Experimental Evidence on the Workings of Democratic Institutions

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Abstract

I review part of the extensive experimental literature on the workings of democratic institutions. I start by describing the existing literature studying the determinants of efficient institutional change. That is, when will people choose institutions that provide incentives for them to take socially optimal actions? I also present results from a new experiment showing that subjects' voting for efficient institutions may depend on their understanding of the environment. I then summarize the recent literature showing that democracy can affect behavior itself, in addition to its effect on the choice of policies and regulations.

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1. Introduction

Much research in economics studies the link between institutions and economic performance (see North 1981, La Porta et al. 1998, Acemoglu, Johnson and Robinson 2001, and Easterly and Levine 2003 among others). Douglass C. North's work has significantly contributed to our understanding of the determinants of institutions and their effect on economic performance. I follow here the definition of institutions present in North (1981): "Institutions are a set of rules, compliance procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals…" (page 201 and 202) but with a focus on formal institutions.

In this chapter, I summarize experimental evidence on the determinants of institutional change in democratic environments and its effect on behavior. Experimental economics has much to contribute to the study of institutions (their effects and determinants) as it allows researchers to circumvent the usual threats to identification that arise with naturally occurring data. It is possible, for example, to exogenously vary plausible determinants of efficient institutional change and identify their impact.

The main question I study in this chapter is when people choose to establish efficient institutions (institutions that give members of society incentives to take actions that are socially desirable). I summarize previous experimental literature that uncovered important elements behind the failure to establish efficient institutions. These elements include coordination problems, perceived and real heterogeneity in which efficient institution is best for each subject, and uncertainty about the effects of the alternative institutions.

In addition, I present novel experimental results supporting a hypothesis put forward by North (1990) regarding one of the possible determinants of efficient institutional change: citizens' understanding of reality. I show that subjects with a more limited strategic understanding of the environment (but with the same information) are less likely to demand efficient institutions.

In this chapter, I also describe a recent literature showing that democracy may affect behavior and economic performance not only through its effect on institutional

choice (and the incentives faced by citizens) but also directly by making citizens more pro-social.

There is an extensive and fascinating experimental literature on political economy that is not reviewed in this chapter given the focus here on democratic institutional change and the direct effect of democracy.[1]

2. Democratic institutions and social dilemmas

North (1990) discusses the conditions needed for political markets to lead to efficient institutions. He stresses, first, the importance of people having a correct understanding of reality so as to be able to understand the impact of different regulations and institutions, and second, the importance of equal access to decision making. "The institutional structure most favorable to approximating such conditions is the modern democratic society with universal suffrage."

A series of different experiments have studied the choice of institutions in democratic settings. These experiments are different in many dimensions but share a central question: how likely are democracies to choose efficient institutions, regulations and policies?

2.1. A simple experiment on voting to overcome a social dilemma

North (1990) discusses reasons why democracies may fail to fulfill their potential with respect to institutional choice. First, citizens may fail to fully understand reality. This could be either due to the lack of information by the voters or also due to their lacking a correct model to predict the impact on behavior and welfare of different institutions. Second, elected representatives may not have incentives to make decisions following the desires of their constituencies.

[1] See for example the experimental literature on voter turn out (Schram and Sonnemans 1996; Goeree and Holt 2005; Grosser and Schram 2006; Levine and Palfrey 2007; Gerber, Green and Larimer 2008) and the experimental literature on voting behavior, information aggregation and efficiency of voting rules (Morton and Williams 1999; Hung and Plott 2001; Casella, Gelman and Palfrey 2006; Battaglini, Morton and Palfrey 2007; Casella, Palfrey and Riezman 2008; Battaglini, Morton and Palfrey 2010; Casella 2011; Esponda and Vespa 2010).

While a large literature has focused on the latter problem (on the agency problem see Barro 1973 and Ferejohn 1986 among others) less is known about the former problem. In other words, if we abstract from agency issues (and other issues that can lead to inefficient policies, see for example Alesina and Drazen 1991, Fernández and Rodrik 1991) could it still be the case that people fail to choose efficient institutions? How sensitive is the institutional decision to the understanding of reality that citizens have?

I discuss next results from a simple experiment designed to answer these questions. In this experiment subjects were anonymously divided into groups of ten to participate in 2-person prisoners' dilemma games with random matching between games. In the prisoners' dilemma game each subject chooses simultaneously between C (cooperate) or D (defect).[2] The payoffs depend on both actions as shown in Table 1. Regardless the action of the other subject, each subject earns more points if he or she chooses D. The unique Nash equilibrium of the game (if subjects only care about points) is for both subjects to choose D. This is an inefficient outcome as mutual cooperation results in higher payoffs for both subjects.

After ten rounds of playing the prisoners' dilemma game, subjects were given the possibility of eliminating one of the two actions by plurality. Each subject voted on whether to keep all actions, eliminate D, or eliminate C. After the voting stage, the subject participated in ten more rounds with the game depending on the decision made by plurality. To study the effect of subjects' understanding of the game on voting decisions I modify how the prisoners' dilemma game is presented to the subjects. In half the sessions, the computer screen shows the payoff matrix with the subject action as rows and their partners as columns. Feedback about the outcome is also provided by highlighting the chosen row and column. The other half of the sessions did not see the payoffs displayed as a matrix and feedback did not stress the behavior of the partner by highlighting his/her behavior in the matrix (but this behavior was reported). Figure 1 shows a screen shot for each treatment (payoffs were denoted in cents).

I hypothesize that not showing the game as a matrix may diminish the subjects' understanding of the structure of the game and the likely effect of modifying the game by

[2] For neutrality, in the experiments the actions C and D were called 2 and 1 respectively. For convenience of the reader, I use here the usual names, C and D.

eliminating a strategy. I called these two treatments as "See Matrix" and "Do Not See Matrix" treatments, respectively.

The participants were 80 Brown University or RISD undergraduates.[3] Half the subjects participated in each of the treatments. As Figure 2 shows, in the first ten rounds the evolution of cooperation is consistent to what has been found in the literature: a significant cooperation rate that decreases with experience (see Andreoni and Miller 1993, and Dal Bó 2005 among others). Between rounds ten and eleven all groups voted in favor of eliminating D. In other words, all groups established an institution that leads to efficiency.

However, the aggregate result hides differences in voting across treatments (see Figure 3). In both treatments, 12.5% of the subjects voted to eliminate C. Of the subjects who saw the matrix, 75% voted to eliminate D against 57% of those who did not see the matrix. This suggests that changing the way in which the information was displayed had a large effect on the voting decisions of the subjects but not in the outcomes.[4]

The difference in voting behavior is consistent with the idea that seeing the payoff matrix helps the subjects understand how their own payoff depends not only on their own action but also on the action of their partners, and how eliminating D would affect their own payoff. In particular, seeing the matrix may have helped them understand the two ways in which eliminating D would affect their payoff: on the one hand there is a negative effect by reducing the subject's own set of possible actions, on the other hand there is a positive effect by forcing the other subject to cooperate.

However, the median voter in this experiment always voted to eliminate D, leading to an efficient evolution of institutions. Does this mean that people will always choose efficient institutions? Or are there elements related to the underlying game or the voting mechanisms that can lead to inefficient institutions? A series of previous experimental papers have addressed these questions. Most of these papers are not integrated into a single literature. I will attempt to integrate them here.

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[3] Subjects were recruited through the Brown University Social Science Experimental Laboratory (BUSSEL) and interacted anonymously through computers using the Multistage (Caltech-UCLA) software in a computer lab at Brown University.

[4] Personal characteristics of the subjects like whether they were Economics majors, year in college, their (self reported) math and verbal SATs (a measure of cognitive ability) and their actions in a beauty contest game (a measure of strategic sophistication) had no significant impact on voting decisions.

2.2. More evidence on voting and efficiency

One element of the environment from the previous experiment that may facilitate the evolution of efficient institutions is that the effect of the changes considered was easy to predict.[5] That is, if D is eliminated there is no uncertainty about the outcome of the game. In real life, it is unlikely that an institutional change can have such a clear effect.

Dal Bó, Foster and Putterman (2010) study institutional choice under a case of more ambiguity (however, this was not the main objective of the paper, which is discussed in the next section). In this experiment subjects were anonymously divided into groups of four subjects to participate in 2-person prisoners' dilemma games with random matching. After ten rounds, subjects were given the opportunity to impose a fine on unilateral defection by majority.[6] This fine converted the prisoners' dilemma game into a coordination game. In the resulting game, both mutual defection and mutual cooperation are equilibria (of course, only the latter is efficient). The fact that the institutional change did not eliminate defection from the game but only changed payoffs to make mutual cooperation a possible equilibrium may better approximate a realistic feature of regulation: that it may only pay to follow the regulation if others are following it as well (think about speeding on the road).

In this game, the subjects' opinion on whether imposing the fine is beneficial or not depends on their beliefs about others' response to the fine. Contrary to the previous experiment, there is no clear theoretical prediction of how subjects should vote. If they expect to coordinate on cooperation, they should vote for the fine; otherwise, they could vote against it.

Dal Bó, Foster and Putterman (2010) find that 54% of the subjects voted in favor of the fine while 46% voted against it (out of a total of 424 subjects). That is, almost half

[5] A previous paper that also considers institutional choice (but not through voting) in an environment in which the effect is easy to predict is Carpenter (2000). In the experiment presented there, subjects played in pairs. One subject had to propose which game to play out of 5 to play in pairs. Four of the games were prisoners' dilemma games and a fifth one was a game in which the symmetric efficient outcome was a Nash equilibrium. The other player could accept the proposal or not (in which case they played one of the prisoners' dilemma games). Thirty out of the thirty five proposals was to play the game that was NOT a prisoners' dilemma game and all but three of these offers were accepted.

[6] As discussed in the next section the voting stage was complicated by the fact that the computer server may chose to disregard the votes. However, this does not change the incentives to vote in any particular way.

of the subjects voted against an institution that could lead to efficiency in equilibrium. Moreover they find that voting for the fine is positively correlated with cognitive ability (as measured by self reported SAT math scores) and strategic ability (as measured by behavior in a beauty contest game).[7] They find no significant effects of class in college, pursuing an Economics major or political ideology.[8]

This result suggests that a large proportion of people may be reluctant to vote for an institution that may lead to efficiency if it is not guaranteed.

In these two experiments there was only one policy that could lead to efficiency. But if more than one policy option can lead to efficiency there could be a coordination problem between voters on which policy to support and this could delay reaching efficiency. Walker et al. (2000) study this issue in the context of a common-pool resources (CPR) game. Each player in this game must decide an amount to extract from the common pool with the cost of extracting depending on the total extraction by all players.[9] This game is a social dilemma game in which the Nash equilibrium is to extract more than is socially optimal.

In that experiment, groups of seven players participate in 10 rounds of the CPR game. After that, players participate in ten more rounds of a modified CPR game. This modified game has two stages. In the first stage each player proposes a vector of extractions (one number for each player) and then they vote on all proposals. The authors considered two voting rules: majority and unanimity. If one proposal wins, then the second stage of the game automatically implements that vector of extractions. If no proposal wins, then the players participate in a normal CPR game.

Under unanimity rule there is a unique sub-game perfect equilibrium of the game if we do not consider weakly dominated strategies. In this equilibrium someone proposes that each player extracts the same socially optimal amount. This level of extraction is lower than the equilibrium level of extraction without institutions and results in greater payoffs.

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[7] See Bosch-Domènech, et al. (2002) and references therein for a detailed description of beauty contest games and the role of levels of strategic reasoning to explain behavior in these games.

[8] Putterman, Tyran and Kamei (2010) study voting on formal sanctions in linear public good games. They find that a large majority of groups learn to impose sanctions that make contributions reach optimal levels. Moreover, they show that voting is influenced by cooperative inclination and ideology.

[9] Note that the common-pool is replenished after every period. This is not a dynamic game.

Under majority there is a multiplicity of equilibria. In addition to the symmetric socially optimal level of extraction, there are several proposals that let only 4 of the 7 players extract resources from the common-pool. Given such a minimum winning coalition, the player would choose a level of extraction to maximize their own sum of payoffs. This results in a total sum of payoffs that is greater than in the equilibrium without institutions but lower than under the symmetrical socially optimal extraction. Since there are 35 possible minimum coalitions there is a large number of possible equilibria. This multiplicity could decrease the probability that players can agree in a policy to reduce extraction from the common pool.

Walker et al. (2000) study 9 groups under majority rule and 4 groups under unanimity rule. Under majority rule, only five out of nine groups (56%) managed to impose restrictions on extraction from the common pool. Under unanimity rule, 3 out of 4 (75%) groups were able to impose restrictions. While this difference is not statistically significant (p-value of 0.55), it is suggestive that subjects may be more likely to agree in a restriction under unanimity rule as this rule eliminates coordination problems that arise from the multiplicity of minimum winning coalitions.[10]

Consistent with this idea is the difference in the type of restrictions chosen by the groups under the two voting rules. In the last round under majority rule, 60% of the restrictions are of the minimum winning coalition type and 40% of the symmetric type. Under unanimity, all restrictions are of the symmetric type. This difference is significant at the 10% level. There is also a difference in the number of distinct proposals under both rules. In the last round, under majority rule there is an average of 4.11 distinct proposals while under unanimity there are only 1.25 distinct proposals. This difference is significant at the 1% level.

But the failure to impose restrictions on extractions is not only due to the multiplicity of optimal minimum coalitions. In fact, a substantial number of proposals involve sub-optimal extraction levels. From the data reported in Walker et al. (2000), we can calculate that in the last round under majority rule, 19% of the proposals involve minimum winning coalitions with inefficient extraction rates and 6% of the proposals

[10] The p-values reported here regarding Walker et al. (2000) are of my own calculation using Wald test considering one observation per group.

involve symmetric sub-optimal rates. For unanimity, 14% of the proposals involve symmetric sub-optimal rates. That is, in an environment in which there is no real disagreement on the fundamentals of the game, some subjects disagree on what they considered optimal extraction for a minimum winning coalition or all players. This disagreement increased the number of distinct proposals and reduced the chance of any restrictions being imposed.[11]

A clear example is provided by the only group that was not able to impose restrictions in the last round under unanimity. In this last round, two subjects in this group proposed that all subjects extract 6 tokens, while the other subjects proposed to extract 7 tokens which is the optimal symmetric amount. This difference in what was considered optimal by different subjects resulted in the group not imposing any restrictions on extractions.

If perceived differences in interests may decrease the chances that a group may democratically choose restrictions to solve a social dilemma, real differences may too. Margreiter, Sutter and Dittrich (2005) study CPR games as in Walker et al. (2000) with the difference that players were not necessarily homogenous. In groups of six players, half the subjects had a high cost and half a low cost. As before subjects propose vector of extraction and then vote. The authors only consider majority rule. They compare behavior in groups with heterogeneous costs with sessions with a homogenous cost set between the high and low cost of the heterogeneous cost groups.

They find that heterogeneous groups relative to homogenous groups have a larger number of distinct proposals, a lower number of accepted proposals and, as a result, a higher average number of extractions and lower payoffs (all these differences are statistically significant at the 5% level).

Kroll, Cherry and Shogren (2007) present evidence from majority voting on vectors of contributions in a linear public good game. They find that groups that can vote on binding vectors of contributions reach significantly higher levels of contributions than groups that cannot. However, not all groups make the most of the opportunity to create efficient institutions in equilibrium.

[11] One could argue that the number of sub-optimal proposals does not matter if subjects only focus on optimal ones. However, the data also shows a similar percentage of subjects also tend to vote for sub-optimal proposals.

Ertan, Page and Putterman (2009) study a linear public good game with the possibility of post-contribution punishments. They show that efficiency is greater when only low contributors can be punished. They then study an environment in which subjects can choose whether to allow punishment of all contributors, of low contributors only or of high contributors only. They show that subjects learn to allow punishments of low contributors only. Noussair and Tan (2011) show that this learning may be hampered if there is heterogeneity in the productivity of contributions across subjects.

Two recent papers study environments in which subjects may independently choose to participate in an institution that may eliminate or reduce free-riding among its members. In Kosfeld, Okada and Riedl (2009), this institution makes the members contribute all their endowments to a linear public good game. In Hamman, Weber and Woon (2011), the institution is the delegation of contribution decisions to one of the members. In both papers, subjects who do not belong to the contribution can still enjoy the public good. Kosfeld, Okada and Riedl (2009) find that many subjects choose to participate in the institution, increasing contributions and welfare. However, they do not make the most of the opportunity since many subjects are not willing to remain in the institution if some other subjects choose to free-ride. Hamman, Weber and Woon (2011) show that most subjects choose not to participate of the institution unless they are able to communicate with each other.

The previous experiments considered social dilemmas that did not depend on past behavior. However, there are many social dilemmas for which dynamic elements are of importance. Battaglini, Nunnari and Palfrey (2009) study the effect of voting institutions on the dynamics of public good investments. They study theoretically the dynamic accumulation of a durable public good depending on whether players make contribution decisions independently or through a binding voting procedure (each round one of the players proposes a level of public good investment and transfers across players, and all players vote and the proposal passes with majority). In theory, the level of investment without voting is below that with voting, and investment under the latter is lower than the socially optimal one.[12] The reason why with voting there is lower investment than

[12] In the solution of the model the authors focus on the Markov perfect equilibrium (MPE) concept.

socially optimal is due to the fact that minimum willing coalitions do not consider the interest of players outside of the coalition.

The authors bring their model to the lab and find that behavior is consistent with the main predictions from the model. The voting institution results in an increase in investment in the public good and an increase in earnings but, as expected, these increases are not large enough to reach efficiency. However, the authors find that proposals tend to deviate from those predicted by theory: they tend to give some transfers to a larger set of players than is predicted. While these proposals are not necessary symmetric, they are reminiscent of the higher than expected presence of symmetric proposals under majority rule in Walker et al. (2000).

Another paper that considers voting in a dynamic game is Bischoff (2007). This paper considers a dynamic CPR game where there is a recommended level of extraction and a probability of detecting deviations from this recommended level (detected deviators earn zero that period). The experimental data shows that when subjects can vote on the recommended level of extraction and the probability of detection, performance is actually worse than when they cannot vote. While it is not clear why this is so, the author concludes that "This result contradicts elementary economic reasoning and cast doubt on the ability of individuals to predict correctly the impact of change and thus their capability to apply institutional change to resolve social dilemma situations."

How able are humans in using institutional change to solve social dilemma situations? Table 2 summarizes the results from the series of experiments described in this section involving voting and for which the needed information is available. The table shows the basic characteristics of the experiment in each paper: the basic game being played, the dimension of institutional improvements that were allowed, and whether the symmetric efficient outcome could be reached in equilibrium with institutional change. The table also shows weather allowing for institutional changes through voting resulted in an increase in earnings and a measure of efficiency gain that can be compared across experiments: the increase in earnings due to voting relative to the increase that would arise if subjects would reach the efficient outcome.

While voting results in an increase in payoffs in the large majority of experiments, there is large variation in the efficiency gain. In many cases, subjects are far from making

the most of the opportunities provided by institutional change. The average increase in payoffs is only 25% of the possible increase.

Among the experiments reported in Table 2, the effect of allowing for institutional changes depends on whether the changes can make the symmetric efficient outcome an equilibrium. When efficiency could be reached in equilibrium, the efficiency gain was 64%. That is, when institutional changes can lead to improvements in equilibrium, subjects use this opportunity to some degree but not fully across the experiments reviewed here. On the contrary, when efficiency could not be reached in equilibrium, the possibility of institutional change actually leads to a decrease in efficiency of 50%. The difference between these two effects is statistically significant at the 10% level.

This difference underscores the fact that providing material incentives to align personal incentives with group goals is important for institutions to be effective. If the set of institutions available to citizens can not eliminate the difference between personal incentives and group goals, it is unlikely that democratic choice among the available institutions will have much impact on payoffs.

While the previous literature has uncovered other important elements behind the failure of subjects to set up efficient institutions (like coordination problems, perceived and real heterogeneity of interests, uncertainty about the effect of reforms), more research is needed on the determinants of efficient institutional improvements. I believe that in particular it is important to understand how subjects' perceptions and understanding of the game and their personal characteristics affect the demand for institutional reform.

3. The direct effect of democracy

The previous section reviews experiments studying how subjects democratically choose institutions so as to affect behavior. In this section I review experiments showing that democratic choice may affect behavior itself, in addition to the effect through the choice of incentives that subjects will face.

The idea that democracy may have a direct effect on behavior goes at least back to Tocqueville (1838): "It is not always feasible to consult the whole people, either

directly or indirectly, in the formation of the law; but it cannot be denied that, when such a measure is possible, the authority of the law is much augmented. This popular origin, which impairs the excellence and wisdom of legislation, contributes prodigiously to increase its power." Other political scientists have also put forward the related idea that political participation may be itself beneficial (see Pateman 1970, Thompson 1970, and Finkel 1985).[13]

In economics, there is a long literature providing evidence consistent with the idea that democracy may have a direct effect on behavior. For example, Bardhan (2000) shows that farmers are more likely to follow irrigation rules that they have themselves chosen. Frey (1998) finds lower tax evasion in Swiss cantons with greater political participation. At the level of the firms there is evidence showing that worker participation in decisions may have a positive effect in productivity (see Levine and Tyson 1990, Bonin, Jones and Putterman 1983, and Black and Lynch 2001). Several experiments show that punishments and rewards in public good games have greater impact on contributions when they are allowed democratically (see Tyran and Feld 2006, Ertan, Page and Putterman 2010, and Sutter, Haigner, Kocher 2010).

While the evidence provided by this literature is consistent with the existence of a direct effect of democracy, it does not necessarily prove that such an effect exists due to three possible identification issues. First, societies or groups with democratic institutions may differ from societies or groups without those institutions (*endogenous democracy*). For example, Swiss cantons with great democratic participation may differ with cantons with low democratic participation. The former may have a more civic minded citizenry, which may directly affect tax evasion. Second, democratic societies or groups may choose different institutions or policies (*policy choice*). For example, farmers may choose better irrigation rules and therefore be less likely to violate them. As such, it is important to precisely control for the type of policies or institutions being imposed. Third,

[13] This idea is also related to the idea of procedural justice in social psychology (see for example Thibaut and Walker 1975, Folger 1977, Lind and Tyler 1988, and Kees van den Bos 1999) and the idea of procedural utility in economics (Frey, Benz and Stutzer 2004). On the related literature comparing endogenous and exogenous games see Van Huyck, Battalio and Beil (1993), Crawford and Broseta (1998), Bohnet and Kübler (2005), Potters, Sefton and Vesterlund (2005), Charness, Fréchette and Qin (2007), and Lazear, Malmendier and Weber (2006). Relatedly, Olken (2010) studies the effect of direct democracy relative to representative democracy in the provision of public goods. He finds greater satisfaction under direct democracy even when there are little differences in the provision of public goods.

democratic choice allows groups with different characteristics to choose different policies (*selection into policy*). This selection into policies would exist when there is democratic choice and not when institutions or policies are chosen from outside, making the detection of a direct effect of democracy difficult. For example, the extra effect of rewards and punishments on contributions when they are allowed democratically found by Sutter, Haigner and Kocher (2010) could be due to unobservable characteristics affecting both how groups vote and their response to rewards and punishments.

Dal Bó, Foster and Putterman (2010) present results from an experiment designed to overcome these three identification hurdles and test for the existence of a direct effect of democracy.

3.1 Identifying the direct effect of democracy

In each experimental session in Dal Bó, Foster and Putterman (2010), subjects participated anonymously through computers. Subjects were randomly divided into groups of four for the entire session. Each session consisted of two parts. In part 1, subjects played 10 rounds of the prisoner's dilemma game in Table 3 (Initial Payoffs). After each round subjects were randomly re-matched with another subject in their group for the next round. In part 2 of the experiment the subjects played 10 rounds as in part 1 but the payoffs could be modified at the beginning of this part to the payoffs in Table 3 (Modified Payoffs). The modification of payoffs consisted of imposing a tax on unilateral defection. While under the initial payoffs the unique Nash equilibrium is mutual defection, under the modified payoffs both mutual defection and mutual cooperation are Nash equilibria.

Whether the payoffs were modified was determined following the procedure shown in Figure 4. First, subjects voted on whether to modify payoffs. Second, the computer randomly chose whether to consider the votes in each group. If the computer considered the votes, then the majority won and in case of a tie the computer broke the tie. If the computer did not consider the votes in a group, it randomly chose whether to modify payoffs or not in that group. The subjects' computer screens inform them whether the computer randomly chose to consider the votes and whether payoffs were

modified. The subjects did not learn the exact distribution of votes, including whether the computer needed to break a tie.

As shown in Figure 4, there are four possible outcomes of the voting stage: endogenous modification (EndoMod), endogenous non-modification (EndoNot), exogenous modification (ExoMod) and exogenous non-modification (ExoNot), where Endo denotes that the votes of the group were considered, Exo denotes that the votes were not considered, Mod denotes that payoffs were modified, and Not denotes that payoffs were not modified. For example, if the votes were considered and they voted to modify payoffs, then the group ends with the outcome EndoMod.

After the voting stage, the subjects play 10 more rounds with other subjects in their group, with the payoff matrix depending on the results from the voting stage.

After the ten rounds in part 2, the subjects answered a series of questions including questions regarding personal characteristics such as academic major, class, math and verbal SAT scores, political philosophy. Finally, the subjects participated in a "beauty contest" game (in order to measure their strategic sophistication).

This design overcomes the three identification hurdles previously mentioned: endogenous democracy, policy choice, selection into policy. As democracy is exogenously determined there is no problem with democratic groups being different than no democratic groups. This solves the problem of endogenous democracy. In addition, the implemented payoff matrix (that is the policy) is perfectly observed. This allows us to control perfectly for the policy that subjects face. This solves the problem of policy choice. The last hurdle is the problem of selection into policy (the fact that subjects that voted to modify payoffs are likely to behave differently from subjects that voted not to modify payoffs). How the design allow us to solve this last problem of identification will be clear in the next paragraphs.

Table 4 presents data from the experiment showing the existence of a direct effect of democracy. However, to underscore the contribution of the paper, I will first provide a comparison which suggest the existence of a direct effect of democracy but which fails to pass the last identification hurdle: selection into policy.

Note that 72% of the subjects under EndoMod cooperated in round 11 while only 50% of subjects cooperated under ExoMod. Since the source of democracy is exogenous and we are comparing behavior under exactly same policy (modified payoffs), the first two identification hurdles (endogenous democracy and policy choice) are not a problem here. However, from panel A in Table 4, note that EndoMod groups tend to have a majority of subjects that voted for modification (55 over 72), while ExoMod subjects have equal number of voters in average (33 and 31). Therefore, this comparison fails to control for selection into policy. Groups that chose to modify payoffs are in average different than groups that had the modification imposed on them in the number of Yes and No voters, and thus they are not comparable.

To overcome this last identification hurdle, selection into policy, Dal Bó, Foster and Putterman (2010) compare behavior in EndoMod and ExoMod controlling by the vote of the subject. In such a way, we can compare subjects that voted in the same way (and therefore are comparable) in the two treatments. For subjects that voted to modified payoffs, we find a 82% of cooperation when the modification is democratic relative to a 58% of cooperation when it is imposed from the outside. This difference is statistically significant at the 1% level. This shows that for subjects that voted for modification there is a direct effect of democracy. There is no effect, however, for subjects that voted to stay in the prisoners' dilemma.

The authors present a decomposition of the total effect of modifying payoffs into a selection effect, an exogenous treatment effect and the direct effect of democracy: the difference between the exogenous and endogenous treatment. They find that of the total effect, 8% is due to the selection effect, 66% due to the exogenous treatment effect and 26% due to the direct effect of democracy.[14] These magnitudes stress the importance of

[14] The total effect is the difference in cooperation rates between ExoMod and EndoNot and it can be calculated from Table 4 as follows: TE = 72.22-17.50 = 54.72. The selection effect is the changein cooperation rates if we keep the cooperation rates of Yes and No voters as in ExoMod but we change their prevalence to that in EndoMod. The selection effect can be calculated from Table 4 as follows: SE = (17/72 −55/80)14.55 + (55/72 − 25/80)24 = 4.27. The exogenous treatment effect is the difference in cooperation rates between ExoMod and ExoNot with the prevalence of Yes and No voters as in EndoMod. From Table 4, ExoTrE = (17/72)(41.94 − 3.85) + (55/72)(57.58 − 23.53) = 36. The endogenous treatment effect is the difference of cooperation rates between EndoMod and ExoMod with the prevalence of Yes and No voters as in EndoMod. From Table 4, EndoTrE=(17/72)(41.18 − 14.55) + (55/72)(81.82 − 24) = 50.45. The direct effect of democracy is the difference between the endogenous and exogenous treatment effect: DE=14.45.

the direct effect of democracy: it is more than three times the selection effect and more than 40% of the exogenous treatment effect.

3.2 Exploring mechanisms behind the direct effect of democracy

Why subjects who modified payoffs democratically cooperated more than those under exogenously modified payoffs? It could be that knowing about the democratic modification provides information about the votes of the other subjects (there must be a total of at least two votes in favor of modification) and this information affects behavior. Knowing that a majority voted yes may affect the subjects' expectations about which equilibrium is more likely. We call this the information hypothesis: the direct effect of democracy is not really direct, but operates by affecting the information that subjects have about the other subjects in their group. An alternative hypothesis is that the effect that was measured by Dal Bó, Foster and Putterman (2010) was not due to differences in information.

Dal Bó, Foster and Putterman (2010) provide data from additional session that show that the effect is not due to information. In these additional sessions, subjects under exogenous modification were informed whether there were at most two or at least two votes in favor of modification. This gives them the same information about votes that subjects obtain under democracy. These two additional treatments are denoted ExoModH and ExoModL in Table 5

As shown in Table 5, 82% of subjects who voted for modification under endogenous modification cooperated in round 11, while only 63% cooperated under exogenous modification under the same information (at least two votes in favor of modification). This difference is statistically significant at the 5% level.

Moreover, the information about votes have no significant effect in the cooperation rate under exogenous modification (58% for no information, 63% for at least two votes in favor of modification and 64% for at most two votes in favor of modification).

The percentages in the text come from comparing the selection effect, the exogenous treatment effect and the direct effect to the total effect.

In conclusion, Dal Bó, Foster and Putterman (2010) find that the direct effect of democracy cannot be explained by differences in information. It appears that democracy directly affects subjects' behavior. This may be due to democracy strengthening cooperative social norms or operating as a coordination device. More research is needed to disentangle these two possibilities.

3.3. The spill-over effect of democracy

Kamei (2010) shows that the direct effect of democracy can spill-over from democratic environment to other environments. That is, a person participating in a democratic decision may also behave in a more pro-social manner in non-democratic environments. This has implications for our understanding on how democratic participation can foster cooperative behavior in a society or organization.

In this experiment subjects could vote to modify the payoffs from a linear public good game to reduce the benefits from investing in the individual account. This reduction however was not enough to change the unique Nash equilibrium under monetary payoffs: it was still a best response to contribute nothing to the public account. Subjects voted and participated in two public good games with two different partners. Some subjects faced exogenously modified payoffs in both games (that is votes were not considered in both games, these subjects are called Exo-Exo) while other subjects had their votes considered in one group but not the other (these subjects are called Endo-Exo).

Table 6 reports, for groups with modified payoffs, the average contribution of the subjects as a function of whether votes were considered or not for both No-No and Yes-Yes voters.[15] As in Dal Bó, Foster and Putterman (2010) it is important to compare behavior of subjects that voted in the same way so as to control for selection into policy.

Yes-Yes voters contributed more in groups under exogenous modification if in the other group they faced and endogenous modification than if they faced an exogenous modification in both groups (15.73 versus 12.05 – significant at the 5% level). This difference shows that when subjects had their votes considered in one group they increased their contribution in the other group as well. There are no significant

[15] No-No (Yes-Yes) voters are those that voted against (for) the modification of payoffs for both groups.

differences for subjects that voted not to modify payoffs, so the spill-over effect is limited to subjects that wanted to modify payoffs.[16]

Note that the data from Table 6 also allows measuring the direct effect of democracy. For Yes-Yes voters, contributions in groups with a democratic modification were significantly greater than those from subjects that did not participated in any democratic group (16.55 versus 12.05 – significant at the 1% level). This is interesting as, contrary to what is the case in Dal Bó, Foster and Putterman (2010), in this experiment the modification of payoffs does not affect the set of equilibria under the assumption of material payoffs. As such the fact that democracy affects behavior is more surprising.

Finally, the results from Kamei (2010) have implications for the set of identification strategies available to measure the direct effect of democracy. While Dal Bó, Foster and Putterman (2010) control by individual vote so as to avoid selection into policy effects while comparing behavior across people, an alternative would be to have the same subject participate in one democratic group and one non-democratic group. In this way, personal characteristics could be controlled for while calculating the effect of democracy on behavior. The spill-over effect found by Kamei (2010) suggests that this identification strategy may fail to measure the direct effect of democracy appropriately as the subject behavior in the non-democratic group is affected by the participation in the democratic group.

4. Conclusions

An important feature of society is the possible tension between the incentives faced by each of its members and society as a whole. This tension may result in inefficient outcomes. One way in which societies may solve this tension is by using the power of the state to establish institutions (for example regulations and policies) that would align the incentives of individuals with the goals of society. One important issue, then, is to study to what degree citizens would vote to impose these institutions.

[16] This is consistent with the fact that the direct effect of democracy in Dal Bó, Foster and Putterman (2010) is limited to voters in favor of modification.

Studying these issues with naturally occurring data is difficult not only due to the usual endogeneity concerns but also due to the fact that it may be difficult to determine what outcomes and institutions are efficient. However, this can be done in experiments where the researcher has full control over the environment.

In this chapter I summarized a series of experiments showing that subjects do not always make the most of the opportunity to set up institutions that would lead to efficient behavior. While this literature has identified important factors behind this result, I believe that more research is needed to better understand the determinants of efficient institutions.

I end the chapter by summarizing the recent literature on the direct effect of democracy. This literature shows that democratic institutions may have an effect on behavior not only through the choice of policies and regulations which will affect incentives and hence behavior. That is, there is a direct effect of democracy. This effect has been shown not to depend on the information revealed through voting. Moreover, this effect spills from democratic environments to un-democratic ones.

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Table 1: Stage Game Payoffs

	Other's Action	
Own Action	C	D
C	10	50
D	30	70

Table 2: The effect of voting to overcome social dilemmas

Paper	Basic game	Voting on	Symmetric Efficiency in Equilibrium	Increase in Earnings	Efficiency Gain
This chapter	PD	Eliminate C or D	YES	YES	100%
Kroll, Cherry and Shogren (2007)	VCM	Contribution vectors	YES	YES	82%
Carpenter (2000)	PD	Fine on DC, subsidy on CD	YES	YES	79%
Putterman, Tyran and Kamei (2010)	VCM	Fine	YES	YES	72%
Margreiter, Sutter and Dittrich (2005) Homogeneous	CPR	Extraction vectors	YES	YES	67%
Walker et al (2000) Majority	CPR	Extraction vectors	YES	YES	63%
Walker et al (2000) Unnanimity	CPR	Extraction vectors	YES	YES	55%
Margreiter, Sutter and Dittrich (2005) Heterogeneous	CPR	Extraction vectors	YES	YES	43%
Sutter, Haigner and Kocher (2010)	VCM	Punishments or Rewards	NO	YES	34%
Dal Bó, Foster and Putterman (2010)	PD	Fine on DC	YES	YES	14%
Kamei (2010)	VCM	Fine	NO	YES	6%
Bischoff (2007) No Communication	Dynamic CPR	Extraction and Detection	NO	NO	-64%
Bischoff (2007) Communication	Dynamic CPR	Extraction and Detection	NO	NO	-175%
Average					29%

Note: Efficiency gain = (Payoff when voting - Payoff when not voting)/(Efficient payoff - Payoff when not voting).

Table 3: Stage Game Payoffs in Dal Bó, Foster and Putterman (2010)

Initial Payoffs			Modified Payoffs		
	Other's Action			Other's Action	
Own Action	C	D	Own Action	C	D
C	50	10	C	50	10
D	60	40	D	48	40

Table 4: The effect of the democracy - Dal Bó et al. (2010)

Panel A: Number of observations

	Consider Votes		Not Consider Votes	
Vote for Modify	Modify (EndoMod)	Not Modify (EndoNot)	Modify (ExoMod)	Not Modify (ExoNot)
No	17	55	31	26
Yes	55	25	33	34
Total	72	80	64	60

Panel B: Cooperation Percentage in Round 11

	Consider Votes		Not Consider Votes	
Vote for Modify	Modify (EndoMod)	Not Modify (EndoNot)	Modify (ExoMod)	Not Modify (ExoNot)
No	41.18	14.55	41.94	3.85
Yes	81.82	24.00	57.58	23.53
Total	72.22	17.50	50.00	15.00

Table 5: The effect of democracy controling for information - Dal Bó et al. (2010)

Modified Payoffs

Panel A: Number of observations

	Original Sessions		Additional Sessions Not Consider Votes	
	Consider Votes		Vote Share	
Vote for Modify	Yes (EndoMod)	No (ExoMod)	≥2 (ExoModH)	≤2 (ExoModL)
No	17	31	20	38
Yes	55	33	56	14
Total	72	64	76	52

Panel B: Cooperation Percentage in Round 11

Vote for Modify	(EndoMod)	(ExoMod)	(ExoModH)	(ExoModL)
No	41.18	41.94	35.00	23.68
Yes	81.82	57.58	62.50	64.29
Total	72.22	50.00	55.26	34.62

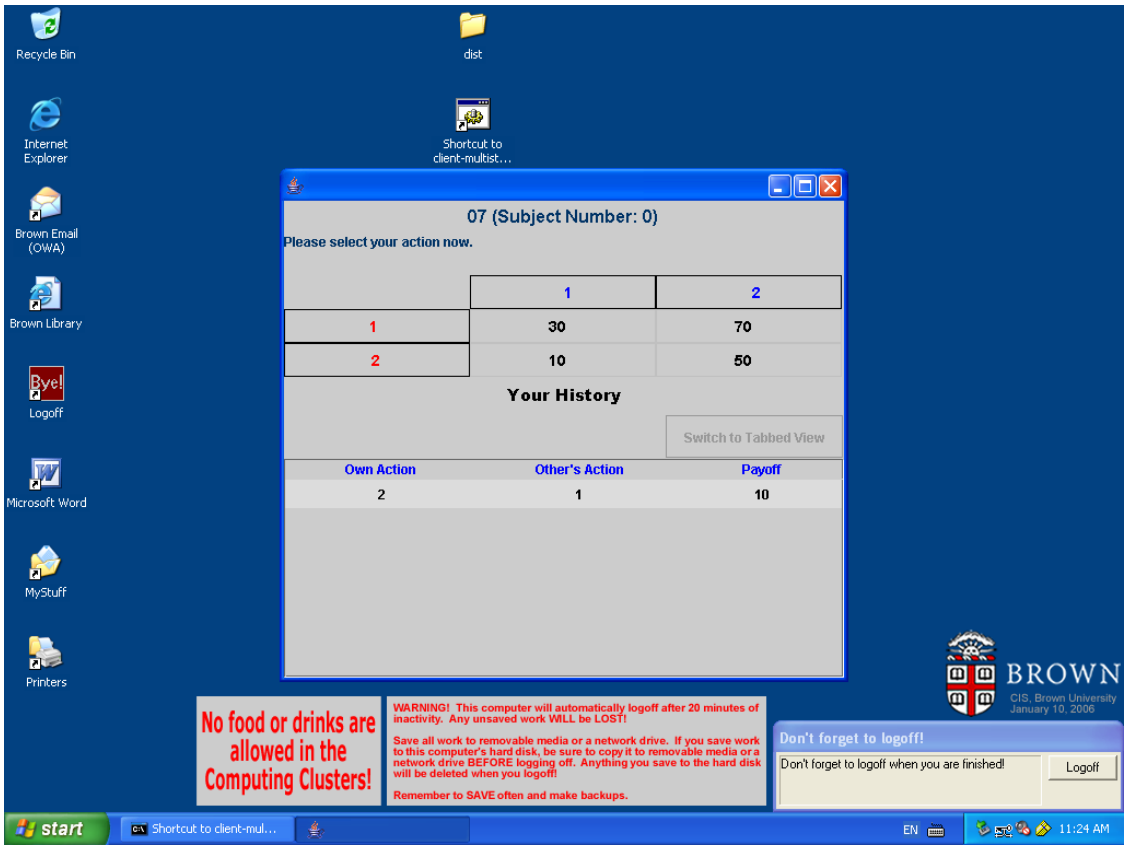
Note: The column Vote Share ≥2 (≤ 2) corresponds to the subjects under exogenous modification in the additional sessions who were informed that at least (at most) two subjects in the group had voted for modification.

Table 6: The spill-over effect of the democracy - Kamei (2010)

Average Contribution under Modified Payoffs

Vote for	Endo-Exo		Exo-Exo
Modify	Endo	Exo	Exo
No-No	7.35	7.65	5.84
Yes-Yes	16.55	15.73	12.05

Figure 1: Multistage Screens for “See Matrix” and “Do Not See Matrix”



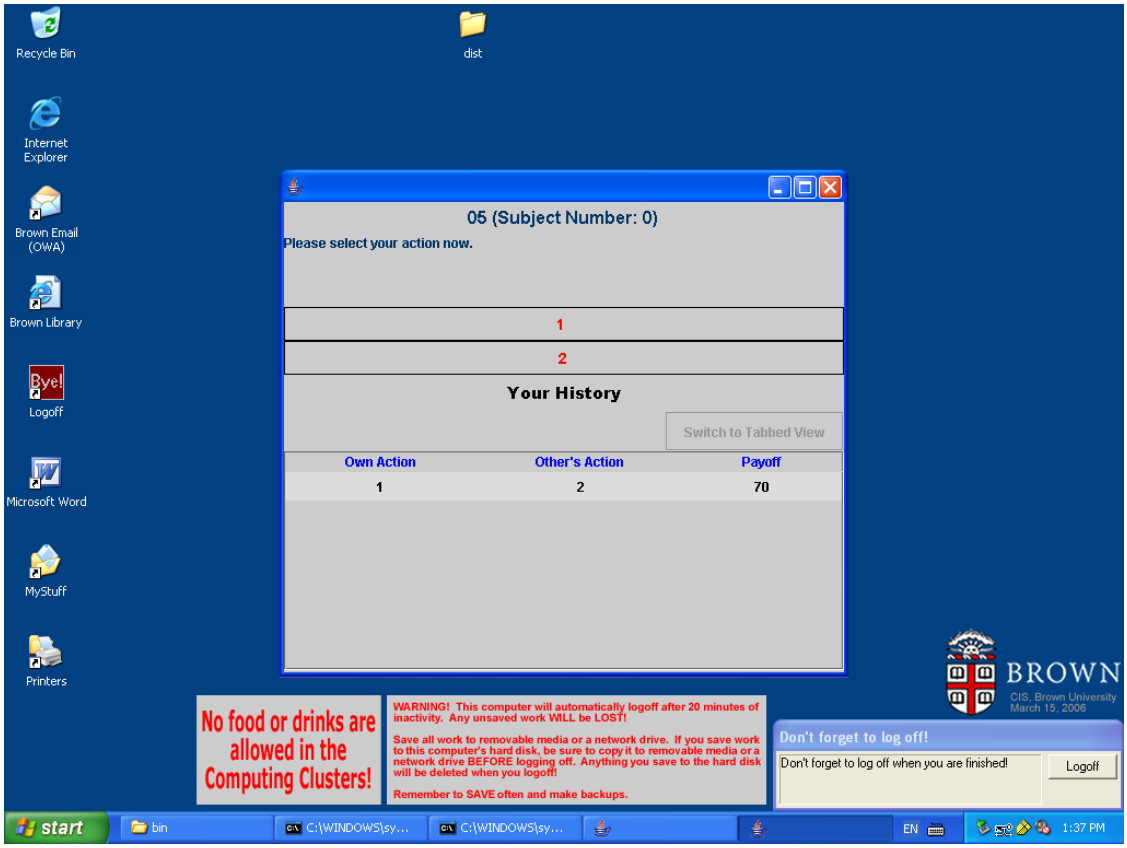


Figure 2: Evolution of Cooperation in Democracy Experiment

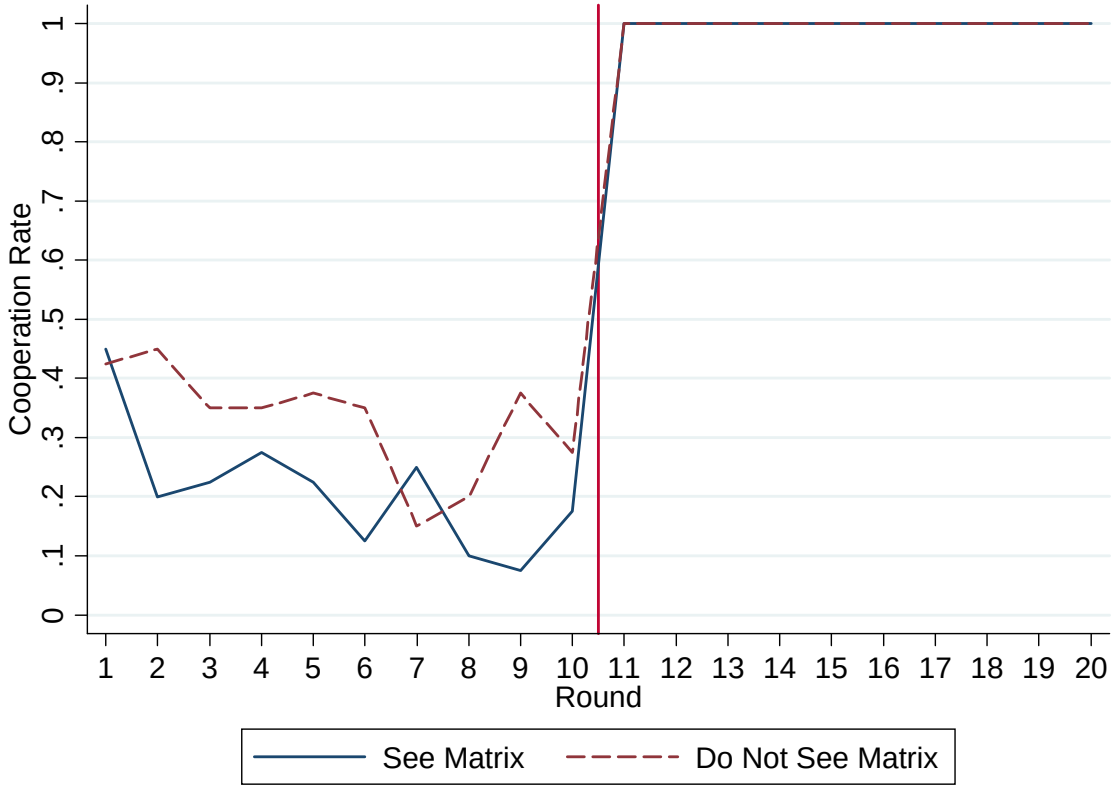


Figure 3: Distribution of Votes in Democracy Experiment

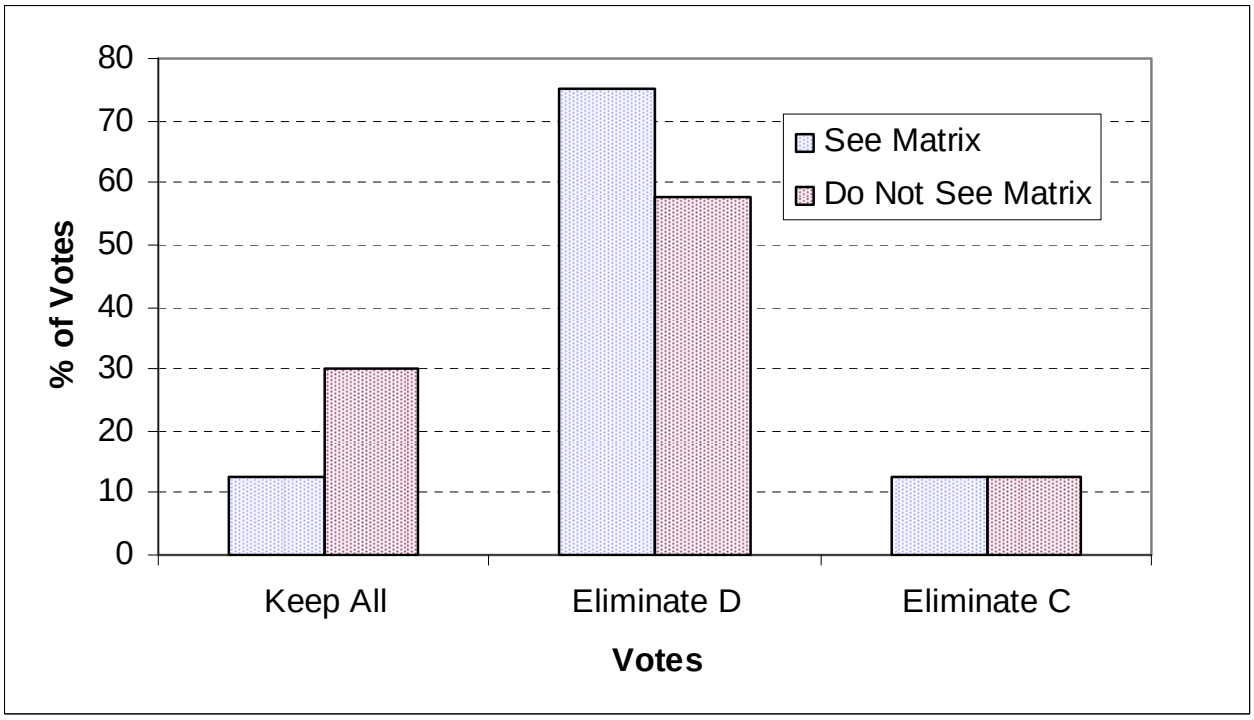


Figure 4: Voting Stage in Dal Bó et al. (2010)