# Theory and Evidence on the role of Social Norms in Voting

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#### Abstract

This paper investigates social norms and voting behavior. I argue that social norms create incentives for signaling, i.e. voting for the purpose of being seen at the voting act. Empirical evidence on signaling can be gained by looking at the introduction of optional postal voting in Switzerland. Even though the possibility of mail voting reduced voting costs substantially, it didn't increase turnout. Consistent with my model's predictions, voter turnout decreased more in the smaller communities, but in the meantime, the share of cooperators (= interested voters) was more positively affected there. Therefore, modern voting tools may decrease average turnout, but nevertheless increase the quality of the voting outcome. Current models predict the opposite, but ignore the effect of different voting systems on the incentive for signaling.

JEL K14, K42. Keywords: Signaling, social norms, voting, mail voting, modern voting tools.

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# 1 Introduction

The fact that people vote is a longstanding puzzle to economists. Since instrumental benefits are close to zero, but not so the costs from going to the polls, a rational individual should abstain from voting.<sup>1</sup> The "Voting Paradox" describes the fact that in spite of the economic prediction of a very low voter turnout, a fairly large amount of people goes to the polls.

Economists have tried to solve the voting paradox, either by departing from the standard framework of expected utility maximization,<sup>2</sup> or by assuming that the voting act as such gives utility (called "expressive benefits").<sup>3</sup> Expressive motives mentioned in the literature include benefits from self-expression,<sup>4</sup> a satisfaction from contributing to the functioning of democracy<sup>5</sup> and a pleasure from fulfilling a civic duty.<sup>6</sup> This last civic duty benefit presupposes that there

<sup>&</sup>lt;sup>1</sup>Downs (1957) was the first to present the "Calculus of Voting": The net payoff from voting is described as  $p \cdot B - C$ , where p denotes the probability of changing the voting outcome and B the net-benefit from having the preferred voting outcome instead of the outcome which results, if no vote is handed in. Since p is close to zero, the expected instrumental benefit  $p \cdot B$  is roughly zero and definitely smaller than C.

<sup>&</sup>lt;sup>2</sup> "Instrumentalists" stick to the assumption that the possibility of influencing the voting outcome motivates citizens to go to the polls. By departing from the simple calculus of voting, economists found models which can explain a positive (but generally low) voter turnout. While certain authors did so by modeling the voting decision according to "Minimax Regret" (see Ferejohn & Fiorina, 1974), game-theorists achieved certain equilibria with a positive voter turnout by endogenizing the probability of being decisive. Intuitively, a citizen's incentive to vote may depend on his expectations about other people's voting decisions. Such interdependencies are considered in Palfrey & Rosenthal (1983, 1985), Ledyard (1984), Austen-Smith (1984) and Owen & Grofman (1984).

<sup>&</sup>lt;sup>3</sup>See Dhillon & Peralta (2002) for the distinction between instrumentalists and expressionists.

<sup>&</sup>lt;sup>4</sup>Copeland & Laband (2002) found that people who contributed 1\$ to the Federal Election Commission or wore a sticker, button or placed a sign in the yard before the elections were more likely to vote.

<sup>&</sup>lt;sup>5</sup>This explanation was proposed by Downs (1957).

<sup>&</sup>lt;sup>6</sup>Benefits from fulfilling a civic duty have been mentioned in Riker & Ordeshook (1968, 1973).

exists a social norm that a good citizen should go to the polls and that certain individuals have internalized this social norm. Evidence from surveys suggests indeed that citizens with a strong sense of civic duty are more likely to vote.<sup>7</sup>

Even though the literature has acknowledged civic duty benefits for conscious citizens, the impact of social pressure or social rewards (external enforcement of norms) on less conscious citizens has largely been ignored.<sup>8</sup>

In this article, I for the first time theoretically and empirically analyze the power of externally enforced norms in explaining voting behavior. In the theory part, I extend the classical models of voting by including external benefits of norm-adherence. Those can be social esteem, the avoidance of informal sanctions or more cooperative trades, if a voter is perceived as more cooperative than a non-voter. Since external benefits of norm-adherence are connected to the observability of the voting act, I define all such external benefits (loosely) as signaling benefits. A main hypothesis of the paper is that certain people go to the polls only to be seen handing in the vote. The goal is to escape social sanctions or to obtain social rewards.

A perfect natural experiment, which took place in Switzerland, helps to shed light on the role of social norms empirically. The experiment involves the introduction of postal voting as an *option* in different Swiss Cantons ("states"). Even though the possibility of mail voting

<sup>&</sup>lt;sup>7</sup>See Knack (1992) and Opp (2001).

<sup>&</sup>lt;sup>8</sup>Two exceptions are Knack (1992) and Opp (2001), who mention the importance of social incentives for voting choices. Their survey findings suggest that citizens are more likely to vote, if they have politically active friends or partners which have been to college. However, this higher incentive to vote is no clear evidence on social pressure, since it could be caused by sorting: citizens with a high interest in politics are more likely to choose friends and partners with similar interests.

decreased the voting costs considerably, the empirical results do not report a general increase in turnout. Rather, quite a substantial decrease is observed in smaller-sized communities. This, at the first-glance, counterintuitive finding is certainly in contrast with traditional models of voting, but matches the predictions of my signaling model quite well.

The model can be briefly described as follows. There are different-sized communities with two types of individuals (cooperators and defectors). Cooperators have internalized the voting norm and feel a pleasure from fulfilling their civic duty (D > 0). Defectors do not care about the community (D = 0) and can only be motivated to go to the polls by the perspective of gathering signaling benefits.

In situation A, voting is only possible by going to the polls. Potential signaling benefits thus originate from being seen (or not being seen) at the voting both. However, in small communities, people know each other and gossip about who was observed at the booth and who wasn't. Therefore, total signaling benefits are assumed to decrease in community size. As a first result, I show that signaling can explain why citizens go to the polls. In a situation, where nobody would vote without signaling (D < voting costs C), a positive voter turnout results under fairly mild assumptions.<sup>9</sup> As a second result, I prove existence of a unique and non-positive relationship between (PBE) voter turnout and community size.<sup>10</sup> The basic intuition is straightforward: since signaling benefits are very high in small communities, pooling (or partial-pooling) equilibria are sustainable where (a part of the) defectors pool with the cooperators in

<sup>&</sup>lt;sup>9</sup>The only assumption is that the maximal signaling benefit exceeds the voting cost.

<sup>&</sup>lt;sup>10</sup>For establishing uniqueness, I have to restrict the beliefs off-the-equilibrium path. Banks & Sobel's (1987) refinement "universal divinity" is applied for that purpose.

order to get signaling benefits. As soon as communities get larger and the signaling benefits get smaller, defectors don't vote anymore and only a separating equilibrium is sustainable.

Situation B describes the case where citizens are given the option of postal voting next to poll voting. Depending on the expected share of cooperators voting by mail, multiple equilibria with self-fulfilling expectations result.<sup>11</sup> In spite of the multiplicity of equilibria, it can be shown that the introduction of postal voting has a non-positive impact on turnout in small communities and a non-negative impact on turnout in large communities (third result). The intuition behind result three is that the introduction of postal voting has two countervailing effects: a cost-reduction effect (with a positive effect on turnout) and a reduced signaling effect (with a negative effect on turnout). As for the latter, imagine a small community, where voting is only possible at the polls. Due to the strong social pressure and the high signaling benefits, a large share of defectors goes to the polls e.g. to avoid social sanctions from non-voting. As soon as postal voting is allowed, cheating becomes easy and defectors don't vote anymore. In large communities, on the other hand, signaling was less rewarding (or necessary) under the old voting system, so that the cost-reduction-effect of mail voting dominates.

These predictions from the signaling model stand in contrast to the predictions of standard models of voting, which only consider the modern voting tools' effect on the voting costs.

<sup>&</sup>lt;sup>11</sup>Since the defector's sole purpose of voting is to obtain signaling benefits, he never votes by mail. If the receiver believes that all cooperators vote by mail, his best response to a poll voter is to give no esteem, which induces the cooperators to vote by mail and the defectors to abstain (it is assumed that the costs from postal voting  $\underline{C}$  are smaller than the duty benefits D). Therefore, the only equilibrium is separating for all communities. At the other extreme, if the receiver believes that all cooperators vote at the polls, his best responses are as derived in situation A and the previously derived equilibria are still sustainable.

Valenty & Brent (2000) posit:<sup>12</sup> "If online voting becomes secure and convenient, voter turnout will increase. However, there may be a trade-off between quantity and quality. … If these [uninformed] voters [with no interest in politics] are encouraged to vote online, the results could be damaging."

At least for small communities, my model predicts the opposite. Modern voting tools (like mail or internet voting) may decrease average turnout, but nevertheless increase the quality of the voting outcome. Since defectors are induced to vote less, the share of informed voters increases.

Empirical evidence on the subject is obtained with Swiss data on party elections. Since the Swiss Cantons ("states") introduced optional<sup>13</sup> postal voting at different points of time, the empirical strategy is difference-in-difference estimation. As it turns out, the introduction of mail voting had no significant impact on (Cantonal) turnout at parliamentary elections. Furthermore, there was a more negative effect on aggregate turnout in Cantons with a high share of people living in small communities (with less than 1000 inhabitants). On a more dis-aggregated level, I analyze the effect of postal voting on community turnout in the Canton Zuerich.<sup>14</sup> The results suggest that postal voting had a negative impact on election turnout, with the decrease being particularly strong in small-sized communities with less than 1000

<sup>&</sup>lt;sup>12</sup>To my knowledge, this is the only economic analysis.

<sup>&</sup>lt;sup>13</sup>The fact, that poll-voting still exists next to postal voting, facilitates the interpretation of the results considerably. If postal voting replaced poll-voting completely, a decrease in turnout may be due to certain people's reluctance to use modern voting tools and may be unrelated to signaling.

<sup>&</sup>lt;sup>14</sup>The Canton Zuerich is the biggest in terms of population and has the best community data.

inhabitants. This result also holds, if the communities of the neighbor Canton St. Gallen, which had postal voting introduced already 15 years earlier, are taken as a control group.

Next to analyzing the effect of postal voting on turnout, I investigate whether optional postal voting reduced the share of defectors voting. The regressions show that the share of high-effort voters<sup>15</sup> (or "cooperators") was more positively affected by the introduction of postal voting in the smaller communities of the Canton Zuerich. This finding is consistent with the idea that under the system of poll-voting, there was a high share of defectors (or uninterested citizens) in small communities, who voted for the purpose of signaling, and whose incentives to do so were reduced with the introduction of modern voting tools.

The study provides results, which benefit several, quite different branches of literature.

- 1) As for the literature on voting, a new answer is given to the question "why do people vote". Part of the voting-paradox can be solved by considering social pressure and social rewards: Citizens go to the polls for signaling purposes. Signaling cannot only explain turnout, but also the negative correlation between turnout and community-size. Empirical evidence on social incentives is for the first time provided.
- 2) Currently, there is a hot debate, in the United States as well as in several European Countries, concerning the effects of modern voting tools (mail voting, internet voting). The general expectation is that cheap voting tools increase turnout but may decrease the quality of

<sup>&</sup>lt;sup>15</sup>In the type of (party)-election studied, a voter can either hand in the list of the favorite party, or change the list of the favorite party by deleting candidates and replacing them with candidates from other parties. Since a voter, who has changed the list, has (normally) spent more time on filling out the vote, I use the share of changed lists as a crude proxy for the share of interested voters.

the voting outcome.<sup>16</sup> This article points out that modern voting tools may not only decrease voting costs, but also signaling benefits, which may reverse the results. Empirically, the Swiss experiment provides an excellent opportunity for testing the effect of cheap voting tools. Since the Swiss Cantons introduced the (same) system of optional mail voting at different points of time, difference-in-difference-estimation (with well known advantages)<sup>17</sup> is possible.

In the United States, mail voting is at least possible in California, where absentee voting laws have been liberalized. However, the interest in the very few studies on this topic is on the characteristics of the absentee voters, rather than on the effect on turnout.<sup>18</sup> Some experiments with specific elections, which were exceptionally either held entirely by mail<sup>19</sup> or by internet<sup>20</sup>, do not allow for a general assessment of the impact of modern voting tools either.<sup>21</sup>

Note further that the Swiss system of postal voting is extremely simple and causes a sub-

<sup>&</sup>lt;sup>16</sup>See e.g. Solop (2001), Fischer (2001), and Valenty & Brent (2000).

<sup>&</sup>lt;sup>17</sup>Fixed effects do not only allow to control for heterogeneity between the Cantons/communities, but also to absorb common trends, which might influence turnout in a particular year.

<sup>&</sup>lt;sup>18</sup>See Patterson & Paldeira (1985) and Dubin & Kalsow (1996). Their main focus lies on the rates of absentee voters and their impact on the election outcome. The effect of absentee voting on total turnout cannot be rigorously analyzed with their data, since the Californian counties were affected by the law at the same time (impossible to control for shocks specific to a certain election).

<sup>&</sup>lt;sup>19</sup>In Oregon, there was one election, which was held entirely by mail, see Southwell & Burchett (1997). Several referenda in different States were also conducted by mail (see Magleby, 1987), but the effect on turnout is hard to asses since there is no information on turnout in similar referenda without mail voting.

<sup>&</sup>lt;sup>20</sup>In Arizona, there was one primary election, where internet voting was allowed. See Solop (2000).

<sup>&</sup>lt;sup>21</sup>First, if a single election is held by mail or by internet, certain voters may test this new voting tool out of curiosity. Long-run effects on turnout might be quite different, however. Secondly, in order to control for shocks specific to the election, a control group with no modern voting tool for the same type of election would be needed. Time-Fixed-Effects could then absorb supply-side effects.

stantial decrease in voting costs. In contrast to the United States, where mail ballots have to be applied for, each eligible citizen in Switzerland *automatically* receives a return envelope with the election documents, which he can either bring to the polls or put in the letter box. Therefore, the reduction in voting costs seems to be much higher than e.g. in California. Finally, the fact that mail voting was offered as an option next to poll-voting facilitates the interpretation of the results considerably (no crowding-out of poll-voters).

3) The literature on Law & Social Norms has put forward theories which explain social norms (creation and adherence to) with signaling motives or the desire to get social esteem.<sup>22</sup> The Swiss experiment of mail voting allows to at least to indirectly "test" these theories, since mail voting caused a shift in the signaling benefits. Otherwise, evidence on social norms is very hard to obtain due to obvious measurement problems.

The rest of this paper is organized as follows. Section 2 presents the model, Section 3 encompasses the empirical studies and Section 4 concludes.

<sup>&</sup>lt;sup>22</sup>McAdams (1997), Sugden (1998) and Cowen (2002) elaborate on the argument that people adhere to social norms in order to receive esteem/approval. Posner (2000) claims that an important incentive to create and obey social norms is signaling. In a recent contribution, Bernheim & Severinov (2003) explain the social norm of dividing bequests equally by the parent's attempt to signal equal parental affection to the children.

# 2 The Model

The standard calculus of voting model describes the payoff from voting as P = I - C.  $I = p \cdot B$  denotes the instrumental benefit from voting (= probability of being decisive p times relative gain from being decisive B) and C the voting costs. Since I is close to zero, the "expressionists" extended the model to P = I + E - C, where E stands for all kinds of expressive motives.<sup>23</sup>

In the following analysis, I will assume that I=0 and focus on expressive motives related to the social norm that a good citizen should go to the polls. In particular, I assume that a share  $\alpha$  of the citizens has internalized the social norm and feels a pleasure (or "warm glow") from fulfilling the civic voting duty (D>0). These agents are named cooperators. Defectors denote the share  $1-\alpha$  of the citizens who don't care about (duties to) the community (D=0). The defector's only incentive to vote is being seen at the voting booth and potentially receiving esteem and other benefits from norm-adherence, the sum of which I call signaling benefits S. While the payoff from voting is P=D+S-C for a cooperator, it is only P=S-C for a defector.

# 2.1 A community where voting takes place at the voting booth

#### The intuition behind signaling

In a community, where voting is only possible by going to the booth, a citizen who is seen at the booth may receive social esteem. Similarly, a citizen who is not seen at the booth may

<sup>&</sup>lt;sup>23</sup>Those are a utility from being able to express one's opinion, a good feeling from helping democracy work and/or from satisfying a civic duty. See introduction.

be informally sanctioned. Since modeling esteem for the voting act and modeling disapproval (informal sanctions) for the non-voting act yield very similar results, I will focus on the esteem model first, but discuss the informal sanction model in the extension.

Being seen at the voting booth may not only bring immediate benefits through social esteem, but also future benefits if citizens are more interested in interacting with a cooperative type.<sup>24</sup> For the sake of brevity, I will hereafter only talk about esteem instead of "esteem and beneficial trades", and resume all resulting benefits under signaling benefits.

In contrast to standard signaling games, where a message is sent in order to reveal a certain type (voting in order to appear as a cooperator), being seen sending the message (without inference on the hidden type) may be rewarding as well. Depending on whether esteem wants to be given for the voting act (irrespective of the type), or whether esteem wants to be given for a cooperator, different games are conceivable. In the main model, I assume that a receiver wants to give esteem to a cooperator, who votes (esteem for the voting act of a certain type). A pure signaling game (esteem for a cooperator), or a game, where esteem is given for a voter (irrespective of the type), are discussed in the extensions.

While signaling benefits originate from being seen at the voting booth, gossip may spread information further. Especially in small communities, where people know each other, people gossip about who was seen at the voting booth and who was not. Therefore, going to the polls may not only lead to signaling benefits through the citizens met at the booth, but also through

<sup>&</sup>lt;sup>24</sup>The idea that people obey to social norms in order to gain esteem goes back to McAdams (1997). Posner (2000) made the point that people who observe a voter tend to think of him as a cooperative and responsible type and may be more willing to engage in future interaction with him.

other people who get to know about the voting act by gossip.

Total signaling benefits from going to the polls (given esteem) can be described as  $S = \underline{V} \cdot n \cdot g$ .  $\underline{V}$  denotes the value from being esteemed by a citizen, n stands for the number of people met at the voting booth and g ( $g \ge 1$ ) for gossip and further information spread. For simplicity, I assume that g = 1/s, with s denoting community size. Therefore, total signaling benefits  $S = \underline{V} \cdot n/s$  decrease in community size.

#### Description of the Signaling Game

Standard signaling games model the interactions between a sender (who moves first and sends a signal) and a receiver (who responds to the observed signal). In the case of voting, every citizen is a sender, who thinks about going to the polls or not, and simultaneously a receiver, who sees other people at the polls (or learns about voting acts by gossip) and has to decide about giving esteem or not. For modeling this situation in a standard way, I assume that there is a "representative receiver" instead of many, possibly different, receivers.

In order to do this, I have to assume that all the members of the communities have the same payoffs from giving esteem or no esteem, independent of their own type (cooperator, defector).<sup>25</sup> For instance, somebody who doesn't care about the community himself, may still praise other peoples' contributions to public goods. Similarly, cooperators as well as defectors like to trade with a cooperator, and that therefore, different types of receivers react in the same way to the

<sup>&</sup>lt;sup>25</sup>For the people who meet at the booth, I do not model interdependencies between the decisions for esteem (i.e. giving esteem for receiving esteem). One can think of people getting a warm glow from praising a good citizen, independent of whether they receive esteem in return or not.

signal of the sender.

I will think of the representative receiver as being sitting at the polls, observing voters and non-voters, and getting perfect information about who votes and who doesn't. This representative receiver spreads this information to other members of the communities. In smaller communities, a larger amount of people get the information about who votes and who doesn't due to increased gossip. Therefore, if the representative receiver decides to give esteem to a voter (or non-voter), total signaling benefits for this citizen can be described as  $S = \frac{V}{s}$  (with  $V = V \cdot n$ ).<sup>26</sup>

#### The game with esteem for the voting act of a cooperator

Figure 1 describes the extensive-form representation of this game. After having learnt his type (cooperator, defector), the sender can send the messages voting (V) or not voting (NV). The receiver in turn can either give esteem (e) or no esteem (ne).<sup>27</sup> The current model assumes that the representative receiver wants to give esteem to the act of voting, but only if it is a cooperator who votes (H > 1).<sup>28</sup> It strikes me as plausible that a citizen does not necessarily

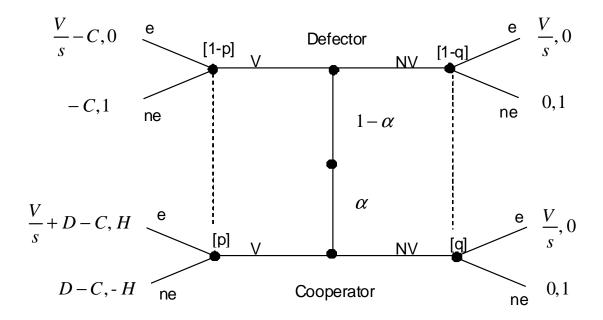
 $<sup>^{26}</sup>$ The number of people met at the polls is similar in the communities. Communities typically adapt the poll days and hours to the expected number of people handing in votes, so that the number of people n met at the polls during a given time interval is unlikely to vary systematically with community size. If anything, one could expect n to decrease in community size as well, since in small communities, people know each other more and therefore, the chance of meeting known people at the polls increases. However, since this only reinforces the gossip factor, it can be ignored w.l.o.g.

<sup>&</sup>lt;sup>27</sup>For the moment, it is assumed that the amount of esteem is fixed.

<sup>&</sup>lt;sup>28</sup>Other specifications of the receiver's payoffs make sense as well. The main results do not hinge on this specific payoff-structure. Only a large enough payoff for giving esteem to a voting cooperator is necessary to make esteem for a voter (at least sometimes) a best response.

want to give esteem to a defector, who doesn't care about the community and who votes just for reasons unrelated to the voting issue. However, modifications will be discussed later.

Figure 1: The Signaling Game 1



#### Equilibria

The equilibria are derived for communities of a minimal size  $\underline{s}$  (e.g.  $\underline{s} \geq 100$ ) and for  $\frac{V}{\underline{s}} > C$ . As will be seen, the type of sustainable equilibrium depends on the share of cooperators in the community ( $\alpha < \frac{1}{1+2\cdot H}$ ). For simplicity, the case with  $\alpha = \frac{1}{1+2\cdot H}$  will not be discussed, since it raises the issue of non-existence of equilibria in certain communities. However, the subsequent results also hold for  $\alpha = \frac{1}{1+2\cdot H}$  and the communities, where equilibria do exist.

<sup>&</sup>lt;sup>29</sup>The case with  $\frac{V}{\underline{s}} < C$  is not so interesting, since defectors never go to the polls. Therefore, attention is restricted to the situation where defectors do have incentives for signaling.

From the structure of the game, it is clear that if a defector votes, a cooperator votes as well, since he additionally has benefits D. Therefore, the only sustainable equilibria are pooling (both types voting or both types not voting), separating with cooperators voting and defectors not voting, semi-separating with defectors not voting and cooperators randomizing, and partial pooling where cooperators vote and defectors randomize. Furthermore, from the structure of the game, it seems intuitive that in the pooling equilibria, a cooperator is more likely to deviate from a non-voting equilibrium and a defector to deviate from the pooling equilibrium with both types voting. The equilibrium refinement of Banks and Sobel (1987) ("universally divine equilibrium") captures this intuition and restricts the out-of-equilibrium beliefs in the following way: a deviation from a pooling equilibrium with nobody voting occurs with probability one from a cooperator, and a deviation from a pooling equilibrium with both types voting occurs with probability one from a defector.<sup>30</sup>

Proposition 1 states that (given this refinement), there exists a unique relationship between community size and voter turnout.

**PROPOSITION 1:** With Banks & Sobel's (1987) equilibrium refinement "universal divinity", there exists a *unique* and *non-positive* relationship between community size and (PBE) voter turnout as well as between community size and equilibrium signaling benefits.

<sup>&</sup>lt;sup>30</sup>Formally, it suffices to show that e.g. in a pooling equilibrium with nobody voting, the set of mixed-best-responses, which induces a cooperator to defect, is strictly larger than the set of mixed-best-responses, which induces a defector to defect. The proof is straightforward and the same logic can be applied to the pooling equilibrium with both types voting.

We can graphically illustrate the results in a very intuitive manner (the formal derivation of all existing equilibria is relegated to the Appendix). Figure 2 illustrates the relationship between the type of equilibrium and community size for the case where C > D, i.e. a situation, where nobody would vote without signaling benefits. The share of cooperators is high enough to ensure existence of a pooling equilibrium (i.e.  $\alpha > \frac{1}{1+2\cdot H}$ ).

As figure 2 shows, the (only) equilibrium for small communities ( $s < s_1$ ) is pooling: cooperators as well as defectors go to the polls and voter turnout is 100%. As community size increases (and  $C > \frac{V}{s}$ ), only a separating equilibrium is sustainable, where cooperators vote and defectors abstain. As soon as the community size exceeds  $s_2$ , the only equilibrium is pooling with nobody going to the polls.

The important point is that in a setting, where nobody would vote without any signaling benefits, people go to the polls. Furthermore, since signaling benefits decline in the community size, the model predicts a non-positive relationship between voter turnout and community size.

Figure 3 illustrates the case with D > C, i.e. a situation where cooperators always vote. Again, signaling benefits motivate defectors to go to the polls as well. For community sizes smaller than  $s_1$ , there is always a certain share of defectors among the voters. In contrast to figure 2, the separating equilibrium is sustainable for all communities larger than  $s_1$ . The reason is that it pays for cooperators to vote even in the absence of signaling benefits (D > C).

Figure 2: Share of cooperators "high", C > D.

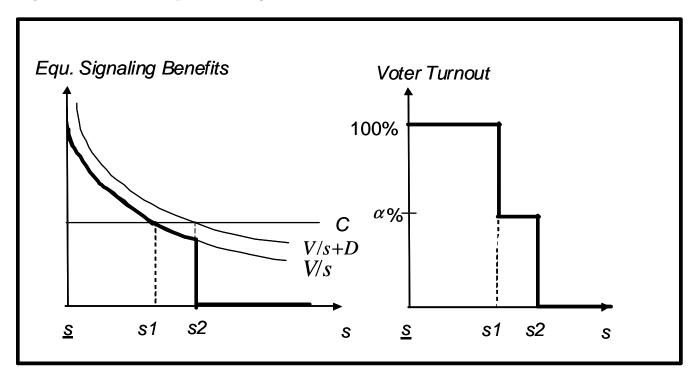
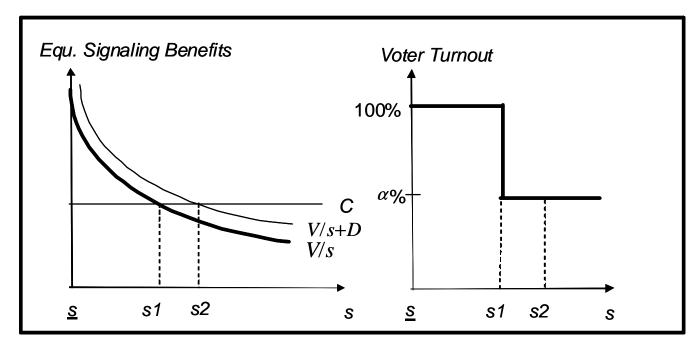
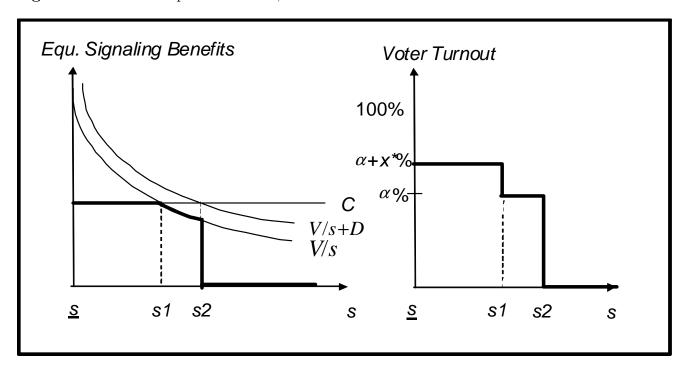


Figure 3: Share of cooperators "high", C < D.



Figures 4 illustrates the case for a low share of cooperators  $(\alpha < \frac{1}{1+2\cdot H})$ . In contrast to the previous cases, a pooling equilibrium is no longer sustainable. For small communities  $(s < s_1)$ , there exists a partial pooling equilibrium where cooperators vote, defectors randomize and receivers give esteem with probability  $\underline{p}$  (mixed best response). Since a mixed-best response is only optimal for a randomizing probability  $x^* = \frac{\alpha}{1-\alpha} \cdot 2 \cdot H$  (see Appendix for details), the share of defectors voting remains constant between  $\underline{s} < s < s_1$ , but  $\underline{p}$  increases in order to make the defector indifferent between voting and not voting (and reaches 1 at  $s_1$ ). With  $s > s_1$ , voting never pays for the defector and only cooperators vote (separating equilibrium). The separating equilibrium ends at  $s = s_2$ , if C > D (see figure 4) or remains for all communities bigger than  $s_1$  if C < D (not depicted).

Figure 4: Share of cooperators "low", C > D.



# 2.2 A community with modern voting tools

Assume that in addition to poll-voting, citizens are given the means of postal or internet voting. Obviously, this brings a substantial reduction in the voting costs (compared to the transaction costs from going to the polls). Therefore, citizens have the choice between postal/mail voting (which causes voting costs  $\underline{C}$ ) and poll voting, which causes voting costs C ( $\underline{C} << C$ ). In the following, I assume that  $D > \underline{C}$ , so that cooperators want to vote (for all s).

Note that standard models of voting (ignoring signaling benefits) predict that the decrease in the voting costs increases voter turnout. However, if the introduction of postal/internet voting affects social norms and the benefits from norm-adherence, the predictions from traditional economic theory may be reversed.

Figure 5 presents the extensive form representation of the signaling game if postal voting is an option next to voting at the polls. While cooperators and defectors still can vote at the polls (PV stands for poll voting), a certain part of the non-poll-voters (NPV) may choose to vote by mail (MV). As can be seen from the payoffs, mail-voting is strictly dominated by non-mail-voting for the defectors,<sup>31</sup> and the opposite is true for the cooperators. Therefore, as for the non-poll-voters NPV, a defector is a non-voter for sure, and a cooperator is a mail-voter for sure. Figure 6 illustrates this simplified game.

<sup>&</sup>lt;sup>31</sup>Since signaling benefits do not depend on the unobservable act mail voting/non-voting, mail voting causes costs of  $\underline{C}$  to the defector, but no benefits.

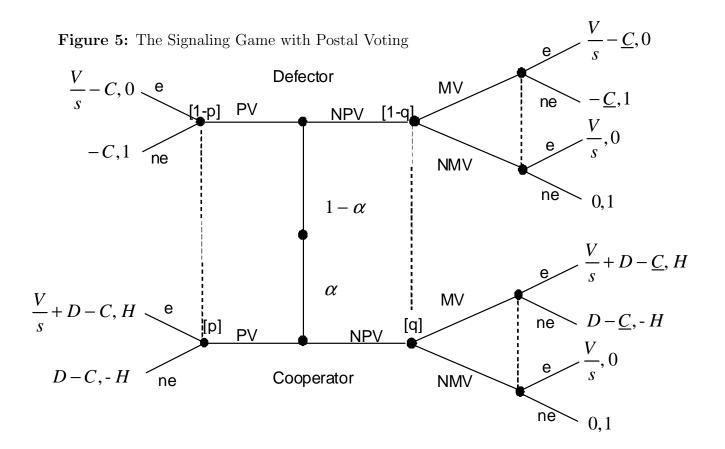
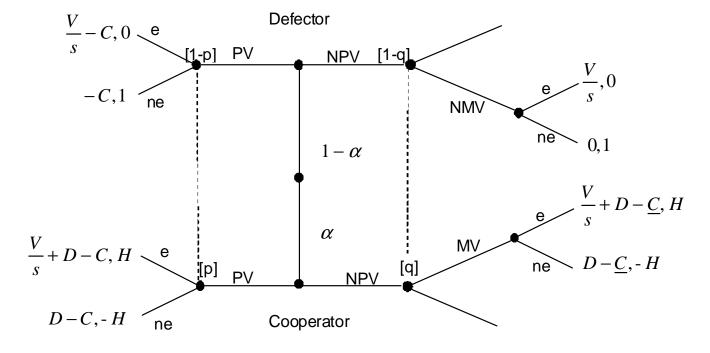


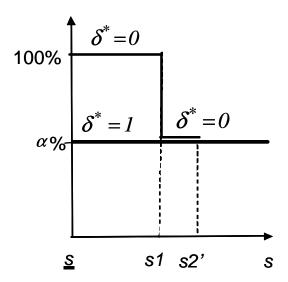
Figure 6: The Signaling Game with Postal Voting, simplified version



I assume that receivers have a (publicly known) prior  $\delta^E$  about the share of cooperators voting by mail. Depending on the prior, expectations become self-fulfilling and may generate multiple equilibria (see Appendix). Figure 7 depicts the R.E. equilibria in the case where the share of cooperators is high, i.e.  $\alpha > \frac{1}{1+2\cdot H}$ .

**Figure 7:** Rational expectations equilibria with poll- and postal voting  $(\alpha > \frac{1}{1+2\cdot H})$ 

### Voter Turnout



Note:  $s_1 = \frac{V}{C}, s_2' = \frac{V}{C - \underline{C}}$ . A RE equilibria with  $0 < \delta^* < 1$  only exists at s2'.

As can be seen therefrom, a rational expectations equilibrium, where cooperators and defectors pool, can only be sustained for the belief that a cooperator votes at the polls for sure  $(\delta^E = 0)$ . As soon as the receiver believes that a cooperator votes by mail with positive probability, the best response to a non-voter is to give esteem, which destroys the defector's incentive to go to the polls. On the other hand, consider a separating equilibrium where defectors do not

vote and a share of the cooperators votes by mail. If  $\delta^E > \frac{1-\alpha}{\alpha \cdot 2 \cdot H}$ , the receiver's best response is to give esteem to a non-poll-voter, which causes the cooperators to vote by mail and the defectors to abstain. A rational expectations equilibrium with  $\delta^* = 1, p = 0, q = \alpha$  is sustainable in all communities s. On the contrary, if  $\delta^E < \frac{1-\alpha}{\alpha \cdot 2 \cdot H}$ , the best response to a non-poll-voter is to give no esteem, which induces the cooperator to vote at the polls and leads to the rational expectations equilibrium  $\delta^* = 0, p = 1, q = 0$  (for  $s_1 < s < s_2'$ ).

In contrast to the case with no postal voting, multiple equilibria exist in small communities. However, unless the receiver believes that nobody votes by mail, the only sustainable equilibrium is separating with cooperators voting by mail and defectors not voting.

A similar logic applies to the case where the share of cooperators is low. A partial-pooling equilibrium with cooperators voting and defectors randomizing can only be sustained for the belief that cooperators only vote at the polls. Again, two types of separating equilibria exist, either cooperators voting by mail and defectors not voting,<sup>32</sup> and cooperators voting at the polls and defectors not voting (for  $s_1 < s < s'_2$ ).

Proposition 2 resumes the expected effects, the introduction of postal/internet voting has on voter turnout in small and bigger communities.

**PROPOSITION 2:** If the option of postal/internet voting is given next to poll-voting, it has a non-positive impact on (equilibrium) voter turnout in small communities and a non-negative impact on (equilibrium) voter turnout in large communities.

<sup>&</sup>lt;sup>32</sup>The equilibrium exists for  $s > s'_2$ , and for all s, if the (out-of-the equilibrium) belief for a cooperator showing up at the polls is sufficiently low  $(p < \frac{1}{1+2\cdot H})$ ; however, this belief is not allowed according to universal divinity.

The intuition behind Proposition 2 is straightforward: For large communities  $s > \frac{V}{C-D}$ , all cooperators vote by mail, whereas defectors do not vote. Therefore, the introduction of postal voting has either no impact on turnout (if cooperators did vote at the polls before (D > C)), or a positive effect, if cooperators preferred not to vote (D < C). Intuitively, the cheap voting mechanism can activate the cooperators which did not vote before due to high voting costs. In medium-sized communities  $(\frac{V}{C} < s < \frac{V}{C-D})$ , there is no effect on turnout, since a separating equilibrium remains (with possibly a share of cooperators newly voting by mail). In small communities  $(s < \frac{V}{C})$ , the pooling (or partial-pooling) equilibrium collapses as soon as the receiver believes that a share of cooperators votes by mail. Since the esteem from going to the polls relative to not voting is reduced, voting doesn't pay for the defector anymore, and turnout decreases.

#### 2.3 Extensions

The esteem model (with esteem for the voting act of a cooperator) is one among many possibilities to model external benefits of norm-adherence. In the following, I will discuss some alternative models and sketch the main differences to the previous model. For the sake of brevity, I will not derive all the results and proofs in the paper; they are available upon request.

#### 2.3.1 Esteem for a cooperative type (pure signaling model)

If the goal is to give esteem or trade with a cooperative type (independent of the voting act), the game can be modified as follows: replace the receiver's payoff from giving esteem/no esteem to a non-voting cooperator in figure 1 by H (e) and -H (ne).

A difference to the previously discussed case (Game 1: esteem for the voting act of a cooperator) only occurs for  $\alpha > \frac{1}{1+2\cdot H}$  and C > D. In contrast to the previously analyzed game, the pooling equilibrium with nobody voting is now sustainable for all community sizes. The intuition is that with beliefs  $p = 1, q = \alpha$  and a high share of cooperators, the receiver's best response is to give esteem to voters as well as non-voters. With these best-responses, cooperators and defectors never vote, independent of the community size. Therefore, the uniqueness of the relationship between community size and voter turnout (Proposition 1) only holds for D > C and/or  $\alpha < \frac{1}{1+2\cdot H}$ .

If postal/internet voting is allowed, the game is the same as in figure 6, and also the equilibria. As such, the introduction of postal voting has a non-positive impact on turnout in small communities, unless the community was in a pooling equilibrium with nobody voting. For large communities, the effect is non-negative.

#### 2.3.2 Esteem for voting act (independent of type)

Assume that the receiver wants to give esteem to a voter and no esteem to a non-voter (irrespective of the type). The receiver's payoffs from giving esteem/no esteem to a voter are (e.g.) 1/0 and from giving esteem/no esteem to a non-voter 0/1.

In a community, where voting takes place at the polls, the best-responses are giving esteem to a voter and giving no esteem to a non-voter. Again, there are three types of pure-strategy-equilibria<sup>33</sup>: Pooling with everybody voting for  $\underline{s} \leq s < \frac{V}{C}$ , separating for  $\frac{V}{C} < s < \frac{V}{C-D}$  (C > D) (or  $s > \frac{V}{C}$  (C < D)), and pooling with nobody voting for  $s > \frac{V}{C-D}$  (C > D).

If postal voting is given as an option, the best-response to a poll-voter is to give esteem. For a non-poll-voter, the best-response is esteem, if q > 0.5 and no esteem, if q < 0.5. 1. With  $\delta^* = 0$ , there exist the following R.E. equilibria (in pure strategies): pooling equilibrium for  $\underline{s} \leq s < \frac{V}{C}$ , a separating equilibrium with cooperators voting at the polls for  $\frac{V}{C} < s < \frac{V}{C-\underline{C}}$ . 2. With  $\delta^* = 1$ , there exist the following (pure-strategy) R.E. equilibria: separating for all s if  $\alpha > 0.5$ , and separating for  $s > \frac{V}{C-\underline{C}}$ , if  $\alpha < 0.5$ . 3. R.E. equilibria with  $0 < \delta^* < \frac{1-\alpha}{\alpha}$  exist at  $s = \frac{V}{C-C}$ .

Therefore, Proposition 2 holds after which small communities are non-positively affected by the introduction of postal voting and large communities non-negatively.

#### 2.3.3 Amount of Esteem

The game can be easily extended to allow for a flexible amount of esteem. If esteem wants to be given for a voting cooperator, an intuitive approach would be to increase the amount of esteem in the sender's probability of being a cooperator  $(S = \frac{p \cdot V}{s})$ . Therefore, in a separating equilibrium (p = 1), more esteem is given to a voter than in a pooling equilibrium  $(p = \alpha)$ .

The main difference to the model with a fixed amount of esteem is a smoothening of the  $\frac{1}{33}$ Hybrid equilibria are sustainable at  $s = \frac{V}{C}$  and  $s = \frac{V}{C-D}$ .

negative relationship between community size and equilibrium turnout. While in figure 2, there is a step-wise function between community size and turnout, the function gets smoother when the amount of esteem increases in the probability of being a cooperator. Next to the pooling equilibria in small communities and the separating equilibria in large communities, there newly exist partial-pooling equilibria where turnout non-linearly decreases in community size. However, since Proposition 1 and 2 still hold with a flexible amount of esteem, a further discussion of this case seems unnecessary.

#### 2.3.4 Informal Sanctions

Although the models so far have been formulated with esteem/no esteem, very similar results<sup>34</sup> are obtained if the receiver gives no approval for a (cooperative) voter and disapproval for a non-voter. In the models, the best-response "esteem" with an additional payoff  $\frac{V}{s}$  can be replaced by the best-response "no disapproval" with an additional payoff of 0, and the best-response "no esteem" can be replaced with "disapproval" and a negative additional payoff of  $-\frac{V}{s}$ , and the same equilibria occur. Therefore, the signaling benefits can generally be interpreted as avoided disapproval, if the reaction of the receiver is to informally sanction a non-voter rather than giving esteem to a voter.

<sup>&</sup>lt;sup>34</sup>In the partial-pooling equilibrium where cooperators vote and defectors randomize, the probability of esteem, which sustains the equilibrium, is different, but the same equilibria can be supported.

# 2.4 The signaling model and the classical theory of voting

The standard theory of voting neglects social incentives to vote to a large degree. The standard approach does not go further than including a D-term (civic  $\underline{D}$ uty) in the calculus of voting. My model accounts for internal benefits of norm-adherence (D-Term), but also for external benefits of norm-adherence. Since being seen at the polls may bring esteem (and/or enables to escape informal sanctions for non-voting), I claim that certain people go to the polls only to be seen at the voting act.

The main additions as well as differences of my model compared to traditional voting theory are the following:

- The signaling argument (broadly defined) gives rise to a new explanation as to why people vote and hence can solve the voting paradox.
- Since signaling benefits are likely to decrease in community size, my model predicts a negative relationship between turnout and community size. Standard voting models do not make any predictions concerning turnout and community size.
- Probably the most obvious discrepancies between standard models and my signaling model concerns the evaluation of modern voting tools. The conclusions from standard voting models are that cheap voting tools (internet/postal voting) lead to an increase in turnout and possibly a decrease in the quality of the voting outcome (see Valenty & Brent (2001, p.121), cited in the Introduction). Inclusion of signaling arguments reveals a differential impact of modern voting tools on different-sized communities. More specifically,

the model predicts: (i) A potential decrease in average turnout after the introduction of postal/internet voting (ii) A non-positive impact on voter turnout in small communities and a non-negative impact in large communities (iii) A decrease in the share of defectors voting (or an increase in the share of informed people) in small communities (iv) A more frequent use of cheap voting mechanisms in larger communities ( $\delta^* = 1$  for  $s > \frac{V}{C-\underline{C}}$ ).

Since partially opposed effects from modern voting tools are predicted from standard models and the signaling model, indirect evidence on signaling can be obtained by investigating the impact of postal voting on turnout in Switzerland.

# 3 The Data

Switzerland is a small federalist country with roughly 7 million inhabitants. The country consists of 26 major districts (called "Cantons", see figure 8), which are further divided into minor districts (called communities, "Gemeinden"). The 26 Cantons have their own constitution and legislative power and are free to pass laws, as long as they do not contradict with federal law.

As for the regulation of the voting process, the Swiss Cantons differ with respect to the use of modern voting tools (postal voting). While certain Cantons introduced the *option* of postal voting<sup>35</sup> already in the 80's, the majority gave citizens the possibility to vote by mail in the 90's (see table 1).<sup>36</sup>

 $<sup>^{35}</sup>$ Mail voting never replaced the polls, but was offered as a further option.

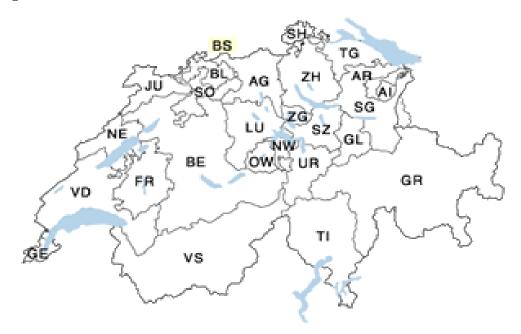
<sup>&</sup>lt;sup>36</sup>In fact, a federal law was enacted in 1995, which prescribed the Cantons to introduce the option of postal voting in order to facilitate voting for the citizens. From then on, there was only some variation left with respect to the time until the process of mail voting was organized.

Table 1: The introduction of postal voting

Canton	Introduction Postal Voting	Canton	Introduction Postal Voting	Canton	Introduction Postal Voting
BL	1978	AI	1979	SG	1979
SO	1980	TG	1985	AG	1993
ZH	1994	NW	1994	LU	1994
SH	1995	UR	1995	OW	1995
GL	1995	ZG	1995	FR	1995
BS	1995	GR	1995	GE	1995
JU	-	VD	-	VS	-
NE	-	GE	-		

Note: Early introducers are bold. Source: Survey of Postal Voting in Switzerland.

Figure 8: The Cantons in Switzerland



The Swiss voting procedure generally, but also the system of mail voting is very simple. In contrast to the United States, where voters have to register, every eligible citizen from Switzerland *automatically* receives the (election) documents per mail. If mail voting is allowed,

a return envelope is added to the election documents, so that the voter has only to put a stamp on the envelope and to drop it in the letter box. Since the alternative is to bring the filled-out documents to the polls, the transaction costs from postal voting are much lower.

The goal of the empirical part is to analyze the effect of postal voting on turnout and to check for differences in different-sized communities (as predicted by the signaling model). The Cantonal variation in the timing of introduction provides a wonderful setup, since it allows for difference-in-difference estimation. Two data sets will be used: Swiss-wide data on Cantonal turnout, and data on turnout in the different communities of the (neighbor) Cantons Zuerich (ZH) and St. Gallen (SG), who introduced postal voting at very different points of time.

# 3.1 An analysis of Cantonal Data

The subject of investigation is voter participation at national parliamentary elections ("Nationalratswahlen") from 1971 to 1999 (elections are held every four years).<sup>37</sup> Similar to the American House of Representatives, the "Nationalrat" is the one (of the two legislative chambers), where the number of seats assigned to each region (Canton) corresponds to the population of the region (Canton). The election is for parties, with the different parties' weight being (roughly) determined by the proportion of votes received (proportional representation).

Analyzing turnout for this type of election bears several advantages. Firstly, the voting subject is unchanged over time. Secondly, since supply-side shocks affect turnout on a national

<sup>&</sup>lt;sup>37</sup>The year 1971 qualifies as a natural starting point, since it is the first year where women were allowed to vote.

rather than Cantonal level, they can be absorbed by time-fixed-effects.<sup>38</sup> Thirdly, since the voting day(s) are determined on a national level, shocks on turnout due to weather conditions are probably similar in the Cantons as well.

The relationship between Cantonal differences in mail voting and turnout shall now be investigated. Figure 9 depicts the development of turnout of the early introducers compared to a control group of similarly sized Cantons. As can be seen from the raw data, the introduction of postal voting doesn't seem to have boosted turnout remarkably (the vertical line depicts the last election with poll-voting only).

However, since turnout certainly depends on many more factors than the voting process, I proceed with a more careful econometric analysis. The fixed-effect models to be estimated are the following:

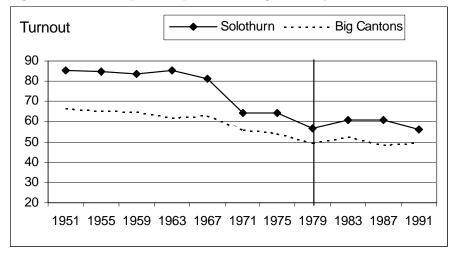
$$VT_{st} = \alpha_s + \gamma_t + b_1 \cdot Postal_{st} + b \cdot Z_{st} + u_{st}$$
 (1)

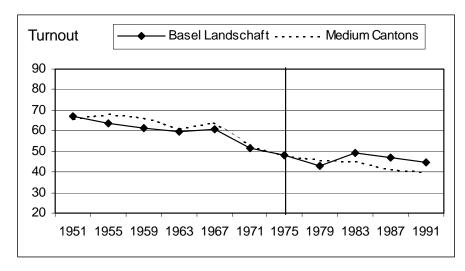
$$VT_{st} = \alpha_s + \gamma_t + b_1 \cdot (Postal \cdot Prop)_{st} + b \cdot Z_{st} + u_{st}$$
(2)

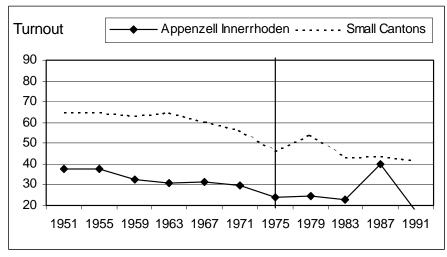
 $VT_{st}$  denotes voter turnout (in percentage) in Canton (state) s in election t. The variable of interest is a Postal-Dummy (Postal), which takes a value of 1, if mail voting is offered, and a value of 0 otherwise.

<sup>&</sup>lt;sup>38</sup>For instance, if a party engages in harder competition by increasing advertising expenditures, it most probably affects the perception of this party (and turnout) in all Cantons.

Figure 9: The impact of postal voting on early introducers







In specification 2, I employ the interaction term between the dummy postal and the proportion of cantonal residents living in small communities (i.e. less than 1000 inhabitants), named  $Prop.^{39}$ 

As control variables Z, I employ:

Population (Pop): number of inhabitants (per Canton and year).<sup>40</sup>

Age (Age): percentage of inhabitants in different age classes (per Canton and year). The following age classes are considered: 0-19, 20-39, 40-59, 60-64, 65-74.<sup>41</sup>

Higher Education (Edu): Number of "high-school degrees" per number of 15 to 19 year old people.<sup>42</sup>

Unemployment Rate (UE): Number of unemployed persons per active population<sup>43</sup>, in percentage.

<sup>&</sup>lt;sup>39</sup>As for the statistics of structure of the communities in each Canton, there exist data about the number of people who live in communities with different sizes. The smallest size is "less than 1000 people", and the highest is "more than 100'000". All in all, 8 classes are distinguished.

<sup>&</sup>lt;sup>40</sup>Cantonal data on population were collected in the population census, which was conducted roughly every ten years. Intermediary values were obtained by linear interpolation.

<sup>&</sup>lt;sup>41</sup>The data stem from the population census as well. Missing data were obtained by linear interpolation.

<sup>&</sup>lt;sup>42</sup>High-school is put in quotation marks, because the Swiss school system is different from the American one. After six years of primary school (commonly attended from 6 to 12 years), there are three options: the "Realschule" (lowest level), the "Sekundarschule" (intermediate level) and the "Gymnasium" (highest level, denoted as "high-school"). While completion of the first two types of education takes between two and three years, "high-school" lasts six years. Therefore, "high-school" is commonly completed at age 18 and the number of "high-school"-degrees per number of 15 to 19 year old teenagers represents an adequate indicator for the frequency of attendance of higher education. Data source: Statistical Yearbooks of Switzerland.

<sup>&</sup>lt;sup>43</sup>The active population consists of individuals working more than 6 hours per week. Unemployment Rates in Switzerland are measured in relation to the active population. Data Source: State Secretariat for Economic Affairs (seco).

Income (INC): Average Cantonal per capita income.<sup>44</sup>

Prop (*Prop*): Percentage of people living in communities with less than 1000 inhabitants.<sup>45</sup>

Duty (DT): A dummy variable which takes a value of 1, if the Canton has a fine for non-voting.<sup>46</sup>

Table 2 shows the regression estimates. Standard errors are depicted in parantheses and account for heterogeneity between as well as autocorrelation within Cantons.<sup>47</sup>

As can be seen from the first column, the introduction of postal voting did not increase voter turnout (the coefficient is insignificant). However, as columns 2 to 4 show, the structure of the Canton matters for the overall effect. Cantons with a higher proportion of people living in small communities had a more negative (or less positive) effect on turnout.

While this differential impact on differently-structured Cantons can certainly not be explained by endogeneity, endogeneity may bias the coefficient in column 1 downward. A crude test for endogeneity is to include lead dummies in the regressions.<sup>48</sup> As it turns out, past voter turnout cannot significantly explain the timing of introduction of postal voting. As such, endogeneity is unlikely to cause the lack of a (significant) positive effect of optional postal voting on turnout.

<sup>&</sup>lt;sup>44</sup>The data stem from the bureau of statistics. One missing year (1971) was obtained by linear interpolation.

 $<sup>^{45}</sup>$ The data stem from the population census as well. Missing data were obtained by linear interpolation.

<sup>&</sup>lt;sup>46</sup>The fines are minimal (normally less than 1 \$), but might nevertheless influence voting behavior.

<sup>&</sup>lt;sup>47</sup>Bertrand, Duflo and Mullainathan (2004) show that the failure to account for within-unit-autocorrelation can lead to an underestimation of standard errors in difference-in-difference estimations. As for the proposed solutions, clustering at the state-level performs quite well and is applied here.

 $<sup>^{48}</sup>$ See Friedberg (1998) for a similar approach in her analysis on divorce laws.

Table 2: Postal Voting, Structure of the Canton and Turnout

	(1)	(2)	(3)	(4)
<b>Dummy Postal</b>	<b>0.7</b> (1.5)		4.9	4.9
Dummy Postal <sub>*</sub> Prop	(1.3)	<b>-0.2*</b> (0.1)	(0.17)	(3) <b>-0.39**</b> (0.17)
Age 0-19	3.2 (2.4)	2.8 (2.2)	2.5 (2.4)	2.4 (2.5)
Age 20-39	1.9 (2.8)	1.3 (2.5)	1.6 (2.6)	1.3 (2.8)
Age 40-59	2.7 (2.5)	2.6 (2.2)	2.5 (2.3)	2.3 (2.4)
Age 60-64	3.2 (3.5)	2.1 (3.6)	1.5 (3.6)	1.4 (3.8)
Age 65-74	1.9 (3.3)	1.2 (2.9)	1.2 (3.3)	1.1 (3.3)
Population	-0.08 (0.05)	-0.1** (0.04)	-0.07* (0.04)	-0.08* (0.04)
Unemployment	<b>-0.7</b> (0.9)	<b>-0.8</b> (0.9)	-0.75 (0.78)	-0.74 (0.76)
Education	-0.2 (0.8)	-0.2 (0.6)	0.8	0.6 (0.84)
Income	0.03	<b>-0.03</b> (0.14)	<b>-0.08</b> (0.14)	-0.07 (0.14)
Prop	-0.16 (0.7)	<b>-0.5</b> (0.7)		-0.4 (0.6)
Dummy_Fine	2.2	2.1	3.4 (2.3)	3.5
Canton-FE	Yes	Yes	Yes	Yes
Time-FE	Yes	Yes	Yes	Yes
Adj. $R^2$	0.99	0.99	0.99	0.99
Number of Observations	202	202	202	202

Dependent Variable: Voter Tumout per Canton and (election) year. White standard errors accounting for serial correlation within Panels (cantons) are depicted in parantheses.

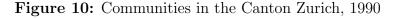
# 3.2 An analysis of Community Data

#### 3.2.1 The effect of postal voting on turnout

While Cantonal data suggest that postal voting did not significantly affect aggregate turnout, opposed effects in small and large communities might cancel each other out. In fact, as the regressions showed, Cantons with many people living in small communities seemed to experience a less positive effect on turnout.

In order to investigate the impact of postal voting on different-sized communities more directly, I look at *communal* turnout for exactly the same elections. Since all votes have to be handed in at the community level, data exist for community turnout as well as Cantonal turnout (i.e. the aggregation over the communities). Unfortunately, community data are not available electronically, and data on community characteristics are not even collected in many Cantons. Therefore, I select the Canton Zuerich as a starting point, since it is the biggest in terms of population and has the most advanced Cantonal bureau of statistics.

The Canton Zuerich has 171 communities, which are of very different sizes (see figure 10). More than twenty percent of the communities can be described as very small, with a population of less than 1000 inhabitants. Since the Canton Zuerich introduced postal voting in the year 1994, it seems interesting to compare turnout in the last election with poll voting only (conducted in 1991) and the first election with optional mail voting (in 1995).



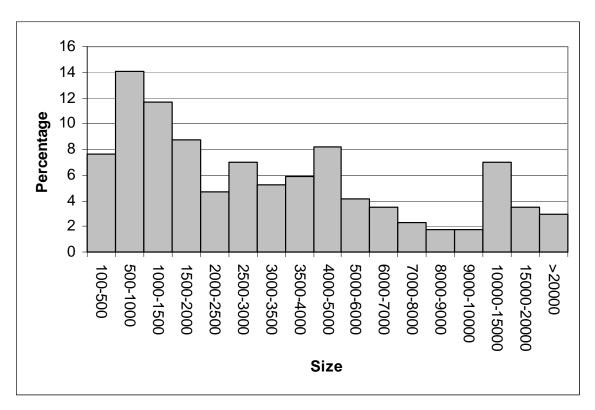


Figure 11 shows turnout at the 1991 parliamentary election. As can be seen therefrom, there is a strong negative correlation between community size and voter turnout. This negative correlation is compatible with the signaling idea that social pressure forced (or social benefits motivated) citizens to go to the polls in small communities. However, other explanations can account for this pattern as well (higher share of cooperators in small communities, higher consumption benefits in small communities).<sup>49</sup> Figure 12 depicts turnout at the next election, where postal voting was given as an option for the first time.

 $<sup>^{49}</sup>$ Note that instrumental benefits are the same in the communities, since votes are counted on a Cantonal level. Therefore, the negative correlation cannot be caused by different instrumental benefits of communities.

Figure 11: The Relationship between Voter Participation and Community Size

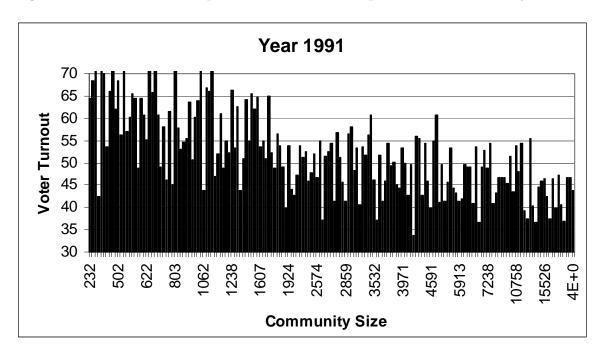
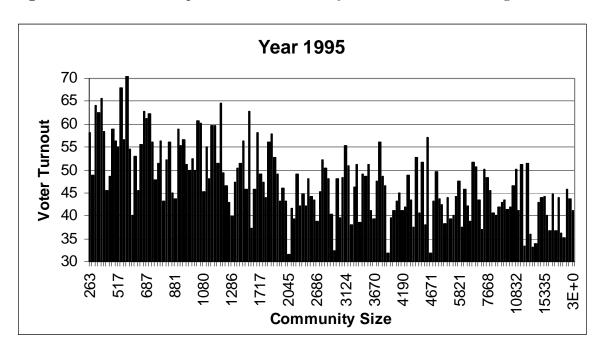


Figure 12: Voter Participation and Community Size with Postal Voting



From pure visual inspection from the graphs, one can see a drop in turnout in the small communities (compare figure 11 and 12). However, since other factors could have caused this drop (e.g. a change in the age structure of population in small communities), I proceed with a more careful econometric analysis.

The panel-data study comprises a time-horizon from 1983-1999 (i.e. three elections without postal voting and two elections with postal voting). In a first set of equations, I analyze the impact of postal voting for the communities in the Canton Zuerich. Since all the communities were hit by postal voting at the same time, difference-in-difference estimation is not feasible. In a second set of equations, I therefore include the communities of the Canton St. Gallen as a control group. The Canton St. Gallen is a neighbor Canton of Zurich (see map, it is located on the right and abbreviated "SG") and has the same language, a similar party-structure, <sup>50</sup> and the Swiss-German culture. It is slightly smaller than Zuerich, with 86 communities, 10 percent of which have less than 1000 inhabitants. Since St. Gallen introduced the option of postal voting already in the year 1979, it serves as a perfect control for difference-in-difference estimation.

<sup>&</sup>lt;sup>50</sup>Both Cantons have a strong right-wing party (SVP).

The main regression equations are the following:<sup>51</sup>

$$VT_{ct} = \alpha_c + \gamma_t + b_1 \cdot Postal_{ct} + b \cdot Z_{ct} + u_{ct}$$
(3)

$$VT_{ct} = \alpha_c + \gamma_t + b_1 \cdot (Postal \cdot Small)_{ct} + b_2 \cdot (Postal \cdot Big)_{ct} + b \cdot Z_{ct} + u_{ct}$$
(4)

 $VT_{ct}$  denotes voter turnout in community c at election t. In equation (3), the coefficient of interest is  $b_1$ , measuring the average impact of postal voting on turnout. Equation (4) estimates the effect of postal voting on turnout for small and large communities separately.<sup>52</sup> The dummy variable  $Postal \cdot Small$  takes a value of 1, if postal voting is given and the community had (a minimal value<sup>53</sup> of) less than 1000 inhabitants, and 0 otherwise.  $Postal \cdot Big$  takes a value of 1, if postal voting is given and the community had (a minimal value of) more than 1000 inhabitants, and 0 otherwise.

The control variables are similar to the analysis of Cantonal data and include the share of citizens in different age classes, as well as a measure for education.<sup>54</sup> Furthermore, I control for differences in the tax rates and also for differences in the average per-capita income in the communities.

<sup>&</sup>lt;sup>51</sup>In the regressions with the Canton Zuerich only, a linear trend is used instead of time-fixed-effects.

 $<sup>^{52}</sup>$ The procedure is similar to splitting up the sample into "small" communities (< 1000 inhabitants) and "big" communities (> 1000 inhabitants), except that b is jointly estimated for all the communities.

 $<sup>^{53}</sup>$ Minimal value stands for the lowest population in the five election years.

<sup>&</sup>lt;sup>54</sup>The age classes are sometimes a bit different than the age classes used in the Cantonal analysis. As for education, a proxy is built by taking the total number of people with a high-school degree and higher, in percentage of the community population older than 19.

The regression results are depicted in table 3. Column 1 depicts the effect of postal voting on turnout for the communities in the Canton Zuerich. The highly significant coefficient suggests that after the introduction of postal voting, turnout dropped by roughly 5 %.

Table 3: Postal Voting, Community Size and Voter Turnout

	(1)	(2)	(3)	(4)
	Canton ZH	Canton ZH	Cantons ZH, SG	Cantons ZH, SG
<b>Dummy Postal</b>	<b>-4.8</b> *** (0.7)		<b>-5.3</b> **** (0.7)	
Dummy Postal*Small		<b>-7.1</b> **** (0.8)		<b>-7.9</b> *** (0.85)
Dummy Postal*Big		<b>-2.4</b> *** (0.8)		<b>-2.7</b> *** (0.6)
Age 20-39	-0.25	-0.2	-0.3	-0.2
Age 40-65	(0.22) 0.17	0.2)	0.2)	(0.2) 0.24
Age 65-80	0.8***	0.2)	0.6***	(0.17) 0.25
Population	0.004***	0.001**	0.001**	0.001**
Population <sup>2</sup>	(0.0008) -1.4E <sup>-08***</sup>	(0.0006) -6.9E <sup>-09***</sup>	(0.0004) -6.8E <sup>-09**</sup>	(0.0006) -6.9E <sup>-09***</sup>
Education	(2.7E <sup>-09</sup> ) 0.07	(2.3E <sup>-09</sup> ) 0.08	0.07	(2.3E <sup>-09</sup> ) 0.04
Income	-0.1**	-0.14***	(0.1)	(0.07)
Tax Rate	(0.05) <b>-0.06</b>	(0.05) <b>-0.06</b>	-0.02	-0.002
Trend	(0.04) -0.24*** (0.1)	(0.04) -0.19** (0.09)	(0.02)	(0.02)
Community-FE	Yes	Yes	Yes	Yes
Time-FE	No	No	Yes	Yes
Adj. $R^2$	0.99	0.99	0.99	0.99
Number of Observations	855	855	1287	1287

Dependent Variable: Voter Tumout per Community and (election) Year. White standard errors accounting for serial correlation within Panels (communities) are depicted in parantheses.

In column (3), the estimations are replicated with the Canton St. Gallen used as a control group. Since the results look very similar, the Canton Zuerich's decline in turnout in the midnineties seems to be truly caused by the introduction of postal voting, and not by an unknown tendency of citizens in small communities to vote less.<sup>55</sup>

Columns (2) and (4) show the dependency of the effect of postal voting on community size and confirm the prior finding that voter turnout dropped much more in smaller communities.

Not depicted for the sake of brevity are several variations of the basic estimations. Instead of defining small communities as communities with less than 1000 inhabitants, I re-estimated the models with defining small communities as communities with less than 1500 inhabitants. Again, the results are similar to before and highly significant. Also, since the population in each community at the elections is known, I re-estimated the model with the interaction term  $(DummyPostal \cdot Pop)_{ct}$  (Pop stands for the community's population). Again, the results are confirmed: the coefficient is (highly) significantly positive, which indicates that larger communities had a bigger increase (or smaller decrease) in turnout after the introduction of postal voting.

#### 3.2.2 Voting effort

The signaling model does not only make predictions about voter turnout after the introduction of postal voting, but also about the share of defectors participating in the voting process. If signaling motives were important under the system of poll voting, the introduction of postal

 $<sup>^{55}</sup>$ If the Canton St. Gallen had experienced the same development of turnout as the Canton Zuerich, the dummies postal and  $postal \cdot small$  would be insignificant.

voting should reduce the share of defectors (and increase the share of cooperators). Furthermore, the share of truly interested voters (cooperators) is expected to increase more in small communities, when mail voting is offered.

This section empirically addresses these predictions. As a proxy for the share of interested voters, I use data on the number of votes that have been modified. In the Swiss system of parliamentary elections, the voter gets a list of each party with the eligible party members on it. If the citizen just wants to vote for the favorite party, he does this by simply putting the list in the envelope/poll station. However, there is the possibility of replacing candidates from the favorite party with candidates from other parties ("Panaschieren"). Obviously, changing the lists by deleting and replacing names takes time and is probably only done by informed voters, who have a real interest in the issue. For the communities in Zuerich and the years 1987, 1991, 1995 and 1999, data exist for the percentage of the lists that have been changed. Unfortunately, no such data have been collected for the communities in the Canton St. Gallen.

Therefore, the effect of mail voting on the share of cooperators cannot be rigorously tested without difference-in-difference estimation.<sup>56</sup> However, the data allow to test whether small communities experienced a more positive effect than larger communities.

Table 4 shows the regression results, with the dependent variable no longer being voter turnout, but the percentage of lists that have been changed. Consistent with the signaling model's prediction, the share of "cooperators" increased relatively more in small communities,

<sup>&</sup>lt;sup>56</sup>The problem is that factors specific to a certain election might generate incentives to change the lists or not. Without a control group, no (election) time fixed-effects can be estimated, which could absorb such influences.

as soon as postal voting was introduced.

**Table 4**: Postal Voting and Voting Effort

	% changed lists	% changed lists
Dummy Postal*Small	1.7** (0.9)	1.7** (0.9)
Dummy Postal		-4.4*** (0.4)
Time-FE Community-FE	Yes Yes	No Yes
Adj. $R^2$	0.99	0.99
Number of Observations	684	684

Dependent Variable: Percentage of changed lists per Community and (election) Year. White standard errors accounting for serial correlation within Panels (communities) are depicted in parantheses.

## 3.2.3 Voting Costs and Voting Behavior

The signaling model assumes that the costs of voting  $(C, \underline{C})$  do not differ with respect to community size. Empirically, however, citizens in small or large communities may face different costs from going to the polls (the costs of mail voting are probably the same everywhere). In the previous estimations, community-fixed effects controlled for the effect of different voting costs on turnout. However, in order to interpret the different reactions of small and large communities to mail voting as evidence for signaling, we have to be sure that differences in poll-voting costs cannot lead to the same pattern of behavior.

The purpose of this section is to investigate whether differences in the costs from pollvoting could have caused the observed reaction to mail voting (i.e. a large decrease in small communities and a small decrease in large communities). Theoretically, such a reaction is conceivable if the costs from going to the polls were much higher in large communities. Then, the introduction of convenient mail voting could boost turnout relatively more (or reduce turnout relatively less) in large communities.

Since no data on the costs from going to the polls were available,<sup>57</sup> I conducted a survey in the 171 communities of the Canton Zuerich. By E-Mail, the presidents of the communities were contacted and asked about several cost factors as well as the use of postal voting. Overall, 110 responses were obtained, though sometimes incomplete (e.g. missing information about the share of votes handed in by mail).

With the information gained from the survey,<sup>58</sup> three cost variables were built: The number of poll stations per populated acres (C1), the average number of days, the polls are open (C2), and the average number of hours, the poll stations are open per day (C3).

Table 5 first column shows that large communities tend to have fewer poll stations per acres, that these poll stations are open on fewer days, but when open on a voting day, they are open for more hours. As depicted in columns two and three, the amount of poll-voting costs affected the decision to vote under the poll-voting system<sup>59</sup> as well as the way of voting (postal, polls) under the new system. However, cost-differences cannot explain more than 20 % of the

<sup>&</sup>lt;sup>57</sup>As for the opportunity costs, there does not seem to be any relationship between community size and average income.

<sup>&</sup>lt;sup>58</sup>The precise questions for extracting information about the costs of poll-voting were the following: How many poll stations do you have in your community? How many days are the different stations open and how many hours on each day?

<sup>&</sup>lt;sup>59</sup>Endogeneity might explain the negative sign before poll hours. Since poll hours are easier to change than the number of stations or opening days, communities with a low turnout may have increased the opening hours.

intra-community variation in turnout and postal voting.<sup>60</sup> The last column is the most relevant. It shows that not even 10 % of the cross-sectional variation in turnout drop before and after postal voting can be explained by varying poll-voting costs. Therefore, different poll-voting costs do not provide a convincing explanation as to why small and large communities reacted so differently to the introduction of mail voting. The signaling explanation is thus certainly not challenged by the poll-costs explanation.

Table 5: Voting and the Costs of Voting

	Correlation with Comm. Size	Turnout	Use Postal	Drop Turnout 1991-1999
C1: Poll Stations	-0.25	1.9***	-3** (1.2)	0.14
C2: Poll Days	-0.25	2.7	-8.7**	0.7
C3: Poll Hours	0.4	(2) -4** (1.8)	(3.8) 3.4 (3.8)	(0.9) -3.7*** (0.8)
Year	1995	1991	1995	(1995)
Adj. $R^2$		0.17	0.20	0.09
Number of Observations		110	80	110

*Note:* Use Postal is defined as the share of votes handed in by mail. Drop turnout is computed as "turnout 1991-turnout 1999" and is mostly positive. Robust standard errors are in parantheses.

# 4 Conclusions

In Switzerland, postal voting was introduced with the hope of slowing down the steady decrease in voter participation. Since the costs from mail voting are much lower than the costs from

 $<sup>^{60}</sup>$ The minimum share of votes handed in by mail is 2 % in 1995 and the maximum is 69 %. The correlation with community size is 0.35.

poll voting, the (economic) expectation was an increase in voter turnout.

The empirical analysis of this paper rather shows the opposite. The introduction of optional postal voting did not increase (aggregate) turnout at parliamentary elections in the Swiss Cantons ("states"). On a community level (studied for the Canton Zuerich), there was even a decrease in turnout, with the decrease being much larger in small communities.

My explanation for this unexpected pattern is a change in the benefits of norm-adherence. In Switzerland, like in many other countries, there exists a fairly strong social norm that a good citizen should go to the polls. As long as poll-voting was the only option, there was an incentive (or pressure) to go to the polls only to be *seen* handing in the vote. The motivation could be hope for social esteem, benefits from being perceived as a cooperator, or just the avoidance of informal sanctions. Since in small communities, people know each other better and gossip about who fulfills civic duties and who doesn't, the benefits of norm-adherence were particularly high in this type of community.

With the introduction of postal voting, the signal from going to the polls got weakened. While before, a citizen not having been seen at the polls was identified as a shirker, it can be a mail voter now. Therefore, in small communities where social pressure forced a substantial share of people to go to the polls, turnout decreased as soon as mail voting and the possibility of cheating was given.

My paper sets up a theory of voting, which for the first time, includes external benefits of norm-adherence ("signaling benefits"). The introduction of postal voting in the Swiss Cantons serves as a perfect experiment for testing this theory, since predictions from traditional voting theory and the signaling model widely differ. Although the empirical results are certainly more compatible with the signaling model than with traditional models of voting, I cannot prove my theory, since the benefits from norm-adherence are not directly measurable. Nevertheless, the match between my model's predictions and the empirical findings can be taken as (cautious) evidence for the important role, social norms play in explaining (voting) behavior.

The article has implications and room for further research in several areas.

First, as for the theory of voting, I shed light on a new motivational factor, which can explain why people vote(d). Since the benefits of norm-adherence arguably depend on community size, predictions for voter participation in differently-sized communities result. According to my knowledge, this is the first economic study which explores links between community size and voting behavior, so that more research in this direction is certainly warranted.

Secondly, this article hopes to show that traditional economic analysis of law or institutional changes can be completely flawed, if potential effects on social norms are ignored. As for the impact of postal voting (or internet voting), the traditional economic focus has always been cost-reduction, with the prediction of an increase in voter turnout. However, as has been shown in this article, changing benefits of norm-adherence may reverse this prediction. Even though voter turnout may decrease if people don't vote for signaling motives anymore, the reduced quantity in turnout may be offset by an increase in the quality of the voting outcome. As such, a decrease in turnout is not necessarily bad from a welfare perspective, if the share of truly interested voters increases. Again, since this is the first theoretical and empirical study, which investigates the effects of modern voting tools, more research is needed.

Finally, the study seems to confirm the most recent theories of social norms, according to which people adhere to certain norms for the purpose of gathering external benefits of normadherence. As long as people do not obey social norms out of conviction but rather out of strategy, socially inefficient norms may prevail. More research about who determines social norms and who achieves the biggest rents from creating or changing social norms could be highly enriching.

# 5 Appendix: Equilibria of the Signaling Game

# 5.1 Voting at the booth

#### 5.1.1 Pure Strategy (Perfect Bayesian) Equilibria

#### PROPOSITION 1: Separating equilibria

Separating equilibria exist only with cooperators voting and defectors not voting. They are sustainable for the following community sizes:  $s > \frac{V}{C}$  if  $D \ge C$  and  $\frac{V}{C} < s < \frac{V}{C-D}$  if D < C.

#### PROOF PROPOSITION 1:

A. Existence of separating equilibria with cooperators voting and defectors not voting. Given correct beliefs p=1, q=0, the best-responses for the receiver are to give esteem to a voter, and to give no esteem to a non-voter.<sup>61</sup> Given these responses, a cooperator with  $D \geq C$  always votes<sup>62</sup> and a cooperator with D < C votes if  $\frac{V}{s} + D - C > 0$  or  $s < \frac{V}{C-D}$ .<sup>63</sup> Given these best responses, a defector votes if  $\frac{V}{s} - C > 0$  or  $s < \frac{V}{C}$ . Therefore, with D < C, a separating equilibrium exists for all  $s_1 < s < s_2$ , with  $s_1 = \frac{V}{C}$  and  $s_2 = \frac{V}{C-D}$ . For  $D \geq C$ , a separating equilibrium exists for  $s > \frac{V}{C}$ . B. Non-Existence of separating equilibria with defectors voting and cooperators not voting. With correct beliefs p=0, q=1, the best responses of the receiver are to give no esteem to the voter as well as the non-voter. Given these best responses, a defector never votes, which destroys this separating equilibrium.

 $<sup>^{61}</sup>$ For a voter, the payoff from giving esteem is H, which is greater than the payoff from giving no esteem

<sup>-</sup>H. For a non-voter, the payoff from giving esteem is 0 and from no esteem 1.

 $<sup>^{62}</sup>$ Since signaling benefits are strictly positive in this equilibrium, a cooperator with C=D votes.

<sup>&</sup>lt;sup>63</sup>Since  $\frac{V}{s} > C$ , there exists a positive  $s = \frac{V}{C - D}$ .

### **PROPOSITION 2**: Pooling Equilibrium with both types voting

A pooling equilibrium with both types voting exists iff  $\alpha \geq \frac{1}{1+2\cdot H}$ . For  $\alpha > \frac{1}{1+2\cdot H}$ , it is sustainable for the following community sizes:  $\underline{s} \leq s < s_1$ , with  $s_1 = \frac{V}{C}$ . For  $\alpha = \frac{1}{1+2\cdot H}$ , it is sustainable in  $\underline{s} \leq s < \frac{p \cdot V}{C}$ .

**PROOF PROPOSITION 2**: 1. For  $\alpha > \frac{1}{1+2\cdot H}$ , the best response of the receiver is to give esteem to a voter<sup>64</sup> and to give no esteem to a non-voter. Given these best responses, a defector votes if  $\frac{V}{s} - C > 0$  or  $s < \frac{V}{C}$ . Therefore, a positive  $s_1$  and hence a pooling equilibrium with both types voting exists since  $\frac{V}{s} > C$  by assumption (cf. p. 13). 2. For  $\alpha = \frac{1}{1+2\cdot H}$ , the receiver is indifferent between giving esteem and giving no esteem to a voter. Denoting  $\underline{p}$  the probability of esteem, a pooling equilibrium exists for  $\underline{s} \leq s < \frac{\underline{p}\cdot V}{C}$ . 3. For  $\alpha < \frac{1}{1+2\cdot H}$ , the best response of the receiver is to give no esteem, for a voter as well as a non-voter. This destroys the pooling equilibrium with both types voting, since a defector prefers not to vote.

#### **PROPOSITION 3**: Pooling Equilibrium with nobody voting

A pooling equilibrium with nobody voting exists iff C > D. Given C > D, a universally divine pooling equilibrium with nobody voting is sustainable for communities of sizes:  $s > s_2$  (with  $s_2 = \frac{V}{C-D}$ ).

**PROOF PROPOSITION 3**: If  $C \leq D$ , cooperators vote, which destroys the pooling equilibrium with nobody voting. With C > D and (refined) beliefs  $q = \alpha, p = 1^{65}$ , the best response

<sup>&</sup>lt;sup>64</sup>The expected payoff from esteem  $(\alpha \cdot H)$  is bigger than the expected payoff from no esteem  $((1-\alpha)-\alpha \cdot H)$  iff  $\alpha > \frac{1}{1+2\cdot H}$ .

<sup>&</sup>lt;sup>65</sup>Since a cooperator has a greater incentive to deviate than a defector (the set of mixed best responses, which

of the receiver is to give esteem to a voter and to give no esteem to a non-voter. Given these best responses, a cooperator goes to the polls if  $\frac{V}{s} + D - C > 0$ , i.e.  $s < \frac{V}{C-D}$ . Therefore, the no-voting equilibrium is only sustainable for  $s > \frac{V}{C-D}$ .

#### 5.1.2 Mixed Strategy Equilibria

### PROPOSITION 4: Hybrid Equilibria

- 1. A partial pooling equilibrium where cooperators vote and defectors randomize exists in the community with size  $s = \frac{V}{C}$  iff  $\alpha \ge \frac{1}{1+2\cdot H}$  or  $\alpha < \frac{1}{1+2\cdot H}$  and  $x \le \frac{\alpha}{1-\alpha} \cdot 2 \cdot H(=x^*)$ ;  $x = \frac{1}{1+2\cdot H}$  denotes the randomizing probability. A partial pooling equilibrium where cooperators vote and defectors randomize exists in all communities with sizes  $\underline{s} \le s \le \frac{V}{C}$  iff  $\alpha < \frac{1}{1+2\cdot H}$  and  $x = x^*$ .
- 2. A semi-separating equilibrium where cooperators randomize and defectors do not vote exists for the community of size  $s = \frac{V}{C-D}$  iff C > D.
  - 3. Other hybrid equilibria do not exist.

#### PROOF PROPOSITION 4:

- A. Exclusion of the existence of other hybrid equilibria: The two other possible hybrid equilibria "defectors voting, cooperators randomizing", and "defectors randomizing, cooperators not voting" can be excluded, since cooperators always vote if defectors vote.
  - B. Existence of Equilibria.

In a partial-pooling equilibrium with cooperators voting and defectors randomizing, the make a deviation optimal, is strictly larger than for a defector), Banks & Sobel (1987) suggest to set the out-of equilibrium beliefs to p = 1 (the resulting equilibria are called "universally divine equilibria").

beliefs of the receiver are  $p=\frac{\alpha}{\alpha+x\cdot(1-\alpha)}, q=0$ , where x denotes the defector's probability of voting. 1. For  $\alpha\geq\frac{1}{1+2\cdot H}$ , the best response of the receiver is to esteem a voter and not to esteem a non-voter. A defector is indifferent between voting and non-voting iff  $\frac{V}{s}-C=0$  or  $s=\frac{V}{C}$ . Therefore, a partial-pooling equilibrium exists for  $s=\frac{V}{C}$ . 2. For  $\alpha<\frac{1}{1+2\cdot H}$  and  $x<\frac{a}{1-\alpha}\cdot 2\cdot H(=x^*)$ , the best response for voting is to give esteem, which leaves the defector indifferent at  $\frac{V}{s}=C$ . 3. For  $\alpha<\frac{1}{1+2\cdot H}$  and  $x=x^*=\frac{a}{1-\alpha}\cdot 2\cdot H$ , the receiver is indifferent between giving esteem and no-esteem to a voter. A defector is indifferent between voting and not voting iff  $\underline{p}\cdot \frac{V}{s}=C$ . Therefore, for  $\underline{s}\leq s\leq \frac{V}{C}$ , there exists a partial pooling equilibrium with defectors randomizing with (constant) probability  $x^*$  and receivers giving esteem with probability  $\underline{p}=\frac{C}{V}\cdot s$ . 4. For  $\alpha<\frac{1}{1+2\cdot H}$  and  $x>x^*=\frac{a}{1-\alpha}\cdot 2\cdot H$ , no partial pooling equilibrium exists. The best response for voting is to give no esteem, hence, a defector never votes.

In a <u>semi-separating</u> equilibrium where defectors do not vote and cooperators randomize, the beliefs of the receiver are:  $p=1, q=\frac{\alpha-\alpha\cdot x}{1-\alpha\cdot x}$ . Therefore, the best response is to esteem a voter and not to esteem a non-voter. Given these responses, a cooperator (with C>D) is indifferent between voting and not voting iff  $\frac{V}{s}+D-C=0$  or  $s=\frac{V}{C-D}$ . For  $D\geq C$ , he cannot be indifferent, but goes to the polls.

# 5.2 Voting at the booth and postal voting

#### 5.2.1 Pure Strategy (Perfect Bayesian) Equilibria

#### PROPOSITION 1: Separating equilibria

Separating equilibria only exist with cooperators voting and defectors not voting. With  $\delta^*$ 

denoting the equilibrium share of cooperators voting by mail, three types of (rational expectations) separating equilibria exist: 1.  $\delta^* = 0$  for  $\frac{V}{C} < s < \frac{V}{C - \underline{C}}$ , 2.  $\delta^* = 1$  for all s if  $\alpha > \frac{1}{1 + 2 \cdot H}$ , for  $s > \frac{V}{C - \underline{C}}$  if  $\alpha < \frac{1}{1 + 2 \cdot H}$  and for  $s > \frac{V}{C - \underline{C}} \cdot (1 - \underline{q})$  if  $\alpha = \frac{1}{1 + 2 \cdot H}$ . 3.  $0 < \delta^* < \frac{1 - \alpha}{\alpha \cdot 2 \cdot H}$  at  $s = \frac{V}{C - \underline{C}}$  (or at  $s = \frac{V}{C - \underline{C}} \cdot (1 - \underline{q})$  for  $\delta^* = \frac{1 - \alpha}{\alpha \cdot 2 \cdot H}$ ).

**PROOF PROPOSITION 1**: A. Existence of separating equilibria with cooperators voting and defectors not voting. In a rational expectations equilibrium, the receivers prior  $\delta^E$  about the share of cooperators voting by mail induces a share  $\delta$  of the cooperators to vote by mail ( $\delta^*$ :  $\delta^E = \delta$ ). Three types of rational expectations equilibria may exist:  $\delta^* = 0, \delta^* = 1, 0 < \delta^* < 1.$ 1. With  $\delta^E = 0$ , the (Bayesian updated) beliefs of the receiver are p = 1, q = 0. The best responses are to give esteem to a poll voter and no esteem to a non-poll-voter. A cooperator votes at the polls if  $s < \frac{V}{C - C}$ , and a defector if  $s < \frac{V}{C}$ . Therefore, a separating equilibrium with  $\delta^* = 0$  is sustainable for  $\frac{V}{C} < s < \frac{V}{C - C}$ . 2.  $\delta^* = 1$ . With  $\delta^E = 1$ , the (Bayesian updated) beliefs of the receiver are  $p, q = \alpha$ . For these beliefs, the best responses are giving esteem to a non-poll voter if  $\alpha > \frac{1}{1+2\cdot H}$ , giving no esteem if  $\alpha < \frac{1}{1+2\cdot H}$  and giving esteem with probability  $\underline{q}$  iff  $\alpha = \frac{1}{1+2\cdot H}$ . For a poll-voter, giving esteem is the best response if  $p > \frac{1}{1+2\cdot H}$ , no esteem if  $p < \frac{1}{1+2\cdot H}$  and a mixed-best response for  $p = \frac{1}{1+2\cdot H}$ . For  $\alpha > \frac{1}{1+2\cdot H}$  and all p, the separating equilibrium is sustainable in all community sizes, since cooperators as well as defectors have a larger payoff from not going to the polls. For  $\alpha < \frac{1}{1+2\cdot H}$ , the best response to a non-poll-voter is to give no esteem. A separating equilibrium with  $\delta^* = 1$  is sustainable for all s, if  $p < \frac{1}{1+2\cdot H}$ , 66

<sup>&</sup>lt;sup>66</sup>However, since the cooperator's incentive to deviate is greater than the defector's incentive to deviate, universal divinity restricts p = 1 and destroys this equilibrium.

and for  $s>\frac{V}{C-\underline{C}}$  otherwise. For  $\alpha=\frac{1}{1+2\cdot H}$ , the separating equilibrium is sustainable for  $s>\frac{V}{C-\underline{C}}\cdot(1-\underline{q})$ . 3.  $0<\delta^*<1$ . A cooperator can only be indifferent between poll-voting and non-poll-voting if he gets no esteem for non-poll-voting (or esteem with probability  $\underline{q}<1$ ). With beliefs  $p=1, q=\frac{\alpha\cdot\delta^E}{\alpha\cdot\delta^E+(1-\alpha)}$ , giving esteem to a poll-voter and no esteem to a non-poll voter are best responses if  $\delta^E<\frac{1-\alpha}{\alpha\cdot2\cdot H}$ . At  $s=\frac{V}{C-\underline{C}}$ , a separating equilibrium with  $\delta^*<\frac{1-\alpha}{\alpha\cdot2\cdot H}$  is therefore sustainable. Iff  $\delta^E=\frac{1-\alpha}{\alpha\cdot2\cdot H}$ , a separating equilibrium is sustainable for  $s=\frac{V}{C-\underline{C}}\cdot(1-\underline{q})$ .

#### PROPOSITION 2: Pooling Equilibrium with both types voting

The only type of R.E. pooling equilibrium with both types voting exists for  $\delta^* = 0$ , i.e. both types vote at the polls. For  $\alpha > \frac{1}{1+2\cdot H}$ , it is sustainable for the following community sizes:  $\underline{s} \leq s < s_1$ , with  $s_1 = \frac{V}{C}$ . For  $\alpha = \frac{1}{1+2\cdot H}$ , it is sustainable in  $\underline{s} \leq s < \frac{\underline{p} \cdot V}{C}$ .

**PROOF PROPOSITION 2**: 1. With  $\delta^E = 0$ , the beliefs of the receiver are  $p = \alpha$ , q. Pollvoting can occur if esteem is given to a poll-voter and no esteem to a non-poll-voter. These best responses are optimal if  $\alpha > \frac{1}{1+2\cdot H}$  and  $q < \frac{1}{2\cdot H+1}^{67}$ . Given these best responses, a defector votes if  $\frac{V}{s} - C > 0$ , or  $s < \frac{V}{C}$ . A cooperator votes at the polls if  $\frac{V}{s} + D - C > D - \underline{C}$ , which is always the case for  $\frac{V}{s} - C > 0$ . Therefore, a R.E. pooling equilibrium with both types voting at the polls  $(\delta^* = 0)$  exists for  $\underline{s} \leq s < \frac{V}{C}$ . For  $\alpha = \frac{1}{1+2\cdot H}$ , a poll-voter is esteemed with probability  $\underline{p}$  and a R.E. pooling equilibrium with both types voting is sustainable for  $\underline{s} \leq s < \frac{\underline{p} \cdot V}{C}$ . 2.  $\delta^E = 1$ . Since no esteem is the best response to a poll voter, a defector never votes. Hence, no R.E. pooling equilibrium with  $\delta^* = 1$  exists. 3. With  $0 < \delta^E < 1$ , the best response to a

<sup>&</sup>lt;sup>67</sup>Note that universal divinity sets q=0, so that the equilibrium is universally divine.

non-poll-voter is to give esteem (recall that a defector never votes by mail). This destroys the pooling equilibrium, since defectors don't vote anymore.

## 5.2.2 Mixed Strategy Equilibria

Note first that no semi-separating equilibria exist, since a cooperator always votes  $(\underline{C} < D)$ .

#### **PROPOSITION 3**: Partial-Pooling Equilibria

A partial pooling equilibrium where cooperators vote and defectors randomize exists only for  $\delta^* = 0$ . It exists for  $s = \frac{V}{C}$  iff  $\alpha \ge \frac{1}{1+2\cdot H}$  or  $\alpha < \frac{1}{1+2\cdot H}$  and  $x \le \frac{\alpha}{1-\alpha} \cdot 2 \cdot H(=x^*)$ . It exists in all communities with sizes  $\underline{s} \le s \le \frac{V}{C}$  iff  $\alpha < \frac{1}{1+2\cdot H}$  and  $x = x^*$ .

**PROOF PROPOSITION 3**: 1. For  $\delta^E=1$ : In this case, only defectors vote at the polls and hence, giving no esteem to a poll-voter is the best response. Therefore, a defector never votes, which destroys the PPE. 2. For  $0<\delta^*<1$ . In a PPE, a defector has to be indifferent between Poll-Voting and Non-Voting. Therefore, the net signaling benefits from going to the polls (compared to not voting) have to be equal to the voting costs. Since a cooperator prefers to go to the polls in this case,  $^{68}$  a PPE with  $0<\delta^*<1$  cannot exist. 3. For  $\delta^*=0$ . With  $\delta=0$ , the Bayesian updated beliefs are:  $p=\frac{\alpha}{\alpha+(1-\alpha)\cdot x}, q=0$ . 1. For  $\alpha\geq\frac{1}{1+2\cdot H}$ , or  $\alpha<\frac{1}{1+2\cdot H}$  and  $x<\frac{a}{1-\alpha}\cdot 2\cdot H(=x^*)$ , the best response of the receiver is to esteem a poll-voter and not to esteem a non-poll-voter. Since a defector is indifferent between voting and non-voting iff  $\frac{V}{s}-C=0$ , a partial-pooling equilibrium exists for  $s=\frac{V}{C}$ . 2. For  $\alpha<\frac{1}{1+2\cdot H}$  and  $x=x^*=\frac{a}{1-\alpha}\cdot 2\cdot H$ , the receiver is indifferent between giving esteem and no-esteem to a poll-voter. A defector is

 $<sup>^{68}</sup>$ For a cooperator, the net signaling benefits must only cover the surplus in voting costs  $(C-\underline{C})$ .

indifferent between voting and not voting if  $\underline{p} \cdot \frac{V}{s} = C$ . Therefore, for  $\underline{s} \leq s \leq \frac{V}{C}$ , there exists a partial pooling equilibrium with defectors randomizing with (constant) probability  $x^*$  and receivers giving esteem with probability  $\underline{p} = \frac{C}{V} \cdot s$ . 3. For  $\alpha < \frac{1}{1+2\cdot H}$  and  $x > x^* = \frac{a}{1-\alpha} \cdot 2 \cdot H$ , the best response for poll-voting is to give no esteem. Since a defector prefers not to vote in this case, no partial pooling equilibrium with  $x > x^*$  can exist.

# 6 Literature

Austen-Smith, David (1984). The Pure Theory of Large Two-Candidate Elections: A Comment on the Ledyard Paper. Public Choice, 41: 43-47.

Banks, Jeffrey & Sobel, Joel (1987). Equilibrium Selection in Signaling Games. Econometrica, 55(3): 647-661.

Bernheim, Douglas & Severinov, Sergei (2003). Bequests as Signals: An explanation for the equal division puzzle. Journal of Political Economy, 111(4): 733-64.

Bertrand, Marianne, Duflo, Esther & Mullainathan, Sendil (2004). How much should we trust Differences-in-Differences Estimates? Quarterly Journal of Economics, 119(1): 249-275.

Copeland, Cassandra & Laband, David N. (2002). Expressiveness and Voting. Public Choice, 110: 351-363.

Cowen, Tyler (2002). The esteem theory of norms. Public Choice, 113: 211-224.

Dhillon, Amrita & Peralta, Susan (2002). Economic Theories of Voter Turnout. Economic Journal, 112: 332-352.

**Downs, Anthony** (1957). An Economic Theory of Democracy. New York: Harper and Row.

Dubin, Jeffrey A. & Kalsow, Gretchen A. (1996). Comparing Absentee and Precinct Voters: A View over Time. Political Behavior, 18: 369-392.

Ferejohn, John A. & Fiorina, Morris P. (1974). The Paradox of Not Voting: A Decision Theoretic Approach. The American Political Science Review, 68(2): 525-536.

**Fischer, Eric A.** (2001). Voting Technologies in the United States: Overview and Issues for Congress. CRS Report for Congress.

Friedberg, Leora (1998). Did Unilateral Divorce Rates Raise Divorce Rates? Evidence from Panel Data. American Economic Review, 88(3): 608-627.

Knack, Stephen (1992). Civic Norms, Social Sanctions and Voter Turnout. Rationality and Society, 4: 133-156.

**Ledyard, John O.** (1984). The Pure Theory of large two-candidate Elections. Public Choice, 44: 7-41.

Magleby, David B. (1987). Participation in Mail Ballot Elections. The Western Political Quarterly, 40: 79-91.

McAdams, Richard (1997). The Origin, Development and Regulation of Norms. Michi-

gan Law Review, 96: 338-433.

**Opp, Karl-Dieter** (2001). Why Do People Vote? The Cognitive-Illusion Proposition and its Test. Kyklos, 54: 355-378.

Owen, Guillermo & Grofman, Bernard (1984). To Vote or not to Vote: the Paradox of Non-Voting. Public Choice, 41: 311-327.

Palfrey, Thomas R. & Rosenthal, Howard (1983). A Strategic Calculus of Voting. Public Choice, 41: 7-55.

Palfrey, Thomas R. & Rosenthal, Howard (1985). Voter Participation and Strategic Uncertainty. American Political Science Review, 79(1): 62-78.

Patterson, Samuel & Caldeira, Gregory A. (1985). Mailing in the voter: correlates and consequences of absentee voting. American Journal of Political Science, 29: 766-788.

**Posner, Eric A.** (2000). Law and Social Norms. Cambridge, Massachusetts: Harvard University Press.

Riker, William H. & Ordeshook, Peter C. (1968). A Theory of the Calculus of Voting.

American Political Science Review, 62: 25-43.

Riker, William H. & Ordeshook, Peter C. (1973). An Introduction to Positive Political Theory. Englewood Cliffs. NJ: Prentice-Hall.

Solop, Frederic I. (2001). Digital Democracy comes at age: Internet Voting and the 2000 Arizona Democratic Primary Election. PS: Political Science and Politics, 34(2): 289-293.

Southwell, Priscilla L. & Burchett, Justin (1997). Survey of Vote-by-Mail Senate Election in the State of Oregon. PS: Political Science and Politics, 30: 53-57.

Sugden, Robert (1989). Spontaneous Order. Journal of Economic Perspectives, 3(4): 85-97.

Valenty Linda O. & Brent, James C. (2000). Online Voting: Calculating Risks and Benefits to the Community and the Individual. In Vogelsang, Ingo & Compaine, Benjamin M.: The Internet Upheaval. Cambridge, Massachusetts: The MIT Press.