerably, especially in toss-up elections. If the motivation behind imposing a quorum is to protect the status quo, avoiding

changes that require a broad societal consensus, then the rejection quorum should be the preferred choice.

From the previous discussion, it is clear that the most common type of quorum, the participation quorum, is dominated by any of the other quora. Moreover, as we saw in section 6.1, besides contributing to decreasing overall turnout levels, the participation quorum always increases the probability of reaching the wrong result: it increases the probability that the Status Quo wins when changers are in majority while it favors Change when conservatives are a majority.

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Appendix 1 — The mathematics of the pivotal voter model with quorum requirements and consumption voters

Assume that if 'Yes' wins the election, Changers obtain a benefit b. Conservatives have a benefit of x. Assume also that there are 9 electors ($i = 1, \dots, 9$) and that each faces a cost of voting given by c_i, where c_i is the realization of a uniformly distributed random variable, $c_i \sim U[0,100]$. Additionally, if an elector votes, she derives an utility of 25 just by the act of voting. Therefore, her net costs are $c_i - 25$.

Each voter knows her own cost, but only knows the cost distribution of the other voters. Also, each elector knows her own type and knows the probability that each other individual elector favors the proposal. A strategy is a function that specifies if elector i votes or abstains for each possible realization of c_i. A symmetric Bayesian-Nash equilibrium implies that all members of a group follow the same strategy. An elector will vote if the voting cost is below some threshold. Let γ_s and γ_o be those cutoff values for Changers and Conservatives, respectively. Taking as given the strategies of the other players, let $\rho(v_o, v_s)$ be the probability that elector i attaches that, among the other 8 electors, v_o vote 'No' and v_s vote 'Yes'.[13]

To derive $\rho(v_o, v_s)$, note that the probability that there are s supporters of Change among the remaining 8 electors is given by $P(s; i) = \binom{8}{s} \mu^s (1-\mu)^{8-1-s}$. Among the s Changers, only the ones whose individual costs are smaller than their cutoff value will vote. Therefore, the probability that v_s of those will vote is $V(v_s) = \binom{s}{v_s} \left(\frac{\gamma_s}{100}\right)^{v_s} \left(1 - \frac{\gamma_s}{100}\right)^{s-v_s}$. Similarly the probability that, among the other $8 - s$ electors, v_o will vote 'No' is $V(v_o) = \binom{8-s}{v_o} \left(\frac{\gamma_o}{100}\right)^{v_o} \left(1 - \frac{\gamma_o}{100}\right)^{8-s-v_o}$. Putting all these together, we have:

$$\rho(v_s, v_o) = \sum_{s=v_s}^{8-v_o} \binom{s}{v_s} \left(\frac{\gamma_s}{100}\right)^{v_s} \left(1 - \frac{\gamma_s}{100}\right)^{s-v_s} \binom{8-s}{v_o} \left(\frac{\gamma_o}{100}\right)^{v_o} \left(1 \right.$$
$$\left. - \frac{\gamma_o}{100}\right)^{8-s-v_o} \binom{8}{s} \mu^s (1-\mu)^{8-s}. \qquad (A.1)$$

Consider the case of no quorum; a Changer is pivotal if her vote is necessary either to break or to reach the tie. So the probability of being pivotal is given by

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[13] This is an obvious abuse of notation, as ρ(.) depends on the strategies of the other players, which also depend on the existing quorum requirement. We refer the reader to Aguiar-Conraria and Magalhães (2010a) for a rigorous derivation of the model.

$\left[\sum_{v=0}^{4} \frac{\rho(v,v)}{2} + \sum_{v=0}^{3} \frac{\rho(v+1,v)}{2}\right]$. For a Conservative the probability is given by $\sum_{v=0}^{4} \frac{\rho(v,v)}{2} + \sum_{v=0}^{3} \frac{\rho(v,v+1)}{2}$.

Next, consider the participation quorum of 4. This rule introduces an additional way in which a voter may be pivotal. Namely, it could be that her vote is decisive in reaching the quorum, in addition to reaching or breaking a tie in case the quorum is met. For a Conservative, this means that she may be pivotal in an undesirable way: if her vote is decisive to meet the quorum and a majority votes in support of change, then her vote actually causes "Change" to win.

In the case of an approval quorum of 3, a Changer may be pivotal either to guarantee, or break, the tie or to reach the quorum. In contrast, a Conservative has no influence in the quorum in this case, so she can only be pivotal to guarantee or break the tie, assuming that the quorum is reached.

Finally, consider the case of a rejection quorum of 4, a Conservative may be pivotal either to guarantee, or break, the tie or to reach the quorum. In contrast, a changer has no influence in the quorum in this case, so she can only be pivotal to guarantee or break the tie, assuming that the rejection quorum is not reached.

Putting all this together, for a changer, the expected benefit of voting and the equilibrium conditions are given by:

$$\begin{cases} \left[\sum_{v=0}^{4} \frac{\rho(v,v)}{2} + \sum_{v=0}^{3} \frac{\rho(v+1,v)}{2}\right] b + 25 = \gamma_s, & if\ NQ \\[2em] \left[\sum_{v=2}^{4} \frac{\rho(v,v)}{2} + \sum_{v=1}^{3} \frac{\rho(v+1,v)}{2} + \rho(1,2) + \rho(0,3)\right] b + 25 = \gamma_s, & if\ PQ = 4 \\[2em] \left[\sum_{v=3}^{4} \frac{\rho(v,v)}{2} + \sum_{v=2}^{3} \frac{\rho(v+1,v)}{2} + \sum_{v=0}^{2} \rho(v,2)\right] b + 25 = \gamma_s, & if\ AQ = 3 \\[2em] \left[\sum_{v=0}^{3} \frac{\rho(v,v)}{2} + \sum_{v=0}^{2} \frac{\rho(v+1,v)}{2}\right] b + 25 = \gamma_s, & if\ RQ = 4 \end{cases}$$

$(A.2)$

For an Opponent, the expected benefit of voting and the equilibrium conditions are given by:

$$
\begin{cases}
\left[\sum_{v=0}^{4}\dfrac{\rho(v,v)}{2}+\sum_{v=0}^{3}\dfrac{\rho(v,v+1)}{2}\right]x+25=\gamma_o, \quad if\ NQ\\[2.5em]
\left[\sum_{v=2}^{4}\dfrac{\rho(v,v)}{2}+\sum_{v=2}^{3}\dfrac{\rho(v+1,v)}{2}-\dfrac{\rho(1,2)}{2}-\rho(0,3)\right]x+25=\gamma_o, \quad if\ PQ=4\\[2.5em]
\left[\sum_{v=3}^{4}\dfrac{\rho(v,v)}{2}+\sum_{v=2}^{3}\dfrac{\rho(v,v+1)}{2}\right]x+25=\gamma_o, \quad if\ AQ=3\\[2.5em]
\left[\sum_{v=0}^{3}\dfrac{\rho(v,v)}{2}+\sum_{v=0}^{2}\dfrac{\rho(v+1,v)}{2}+\sum_{v=4}^{5}\rho(v,3)\right]x+25=\gamma_o, \quad if\ RQ=4
\end{cases}
\qquad (A.3)
$$

Note that in the participation quorum case, a Conservative may be pivotal in an undesirable way if her vote is decisive to meet the quorum, hence the negative signs in the second equation.

For each quorum treatment, we have two equations and two unknowns. We find the equilibria numerically. Existence of solutions is not a problem, but there are no general uniqueness results. However, given that our problem is only two-dimensional and bounded, one can perform a detailed grid search to look for several equilibria. Only in the case of the participation quorum, we found multiple equilibria.

Appendix 2 — Regression results: turnout rates

We estimate a regression where WTP ("willingness to pay") is the dependent variable. The explanatory variables are dummies for the combinations between the different quorum treatments, the values of μ and, whether subjects are conservatives or changers. We control for individual random effects and for the round number — which is like a time trend with each period corresponding to a round in the game. To correct for clustering, standard errors are adjusted for 24 clusters (one per group of players).The time trend was statistically significant up to a third order polynomial.

Table A2.1: Random effects model of the Willingness To Pay to vote		
	Coefficient	SE
Constant	21.4	1.5
AQ, conservative in clear minority	0.3	1.7
PQ, conservative in clear minority	-12.9	3.4
RQ, conservative in clear minority	11.9	2.5
AQ, changer in clear minority	1.3	3.4
PQ, changer in clear minority	8.7	2.3
RQ, changer in clear minority	-5.6	2.3
NQ, in borderline minority	14.3	1.5
AQ, conservative in borderline minority	10.8	2.3
PQ, conservative in borderline minority	-7.9	3.8
RQ, conservative in borderline minority	31.7	1.8
AQ, changer in borderline minority	14.9	1.9
PQ, changer in borderline minority	22.9	2.4
RQ, changer in borderline minority	4.4	1.4
NQ, in borderline majority	34.9	1.8
AQ, conservative in borderline majority	29.7	3.0
PQ, conservative in borderline majority	7.4	4.2
RQ, conservative in borderline majority	37.0	1.9
AQ, changer in borderline majority	36.6	2.9
PQ, changer in borderline majority	35.3	3.0
RQ, changer in borderline majority	22.0	2.0
NQ, in clear majority	34.7	1.7
AQ, conservative in clear majority	26.2	2.9
PQ, conservative in clear majority	5.4	3.2
RQ, conservative in clear majority	34.4	1.8
AQ, changer in clear majority	36.7	2.0
PQ, changer in clear majority	43.5	2.4
RQ, changer in clear majority	31.9	2.4
Round number	1.365	0.176
Round number to the square	-0.051	0.009
Round number to the cube	0.0006	0.0001
Number of observations	10368	
Number of individuals	216	
SE adjusted for 24 clusters in Group		

In the no quorum treatment the game is totally symmetric and, therefore, there is no distinction between conservatives and supporters

Appendix 3 — Regression results: probability of a boycott

We estimate a random effects probit model, with the same exogenous variables as in Appendix 2. Our dependent variable is a dummy variable, call it Boycott, which takes the value one if WTP = 0 and zero otherwise.

Table A3.1: Random effects Probit on Boycotting elections		
	Coefficient	SE
Constant	-1.889	0.200
AQ, conservative in clear minority	-0.086	0.129
PQ, conservative in clear minority	1.497	0.251
RQ, conservative in clear minority	-0.197	0.176
AQ, changer in clear minority	-0.002	0.201
PQ, changer in clear minority	-0.216	0.099
RQ, changer in clear minority	0.394	0.237
NQ, in borderline minority	-0.461	0.120
AQ, conservative in borderline minority	-0.339	0.277
PQ, conservative in borderline minority	1.386	0.193
RQ, conservative in borderline minority	-1.206	0.439
AQ, changer in borderline minority	-0.526	0.191
PQ, changer in borderline minority	-0.559	0.184
RQ, changer in borderline minority	-0.207	0.173
NQ, in borderline majority	-1.724	0.257
AQ, conservative in borderline majority	-0.877	0.262
PQ, conservative in borderline majority	0.834	0.171
RQ, conservative in borderline majority*	-	-
AQ, changer in borderline majority	-1.744	0.376
PQ, changer in borderline majority	-0.929	0.260
RQ, changer in borderline majority	-0.400	0.239
NQ, in clear majority	-1.333	0.197
AQ, conservative in clear majority	-0.544	0.278
PQ, conservative in clear majority	1.072	0.180
RQ, conservative in clear majority	-1.564	0.428
AQ, changer in clear majority	-1.571	0.346
PQ, changer in clear majority	-1.046	0.173
RQ, changer in clear majority	-0.776	0.269
Round number	-0.002	0.021
Round number to the square	-0.000005	0.001
Round number to the cube	-0.000002	0.00001
Number of observations	10368	
Number of groups individuals	216	
SE adjusted for 24 clusters in Group		

In the no quorum treatment the game is totally symmetric and, therefore, there is no distinction between conservatives and supporters

* Ommited because it is a perfect predictor of zero

Appendix 4 — Experiment instructions

The following instructions were displayed (in German) on screen when subjects entered the laboratory:

<div align="center">

Instructions

</div>

Thank you for participating in this experiment. Please read the following instructions carefully. If you have a question, silently raise your hand.

General Rules

- This experiment will last for approximately 90 minutes. During this time, you should not leave your place.
- Please turn off and put away your mobile phone. Starting now, there should be nothing on your table. (A drink is permitted.)
- Please remain quiet during the experiment, and do not speak to other participants.
- At the end of the experiment, stay at your sear until your number is called. You will then be paid and you will sign a receipt.
- You will receive further instructions after all participants have taken their seats."

After all subjects had taken their seats, an announcement was made that instructions for the experiment would be displayed. Subjects were told that the instructions cover six screens and that they would be able to navigate back and forth as often as they wished. The following screens were then displayed in sequence, with "forward" and "back" buttons displayed at the bottom of the screen.

Screen 1

<div align="center">

Rounds, Points, Payment

</div>

- You will receive a 5 EUR participation fee for participating. During the experiment, you may attain either a higher or lower payment.
- Your payment will depend on your decisions and those of other participants.
- The experiment consists of 48 rounds, each of which is independent of the others. In every round, you will have the opportunity to earn points. At the end of the experiment, **10 rounds** will be randomly chosen for payment.
- Your payment will depend on your **average number of points** in the randomly chosen rounds. Points are exchanged for payment at the ratio

<div align="center">

1 point = 0.06 EUR

</div>

- If you should earn a negative number of points during the experiment, the corresponding amount will be subtracted from your show-up fee. However, your payment will be positive in all cases.

Screen 2

<div align="center">

What happens during a round?

</div>

- At the start of each round, every participant draws a **ball** from a (virtual) urn. The ball is marked either **"A" or "B"**. (Additional details regarding the composition of the urn will follow below.)
- After this, you and 8 other participants (i.e. a **group of 9 participants**) will make a choice.
- The members of the group choose between two **options "A" and "B"** by way of voting. (Details regarding the voting rules will follow below.)
- If the option chosen by your group ("A" or "B") matches the ball you have drawn ("A" of "B"), you will receive **425 points** in this round.

(Remember: 1 point = 0.06 EUR. Thus 425 points = 25.50 EUR)

Screen 3

Details: Urn and Balls

- Every participant draws a ball from his or her **own urn**, **independently** of other participants.
- The urn contains **9 balls**. Some are marked **"A"**, the others are marked **"B"**. The composition of the urn will vary from one round to the next.
- You will be informed about the number of balls marked "A" and "B" at the beginning of each round.
- Within a given round, the number of balls "A" and "B" are the **same for all participants**. The chances of drawing a ball marked "A" or a ball marked "B" are therefore the same for all participants.

Example: Suppose that the urn contains 4 balls marked "A" and 5 balls marked "B".

- In this example, the probability that you will draw a ball marked "A" is 4/9. The probability that you will draw a ball marked "B" is 5/9. The same is true for all other participants.
- In this example, it will not necessarily be the case that 4 participants will draw a ball marked "A" and 5 participants will draw a ball marked "B". For example, it is possible (though unlikely) that all participants will draw a ball marked "A".

Screen 4

Details: Voting

- In each round, every participant will decide whether he wishes to **vote** or whether he wishes **not to vote**.
- If the participant chooses to vote, a certain number of points will be initially subtracted from his total in that round. We will refer to the number of points subtracted as his **voting cost**.
- Your voting costs lie **between 0 and 100 points.** They will be **randomly determined** for each participant at the beginning of every round. Every number between 0 and 100 points is equally likely. (Remember: 1 point = 0.06 EUR. Therefore 100 points = 6 EUR.)
- Every participant is assigned his own voting cost in each round. In general, these costs will therefore differ between participants.
- If a participant decides to **vote**, then a vote for the **option corresponding to his ball** is automatically counted.
- In addition, each participant who decides to vote will receive **25 points**. We refer to this as a **voting bonus**.

Example: Suppose you draw a ball marked "A". If you choose to vote, then one vote for option "A" is automatically counted. In addition, you will "pay" the voting cost and receive a voting bonus of 25 points.

Screen 5

Details: Your Decision

- In order to better understand your decision (vote or not vote), we will proceed as follows.
- In each round, we will ask you to state **how much you are willing to pay, at most**, in order to cast a vote in this round.
- Important: We will ask this question **before we inform you of your actual voting cost in the round**. (However you will know the composition of the urn, the ball you have drawn, and the voting rule that is in effect.)
- If your voting cost is **smaller than or equal to** your stated willingness to pay, you will cast a vote and "pay" the voting cost (**not** your stated willingness to pay) and receive a voting bonus of 25 points.
- If your voting cost is **larger** than your stated willingness to pay, you will not cast a vote and you will not receive the voting bonus.
- **Your statement has no influence on your actual voting cost**. This cost is randomly determined already before you make your decision.

Screen 6:

Parts in green varied depending on treatment. Bold type was red in original.

Details: Voting Rule

- After all participants have decided (as described above) to vote or not to vote, the votes cast are counted.
- Recall that when a participant votes, a vote for the option corresponding to his ball is automatically counted.
- **In principle:** The option which receives the **most votes** is chosen. In case of a **tie**, a random choice is made (50/50).
- **However:** In addition, in **some rounds**, there will be a so-called **quorum rule**. This rule states that one of the two options (A or B) will be automatically chosen if [PQ: "**fewer than 4 votes** are cast." ; AQ: "… **fewer than 3 votes for the other option** are cast."; RQ: "… **at least 4 votes for that option** are cast."].

Example: Suppose the quorum rule states: "If [PQ: fewer than 4 votes; AQ: fewer than 3 votes for B; RQ: at least 4 votes for A] are cast, option A will automatically win." Then if, for example, [PQ/AQ: 2 votes for option B and one vote for option A; RQ: 5 votes for B and 4 votes for A] are cast, option A will win **despite** the fact that B has a majority of the votes.
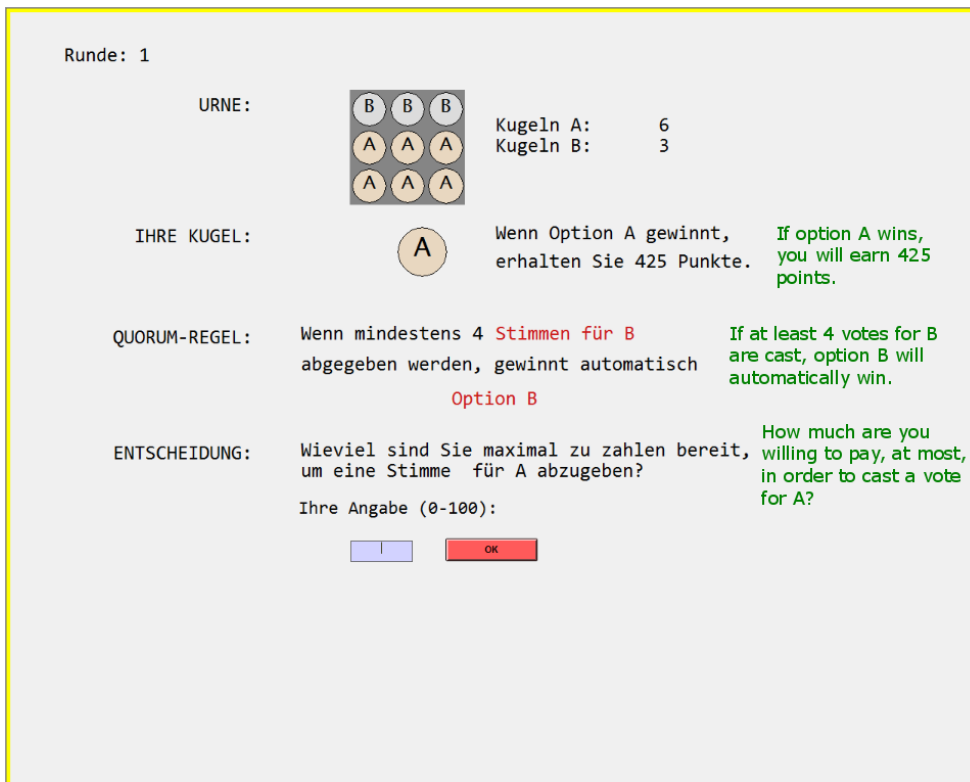
- You will be informed prior to making your decision about whether a quorum rule is in effect, and which option will win if the quorum is not met.

Note: If the option corresponding to your ball wins, you will receive 425 points, even if you have not cast a vote.
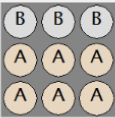
Screenshot 1: drawing a ball
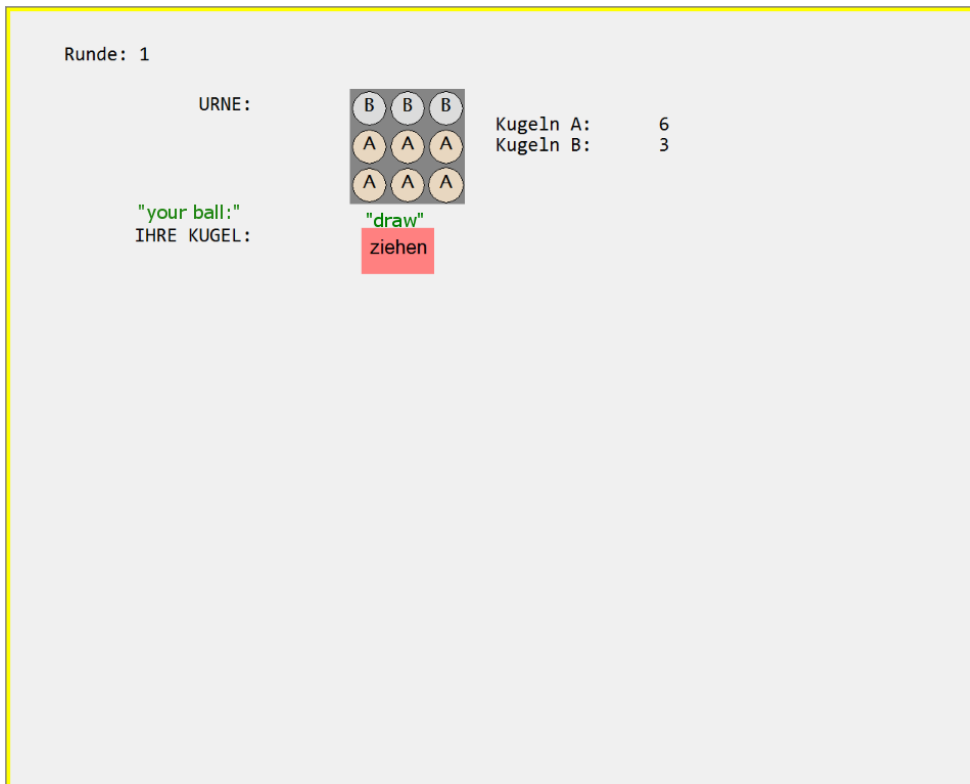
Screenshot 2: Input willingness to pay (rejection quorum version)

Screenshot 3: Feedback after cost draw (rejection quorum version)

Runde: 1

URNE:

Kugeln A: 6
Kugeln B: 3

IHRE KUGEL:

A

Wenn Option A gewinnt,
erhalten Sie 425 Punkte.

QUORUM-REGEL: Wenn mindestens 4 Stimmen für B
abgegeben werden, gewinnt automatisch
Option B

ENTSCHEIDUNG: Wieviel sind Sie maximal zu zahlen bereit,
um eine Stimme für A abzugeben?

Ihre Angabe (0-100):   Ihre Abstimmungskosten:
Your input: Your voting cost:
40   30

You will vote, pay 30 points,   Sie werden abstimmen, 30 Punkte bezahlen,
and receive a 25 point voting   und 25 Punkte Abstimmungsbonus erhalten.
bonus.

OK

Screenshot 4: Feedback at end of round (rejection quorum version)

Runde: 1

URNE:

Kugeln A: 6
Kugeln B: 3

IHRE KUGEL:

A

Wenn Option A gewinnt,
erhalten Sie 425 Punkte.

QUORUM-REGEL: Wenn mindestens 4 Stimmen für B
abgegeben werden, gewinnt automatisch
Option B

ENTSCHEIDUNG: Sie werden abstimmen, 30 Punkte bezahlen,
und 25 Punkte Abstimmungsbonus erhalten.

Participants with ball A: 6   Votes for option A: 3
ERGEBNIS: Teilnehmer mit Kugel A: 6   Stimmen für Option A: 3
RESULT: Teilnehmer mit Kugel B: 3   Stimmen für Option B: 1

Das Quorum wurde nicht erreicht. The quorum was not reached.

Option A wins (most votes)
Es gewinnt: Option A (Mehrheit der Stimmen)
(result of vote)   (voting bonus)
IHRE PUNKTE: 425 (Ergebnis Abstimmung) + 25 (Abstimmungsbonus)
YOUR POINTS: (voting cost)
- 30 (Abstimmungskosten) = 420

OK