Bribing Voters

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Abstract

We show how an outside party offering incentives to a committee can manipulate at no cost collective decisions made through voting, and induce inefficient outcomes. The model can easily deal with different incentive schemes, credibility situations, and payoff and information structures. We then relax the assumptions producing the initial results and explain how institutions and norms actually observed may be protecting collective decisions from influence. We assess when voting should be made secret, how the existence of political parties may raise the price of influence, and how the committee's corruptibility can be reduced by granting it the authority to change its own decision rules. We discuss implications for lobbying, voting in legislatures and central banks, and the efficiency of democracy.

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1 Introduction

One might think that corrupting a group of people reaching decisions through voting will take more bribes than corrupting a single individual. If so, collective decision making bodies would make relatively good anticorruption devices. Two important questions in economics and politics–which this paper tackles–are whether the previous statements are true, and how to insulate collective decisions from undesirable influences.

These questions are highly relevant: voting inside collective bodies is used throughout society to make important decisions. Two of the three republican powers–the legislature and the judiciary–involve collective bodies where members vote. In addition, many central banks around the world are run by boards voting on monetary policy.[1] Thus, if the executive found it easy to influence voting decisions, the independence of central banks and the republican separation of powers could be seriously curtailed. Indeed, political philosophers like Bentham, Rousseau, Hume and Mill all worried about voting being influenced: little could be expected from democratic forms if an astute king or aristocrat could easily sway assemblies and courts, or if elections could be rigged easily. These thinkers' concern for representative government involved wondering about the pros and cons of using collective bodies: "*Some things cannot be done except by bodies; other things cannot be well done by them...it is necessary to consider what kinds of business a numerous body is competent to perform properly.*" (John Stuart Mill, Considerations on Representative Government, Chapter V, p.271).

A number of issues involving electoral and representation systems, and the statistical properties of collective decision making, were tackled early on (by scholars like Borda, D'Hondt and Condorcet). These have been well studied in the modern literature.[2] In contrast, the potential for influence over assemblies or committees (of which the electorate is a particular case) has not been understood as well. This paper shows that committees do not necessarily constitute safe decision making devices in the presence of outside influence. Running against direct intuition, perhaps, bodies will not necessarily be more expensive to

[1] Further examples of situations where collective decisions are made through voting include trade union members meeting to decide whether or not to go on strike; zoning boards granting building permits; shareholders gathering in assemblies to vote on matters of corporate control; and academic committees deciding on the admission of students and colleagues.

[2] In particular, Condorcet's Jury Theorems have triggered a significant amount of modern research on how voting aggregates information. See inter alia Grofman, Owen and Feld (1983), Young (1988), Austen-Smith and Banks (1996), Feddersen and Pesendorfer (1997) and Myerson (1998). See Persico (2000) and Cai (2001) for committees where information is costly. For an experimental study of group decisions, see Blinder and Morgan (2000).

bribe than a single individual. Once this is established, we study features of committee design that can make their decisions less vulnerable to external influence, allowing us to account for a variety of "protective" institutions actually observed.

We consider a group of people–to be called a "committee", the "voters", or the "agents"– that have to make a binary decision by majority voting. These voters are potentially under the influence of an outside party–to be called the "principal".[3] We establish assumptions isolating a baseline case in which the principal can induce the committee to opt for either of the two alternatives *while making no payments in equilibrium*. Under these circumstances (but also under more general ones) we find that collective decisions through voting under influence can be inefficient. This is said in the sense that those decisions do not maximize the sum of utilities of the principal and the agents. This can happen when agents would have chosen an efficient allocation in the absence of external influence. Neither of these results holds when all decision rights are held by a single agent reflecting the committee's preferences. Moreover, these results hold for committees of any size and for any majority rule short of unanimity.

The model allows all initial assumptions to be relaxed and offers predictions on the cost of capturing committees and on the efficiency of the outcome under various regimes. In particular, we show that costless capture disappears, and the potential for inefficient outcomes is reduced (although not always eliminated) when: (i) voters can be held individually accountable and this introduces a cost for casting the "wrong" vote that is independent of the collective decision, (ii) voters can collude, and (iii) the type of events on which the principal can condition payments is limited, so bribes become "coarser" (more variations–including a treatment with incomplete information–are analyzed in Dal Bó, 2000). We relate these treatments to the operation of real life norms and institutions. These devices can then be rationalized as means to depart from the grim baseline case, i.e. as means to protect the independence of committees. Examples of devices that our framework helps rationalize are political parties, the discretion legislators enjoy when setting the legislative path that a bill will follow within Congress, and the choice of whether voting should be kept secret or not.

[3]Considering a set-up with only one principal is interesting since it captures many real life situations in which there is only one party in a position to exert influence over the agents. Other interested parties may not be organized or be too badly informed (about, for instance, the fact that one other party has approached the committee). A regulated firm, for instance, is more likely to be able to lobby the regulator than the consumers. The executive, at times, may be in a far better position to lobby the congress than normal citizens or interest groups. There are numerous contributions profitably exploiting single-principal lobbying set-ups. See for instance Bennedsen and Feldmann (2002) on informational lobbying.

According to John Stuart Mill, *"The question of greatest moment in regard to modes of voting, is that of secrecy or publicity."* (Considerations on Representative Government, Ch.X, p. 353). We offer what we believe is the first formal analysis of the effects of the secrecy of voting when there is a danger of vote buying. One fundamental distinction in the paper is between different types of costs facing a voter when casting the "wrong" vote. One type of costs accrues when one's vote is decisive and causes the approval of a bad decision. The other type of costs are strictly vote-related, and accrue regardless of the collective decision. Examples of the latter costs are the moral dissatisfaction of voting against one's own conscience, or the costs of being seen to be voting the wrong way by constituents one is representing in the committee (this could be the cost of not being reelected to a legislative seat, say). The model predicts that secrecy is best when the decision-related costs are relatively important vis-à-vis the vote-related costs. This helps explain why, while voting should always be kept secret in general elections, it may be beneficial to keep it public in legislatures–thus giving rise to roll calls and to position-taking activities by legislators (see Snyder and Ting, 2002). Our results can also account for contrasting transparency standards in major central banks. While voting is secret in the Bundesbank and the European Central Bank, it is public in the Bank of England, the Bank of Japan, and the Federal Open Market Committee at the Federal Reserve of the United States. This has been the subject of a heated debate (see Buiter, 1999, and Issing, 1999) although according to our model the observed pattern is compatible with optimal committee design.

The result of costless capture is a useful benchmark to have: a number of institutions can be explained as means to avoid it. But the result also contributes an explanation for the "Tullock paradox", i.e. the observation that certain groups of society obtain favors from politicians that are worth disproportionately more than what those groups invested in influencing them.[4] Ramseyer and Rasmusen (1992) report examples of cheap capture involving American legislators (see also Helpman and Persson, 2001, for a different view). Our explanation may seem vulnerable to the observation that if one interest group is costlessly corrupting a committee and obtaining large favors, then other groups would be tempted to enter such lucrative activity. And indeed, costless capture disappears if one considers extensions with more than one principal. One can show however that if entry is endogenous and

[4] Ansolabehere, de Figueiredo and Snyder (2003) report very interesting US data concerning the value of political benefits and expenditures for certain interest groups. The (weighted average) ratio of benefits to expenditures across groups ranges around 10,000. If politics is seen as an industry, the question arises of why rates of return there seem so much higher than those in other economic activities.

(even minimally) costly, costless capture can survive.

The finding that collective decisions under influence can be inefficient contributes to the debate on whether democracies will tend to display efficient results. Wittman (1989) holds that the market for policies operates as well as the markets for goods do, and that therefore democracies will generate efficient results. In our view, the market for policies involves collective decisions under external influence to a larger degree than the markets for goods do. Therefore the market for policies–i.e. democracy–may fail more often than the market for goods.[5]

Our work is related to the literature on vote trading. This practice was seen in a good light by authors like Coleman (1966) and Buchanan and Tullock, (1962, Chapter 10), as it allowed the expression of intensity of preferences. Although without an equilibrium foundation, Riker and Brams (1973) argued that voting externalities could make vote trading among voters with different preferences undesirable.[6] Our analysis of vote trading with an outside party does not require heterogeneity in voters' preferences, and reveals a degree of vulnerability of collective decisions–in equilibrium–that has gone unnoticed. Implications for the literature on voting patterns in legislatures follow as well. Riker (1962) predicted the formation of minimum winning coalitions. Groseclose and Snyder (1996) explain the formation of supermajorities as a result of sequential strategic bribing. Weingast (1979) and Niou and Ordeshook (1985) provide explanations for why legislatures would display relatively unanimous voting patterns instead. We will show that outcomes very close to minimum winning coalitions, supermajorities, and universalist (unanimous) outcomes are all equilibria when a committee is under influence.

Snyder (1991) provides an early contribution on the buying of legislators. Neeman (1999) studies a more general contracting set-up and identifies situations where the freedom to contract should be limited. Prat and Rustichini (1999) study the provision of incentives–by competing principals–to agents playing a variety of games, voting included. All these papers consider that payments to an agent are made contingent only on that agent's actions, while we consider a wider set of possible offers. Moreover, their focus is different. Prat and Rustichini,

[5] One may conjecture that inefficiencies are strictly due to our allowing for only one principal, and that "true" democracy is about more than one principal being able to make offers. This does not help, however. It is possible to construct examples with more than one principal where inefficiencies persist. Prat and Rustichini (1999) show very generally that adding principals in a multi-agent setting introduces a new class of inefficiencies on top of the one we focus on in this paper.

[6] Voting externalities were probably first identified by Downs, 1957, p. 191-192. See Philipson and Snyder (1996) for a less grim picture on the consequences of vote trading.

for instance, devote their paper to proving very general propositions regarding a wide variety of interactions. This is also true for another related paper, by Segal (1999). He studies the general case of a principal exploiting externalities among agents when contracting with them. Our model, tightly tailored to the voting case, is consistent with his more abstract approach. By being simpler, however, our model can easily offer a wider range of treatments, including that when voters can alter the game after hearing the principal's offers. This more focussed framework enables us to say more about how to design committee structures. Both in this paper and in Segal (1999), the principal can use a "divide and rule" mechanism whereby the payoff of one agent is made contingent on the behavior of others. This idea goes back at least to Crémer and McLean (1985), and is also present in papers exploring exclusionary contracts (see Section III in Aghion and Bolton, 1987) or surplus extraction (Spiegler, 2000).

The plan for the paper is as follows. Section 2 presents an example that clarifies intuitions behind the initial results. Section 3 presents our baseline model of influence over a committee. Section 4 establishes the benchmark result of costless and inefficient capture. Section 5 considers limitations to the complexity of the offers the principal can use. In Section 6 we allow for voters that not only care about the collective decision, but also about how they vote in itself. In Section 7 we analyze collusion among voters. Section 8 analyze when voting in committees should be kept secret. Section 9 concludes. Proofs are contained in the Appendix when no reference is made to them in the main text.

2 An example

Consider a situation in which a real estate developer plans to buy a green area to build houses. This area is collectively owned by three neighbors gathered in a committee. The developer submits a proposal to them: she offers to buy the land for a very low price and then build a huge number of houses. All three neighbors realize that selling the green area they enjoy for such a price, only to find the neighborhood overcrowded in the future, would be a terrible deal. They would each suffer a utility loss of size $\theta > 0$. The three neighbors are to vote, simultaneously, for or against the developer's proposal. This will be approved if and only if at least two neighbors vote "*yes*". Given the neighbors' preferences, one can expect them to vote against it. Now imagine that, before voting takes place, the developer offers a bribe to every neighbor.

Several interesting questions arise: **1.** Would we expect the developer to have to spend little or much money to get the proposal accepted? **2.** Will the outcome be efficient, in the sense that the sum of utilities of neighbors and developer is maximized? **3.** Would the neighbors make the decision process less corruptible by, (i) trusting it to just one of them, (ii) keeping their individual votes secret, (iii) talking with each other, (iv) signing contracts among themselves, or (v) voting first on changing the decision rule? These are some of the questions answered in this paper.

Suppose the developer offers contracts telling each voter: "I will pay you a penny if you vote "*yes*", and I will add an amount θ if your vote is pivotal." We call these "pivotal bribes" because they really compensate each voter for the disutility θ if and only if his vote happens to be decisive.[7]

Under these contracts every neighbor will reason this way: "If my vote is not pivotal, say because my two neighbors vote "*no*", then I will suffer no loss–no matter what I vote–because the proposal will be rejected, so I might as well vote "*yes*" to cash in a penny. If on the other hand my vote is not pivotal because my two neighbors are voting "*yes*", then my loss is θ–no matter what I vote–because the proposal will be accepted, so I might as well vote "*yes*" to get the penny. In the cases in which my vote is pivotal and makes the project to be accepted, I will be more than compensated. It follows that I am always happier voting "*yes*". Voting this way is therefore a strictly dominant strategy for me." Since every neighbor reasons in the same way, they should all vote "*yes*". Then nobody happens to provide a pivotal vote, and the developer–honoring her promises–will pay nothing, although her project has been approved. This example illustrates how collective decisions made through voting can be vulnerable to external influence. We will analyze the nature and limits of this vulnerability, and study ways to reduce it.

3 The model

Three members of a committee (also called "voters") are to vote on a given issue.[8] Each committee member casts a vote v_i for or against the proposal. Therefore, the action space for an individual voter is the set $\mathcal{V}=\{yes,no\}$. The letter v denotes the profile of cast

[7] With three neighbors, each is providing a pivotal, or decisive, "*yes*" vote whenever he is voting that way together with just one other voter. In these circumstances, changing the vote would alter the collective decision.

[8] The assumption that the committee size is three is just made to simplify presentation. Some results are in fact proved for the general case. Otherwise, when stating each result, we will comment on how it extends to the case of a committee of size $N > 3$. The results hold also for $N = 2$ if the requirement to make a decision favoring the principal is only one vote.

votes $[v_1, v_2, v_3] \in \mathcal{V}^3$. This action profile determines the committee's decision through a decision function $d(v)$ which we take to be simple majority. The main results are not altered by considering other non-unanimous majority rules in committees of any size N. The committee's decision $d(v)$ belongs to the set $\{Yes, No\}$.[9] The decision is "Yes" ("No") if and only if at least two of the three votes are "*yes*" ("*no*"). Abusing notation, we assume that $d(v)$ takes the value 1 when the decision is "Yes", and the value 0 when it is "No". We assume, to begin with, that the principal can observe the entire vector v (decision d is obviously observable). We study the case when the principal does not observe v later on.

The principal gets revenue $\pi > 0$ when the committee's decision is "Yes". Decision "No" yields her zero.[10] Therefore the principal will try to induce the committee to choose "Yes" by offering its members a collection of bribe offers $\{b_i\}_{i=1,2,3}$. An offer b_i is actually a function $b_i(v)$ expressing the bribe that will be paid to voter i depending on the realized voting profile v. The principal's payoff can then be written as,

$$d(v)\pi - \sum_{i=1}^{3} b_i(v).$$

We assume the principal cannot tax voters so bribes are always nonnegative. We also assume bribe offers are only observed by the recipient (as befits possibly illegal offers) but the results are also valid for the case where offers are public (we will comment on some extensions in Dal Bó, 2000, where public offers allow the principal even further room for manipulating the committee than discussed here). The principal is assumed to be able to commit to her offers.[11] It is not necessary, however, to assume any commitment power on the voters' side. This amounts to say–stacking the deck against the principal–that voters hear offers but do not sign contracts. Voters vote the way the principal wants only if it is convenient for them

[9] We will always write "*yes*" ("*no*") with lower case initial when we refer to an individual vote, and with uppercase initial when we refer to the overall committee decision. We will use the expressions "*yes*" ("*no*") and "*y*" ("*n*") interchangeably when referring to individual votes. Note however that uppercase "N" on its own just denotes the committee size when we want to refer to it generically.

[10] For expositional convenience, we will refer throughout to the principal as a female, and to the voters as males.

[11] This would be natural when a long-lived principal faces a sequence of committees (as a big corporation may do over decades with changing legislatures) and she wants to develop a reputation for honouring promises. Assuming away the credibility problem is standard in the literature on political influence (see for instance the common agency models as introduced by Bernheim and Whinston, 1986). We follow this convention in order to relate the origin of our results to the specific difference of our environment: the body under influence is a committee rather than an individual.

to do so given the payments promised. We now make three important assumptions (that will be relaxed later on):

Assumption 1. The principal can make payment promises contingent on the complete action profile: each voter may be offered a payment depending not only on what he does, but also depending on what the others do. This requires that the principal may be able to observe the voting profile v.

Assumption 2. Committee members care about the collective decision, but not about how they vote *per se*.

Assumption 3. Committee members can communicate and coordinate their play through nonbinding agreements, but they cannot contract among themselves.

The payoff of voter i can now be written as,

$$-d(v)\theta_i + b_i(v).$$

This expression says voters care positively about the bribes they receive, and negatively about the committee's decision. When it is "No", voters get zero utility (apart from bribes), but when it is "Yes", each committee member i suffers a utility loss of size θ_i. This magnitude is the "type" of voter i. We will focus on situations in which these types are public information (the main results are not affected when types are private information–see Dal Bó, 2000). We want to focus on cases where there is a conflict between the committee and the principal. Therefore we assume that all types θ_i are positive, which means all committee members are to some extent *against* the approval of the project desired by the principal. Assuming that some members of the committee are actually in favor of the principal would just make things easier for the latter. All results in this paper would be either strengthened or unchanged. For simplicity of exposition we make all types equal to $\theta > 0$. Note our formulation reflects Assumption 2, namely that voter i cares about his own vote only in so far as it affects the collective decision $d(v)$ and the bribe $b_i(v)$ he will receive.[12]

Although we allow voters to use mix strategies, all our results involve pure strategies. Therefore, in order to save space, we omit expanding the notation to explicitly deal with mixing. All the propositions in this paper survive if we specify risk averse preferences and when using nonseparable utility functions.

[12] If voters face a moral cost of accepting offers of any sort from the principal, things are altered. The acceptance or not of those offers must be modeled explicitly as a decision previous to voting. The treatment is then similar to the one in Section 6, where voters mind directly about what their vote is.

Timing

First stage: Nature determines the value of θ and both principal and voters learn it. Then the principal communicates to each voter i a bribe offer $b_i(v)$.

Second stage: The voters learn the bribe offers of the principal. Then they cast their votes simultaneously and noncooperatively.

Solution concept

We will be interested in (sub-game perfect) Nash equilibria (SPNE) for the game described. Votes are the committee members' pure strategies. A collection of bribe offers $\{b_i\}_{i=1,2,3}$ is a pure strategy for the principal.

Given a majority rule, we will say that the principal can induce or implement a decision "Yes" by the committee if and only if there is a majority for whom voting "*yes*" is a dominant strategy. This makes the bribes effective even when secret, as when a player has a dominant action, he does not care what the payoffs of others players are. Whenever voters have a dominant strategy we consider that they will use it.

4 The baseline case

Think first about the voting game the committee members are to play when the principal is not active–to be called the *laissez faire* voting game. This game can be represented in normal form by having voter 1 choosing rows, voter 2 choosing columns, and voter 3 choosing boxes. The payoffs in each cell correspond from left to right to voters 1, 2 and 3 respectively.

n

	n	y
n	$0,0,0$	$0,0,0$
y	$0,0,0$	$-\theta,-\theta,-\theta$

y

	n	y
n	$0,0,0$	$-\theta,-\theta,-\theta$
y	$-\theta,-\theta,-\theta$	$-\theta,-\theta,-\theta$

(1)

There are eight possible voting profiles in this game. Five of these profiles constitute Nash Equilibria (henceforth, NE): $[y,y,y]$, $[n,n,n]$, $[n,n,y]$, $[n,y,n]$ and $[y,n,n]$. In other words, in none of these profiles there is a player who could improve his payoff by voting differently. Among these NE, however, the most robust prediction for how the game should be played is given by the profile $[n,n,n]$, which involves (weakly) dominant strategies by all players. Dominant strategies are the safest course of action for an individual player if he attaches a tiny probability to the event that some other player may make a mistake when playing.

Now we meet the principal. If she thinks that profile $[n, n, n]$ is the most likely outcome of the *laissez faire* voting game, she will try to affect the way this game is played. Imagine that the principal offers the pivotal bribes of our example in Section 2. These promise every voter a payment $\theta + \varepsilon$ in exchange for a pivotal "*yes*" vote and just ε otherwise. The amount ε can be assumed to be arbitrarily small throughout and to avoid open set problems we assume there is a minimum currency unit $\varepsilon > 0$ of negligible value. The voting game the committee members play under these offers has the following normal form:

n

	n	y
n	$0, 0, 0$	$0, \varepsilon, 0$
y	$\varepsilon, 0, 0$	$\varepsilon, \varepsilon, -\theta$

y

	n	y
n	$0, 0, \varepsilon$	$-\theta, \varepsilon, \varepsilon$
y	$\varepsilon, -\theta, \varepsilon$	$-\theta+\varepsilon, -\theta+\varepsilon, -\theta+\varepsilon$

It now follows from inspection of the payoffs that the profile $[y, y, y]$ should be the best prediction for the voting game under pivotal bribes. It involves strictly dominant strategies by all players and is thus the unique NE of the voting game.

The pivotal bribes render the voting game a multilateral prisoners' dilemma. By playing dominant strategies all players end up in an outcome that is undesirable for them relative to some other feasible outcome. Note that the pivotal offers specify virtually zero payments if the profile $[y, y, y]$ were realized. Thus, they induce the approval of the principal's project at virtually zero cost.[13] Having ruled out negative bribes, this is as good as things can get for the principal. Hence, offering these bribes must be an equilibrium for her. It follows that we have an equilibrium for the overall game. This implies,

Proposition 1 *In equilibrium, the principal will induce the committee to decide "Yes" at no cost.*

Several remarks follow. Some clarify aspects of this equilibrium, others extend the result, and the last one deals with efficiency concerns

Extension to committees of size N In the case $N = 2$ (and the decision rule being $d(v_1, v_2) = Yes$ if and only if at least one vote is "*yes*"), offering each player a large enough

[13] Even if we make $\varepsilon = 0$, $[y, y, y]$ is an equilibrium in weakly dominant strategies, although no longer the unique NE.

bribe contingent on him voting "*yes*" on his own transforms the voting game into a two players prisoner's dilemma. In equilibrium, the two voters vote "*yes*" and get zero payments. When $N > 3$, it is immediate that the pivotal bribes scheme can be adapted.

Multiplicity of equilibria The reader can check that slightly different schemes also allow the principal to induce decision "Yes" at no cost. It is interesting to consider some variations of the pivotal bribes and a committee of size $N > 3$.[14] Offering bribes contingent on the provision of a pivotal "*yes*" vote to all N voters will induce the casting of N votes for "*yes*" and zero votes for "*no*", if every voter uses his dominant strategy. However, the principal would do as well by offering such contracts to any number k of members, where k is strictly larger than $\frac{N+1}{2}$ and smaller than N, while offering no contracts to the remaining $N - k$ voters. If, in each case, all voters play dominant strategies, we will have a corresponding voting equilibrium with k votes for "*yes*" and $N - k$ votes for "*no*". As k is greater than $\frac{N+1}{2}$, no voter is ever pivotal, and all these equilibria will yield decision "Yes" at no cost for the principal. The next corollary tells us that the same committee and lobbying situation can generate very different voting patterns.

Corollary 1 *An outcome very close to a minimum winning coalition (i.e., a minimum winning coalition plus one vote), supermajorities of any size, and unanimous outcomes, are all equilibria of the voting game under influence.*

Different decision rules The results hold for any other majority requirement less demanding than unanimity. They break down with the latter, because every voter becomes pivotal to the decision "Yes".

Talk does not help voters Note that under the pivotal bribes $[y, y, y]$ is the unique NE of the voting game. Therefore players cannot rely on nonbinding communication to help them coordinate a move to any other profile. Contractual capabilities or repeated interaction are required.

Efficiency Let's define efficiency as a feature of equilibria where the committee's decision maximizes the sum of utilities of all four ($N + 1$ if the committee has size N) players in the game. Since, as shown before, the principal can attain decision "Yes" at no cost, any other equilibria of the overall game will involve bribes achieving that same outcome–otherwise they will not be equilibria. We then notice that the equilibria of the voting game under influence will always involve decision "Yes", no matter how small the principal's gain π is, and no

[14] We take N to be odd in the following calculations, but the results apply to even sizes as well.

matter how large the committee members' utility loss 3θ is. Then whenever $\pi < 3\theta$ the collective decision does not maximize the sum of all players' utilities. It follows that,

Proposition 2 *If $\pi < 3\theta$ ($\pi < N\theta$, for committees of size N), the equilibria of the voting game under influence are inefficient.*

The reader may think "Of course, a committee where members do not trade among themselves and where preferences are heterogeneous may well choose an allocation that yields tiny gains to the majority and imposes enormous costs on the minority. Thus, voting procedures may fail to maximize the sum of utilities even when no principal is rigging them". Note however that Proposition 2 points at something else: when a single person would choose an allocation that maximizes the sum of utilities of both principal and agent, a committee will probably not. And this is so even when the committee holds unanimous preferences and therefore would indeed–in the absence of a principal–choose an allocation that maximizes the sum of the voters' utilities.

The rationale for the results in this section is connected to each committee member having limited control over the committee's final decisions and therefore over his own payoff. This control loss is due to the fact that, under a non-unanimous decision rule, no player is a priori pivotal to the collective decision. Any decision that is payoff-relevant to a player can be made without his agreement. This allows the outside party to make a committee do things for a price that none of its members would accept individually. These results are perhaps surprising. The reader may think, however, that the principal was allowed far too many advantages. The remainder of the paper is devoted to removing them.

5 Coarser bribing methods

In this section we relax Assumption 1. In real life it may not always be possible to communicate intricate payment schemes like the pivotal bribes in a quick and safe way. These may trigger more negotiation and argument than simpler offers. One possibility is that offers to member i are constrained to be of the form: "I will pay you a bribe b_i if you vote "yes", and zero otherwise". We call these vote-contingent bribes. Another possibility arises when the principal cannot observe the realized voting profile–say because votes are secret. Then she cannot condition payments on the way individual committee members vote. In such cases the principal can condition payments on the committee's decision. Then bribes to any player i are of the form: "I will pay you an amount b_i if the committee chooses "Yes", and zero otherwise". We are now concerned with finding the minimum cost at which the principal can induce a favorable decision from the committee under these schemes.

Proposition 3 *If the principal wants to induce the collective decision "Yes" by offering either vote-contingent bribes or bribes contingent on the collective decision, she must spend an amount arbitrarily close to 2θ.*

Proof: See Appendix.

The last proposition tells us that limiting the principal's conditioning ability can substantially affect the cost of influencing the committee's decision. With both vote-contingent bribes and bribes contingent on the collective decision, the principal must fully compensate two of the three members in the committee to be confident that the collective decision will be favorable to her.[15] Clearly, outcomes will still be inefficient whenever $\pi \in (2\theta, 3\theta)$, as the principal can afford capture but her gains are smaller than the voters' added losses. The result in the last proposition extends naturally to the case of committees of size $N > 3$ (the cost of capture is $\frac{N+1}{2}\theta$ for N odd).

In cases when individual votes are secret the principal may still be able to observe the vote share–as in general elections–and condition payments on it. The interested reader is referred to our working paper where such case is analyzed. It is shown that quite complicated bribe schemes that condition payments on the vote share can induce a unique pure strategy NE in the voting game where all voters vote "*yes*" in exchange for negligible bribes. However, such schemes are vulnerable to mixing on the part of voters and require publicity in order to work, as they do not rely on dominance. This implies that, in order to rig a general election, the need to reach large numbers of voters in a cost-effective manner would probably require advertising bribes in the mass media–clearly an inconvenience.

6 The impact of individual accountability: vote-related costs

In this section we relax Assumption 2. We assume now that voters care about how they vote *per se* besides caring about bribes and the final decision. Assume that, on top of losing

[15] Note that, when offering bribes contingent on individual actions, the principal commits to pay non-trivial amounts for profiles that yield decision "No". So these offers are only possible when the principal has enough wealth prior to the obtention of any committee favors.

θ if the project is approved, every committee member suffers a loss η when voting "*yes*". This value η may reflect moral concerns or the fact that committee members act under some form of external monitoring. For example, a legislator voting for a project damaging his constituency may face a cost in terms of lower chances of reelection.[16] The payoff of voter i is now,

$$-d(v)\theta - I(v_i)\eta + b_i(v),$$

where $I(v_i)$ is an indicator function taking the value 1 when v_i = "*yes*" and the value 0 otherwise.

The reader can easily check that, with vote-related costs, the *laissez faire* voting game has a unique NE: $[n, n, n]$–inspect the normal form game below. This means that the principal must intervene if she wants the collective decision to go her way. With full conditioning abilities, we have,

Proposition 4 *If the principal wants to induce decision "Yes", then she needs to spend at least min{2($\eta + \theta$),3η}.*

Proof: Implementing decision "Yes" requires that a profile comprising either two or three "y" votes be a NE. The normal form game is,

n

	n	y
n	$0, 0, 0$	$0, \text{-}\eta, 0$
y	$\text{-}\eta, 0, 0$	$\text{-}\theta\text{-}\eta, \text{-}\theta\text{-}\eta, \text{-}\theta$

y

	n	y
n	$0, 0, \text{-}\eta$	$\text{-}\theta, \text{-}\theta\text{-}\eta, \text{-}\theta\text{-}\eta$
y	$\text{-}\theta\text{-}\eta, \text{-}\theta, \text{-}\theta\text{-}\eta$	$\text{-}\theta\text{-}\eta, \text{-}\theta\text{-}\eta, \text{-}\theta\text{-}\eta$

(2)

Making $[y, y, y]$ the equilibrium in dominant strategies costs (virtually) 3η: the principal's best strategy is to offer a payment of $\eta + \varepsilon$ for a non-pivotal "y" vote, and an extra payment θ if that vote is pivotal. Making a profile comprising two "y" votes to be a dominant strategy NE, in turn, works by compensating two voters with $\eta + \theta + \varepsilon$ for a "y" vote. Otherwise these two voters would deviate. Hence the second approach costs close to $2(\theta + \eta)$. The principal will choose the cheapest approach.■

When accountability costs are relatively high (i.e. when $3\eta > 2(\theta + \eta)$), the principal will choose the second approach. It follows that whenever $\pi \in (2(\eta + \theta), 2(\eta + \theta) + \theta)$ capture

[16] A positive cost η implies that constituents can tell that the bad project is bad. A cost $\eta = 0$ would mean that they are uninformed and cannot tell a bad project from a good one. A cost $\eta < 0$ would mean they are misinformed, and reward a legislator voting for a bad project.

is costly but possible (at price $2(\eta+\theta)$), and the final decision inefficient (as the voters' total losses amount to $2(\eta+\theta)+\theta$). Inefficient capture is precluded only if the interval $(2(\eta+\theta), 2(\eta+\theta)+\theta)$ collapses into a single point of the real line, so that π has no chance of being inside the interval. Note now that, for any vote-related costs η, this only happens when θ goes to zero, i.e. when voters do not care about the final decision. If, on the other hand, $3\eta < 2(\theta+\eta)$, the principal will choose to make $[y, y, y]$ the equilibrium in dominant strategies. The condition for affordable but inefficient capture is now $\pi \in (3\eta, 3(\eta+\theta))$. The potential for inefficient capture is again seen to disappear only when θ goes to zero. This isolates the origin of inefficiencies to the voting externality θ that two voters supporting the project impose on a third who does not. These results extend in the obvious way to the general case of a committee size N and a majority M: the relevant intervals for π become $(M(\eta+\theta), M(\eta+\theta)+(N-M)\theta)$ and $(N\eta, N(\eta+\theta))$.

What is suggestive in this variation of the basic model is that when voters care about how they vote per se, as well as about policy, capturing the committee is more expensive. Costs η can be expected to arise when voting in legislatures is public (as with roll call votes), and each legislator faces a threat of non reelection when displaying a bad individual voting record. Given such threat from constituents, one would expect legislators to engage in position-taking activities (as considered by Snyder and Ting, 2002). This is, to spend considerable time and effort making sure they are *seen* to be voting in tune with the desires of their constituents even if their individual vote will not affect the policy outcome. Snyder and Ting (2002) apply our analysis of optimal bribes in the context of Snyder's (1991) continuous policy setup. They consider how each legislator's constituency should choose between conditioning reelection on the legislature's policy performance or on their legislator's voting record. The electorate is seen to prefer the second strategy because it creates vote-related costs and raises the cost of capture. Although position-taking activities may be seen as wasteful when they will not affect policy, they may be evaluated differently in a game where individual accountability increases the costs of capture.

7 Collusion among voters

In this section we relax Assumption 3.

7.1 Collusion through contract: a role for political parties

If voters can agree to implement any scheme of transfers contingent on the voting profile before the principal makes offers, then they can alter the payoffs of the game in any way they like. For instance they can agree on schemes that reward those voting "*no*" and punish those voting "*yes*", by making the latter have to pay sums of money to the former. As a result, the costs of capture can be increased arbitrarily by raising the transfers involved in the reward/punishment scheme. Therefore, the voters could choose a scheme such that the costs of capture are raised exactly to π, and proceed to extract the principal's surplus if this is larger than their total losses, thus eliminating the possibility of costless capture. The interested reader is referred to our working paper for a formal exposition of how such schemes work.

One important fact is that schemes of this type require that voters have deep enough wallets and perfect enforcement capabilities–something committee members may lack. This suggests that voters such as legislators may have an interest in developing organizations like political parties, understood as technologies to render contracting among themselves possible. According to Wittman (1989), parties "put restraints on opportunism" facilitating trade among politicians. In Alesina and Spear's (1988) paper, contracting among politicians is used to avoid the well known last-period problem. Our model isolates a different instance where contracting among politicians would be useful: when committees are under pressure. In this situation, the existence of parties capable of internal discipline would lend credibility to deals among politicians. This would render feasible the protective schemes discussed above, raising the costs of capture.

Still, parties as a source of enforcement may not be perfect, and in many committees members may not engage in the practice of making payments among themselves at all. So we turn our attention to complementary institutional remedies that may function "as if" voters did trade.

7.2 Choosing decision rules

In this subsection we study what amounts to a restricted form of collusion. This does not require voters to possess any resources nor enforcement capabilities. We look at whether a simple provision in the committee's "constitution" can eliminate cheap and inefficient capture. Up until this point, the constitution of the committee states one thing: the function $d(v)$ embodying the decision rule. Assume now that the constitution includes a provision regarding the possible *reform of* $d(v)$, saying: "The committee may at any point decide to change *to unanimity* the decision rule if and only if there are at least M votes in favor of doing so." We then add a stage to the basic game. In the first stage the principal announces bribes. In the second (the "reform") stage, an imaginary third party puts forward the proposal of procedural reform and committee members vote secretly on it under the majority requirement M.[17] In the third (the "project") stage, voters vote publicly on the principal's project according to the voting rule emerging from the second stage.

The complete action profile of voters in the game with a procedural reform stage is now denoted with $\{v^r, v^p\} = \{[v_1^r, v_2^r, v_3^r], [v_1^p, v_2^p, v_3^p]\}$, where as before the subscript denotes the voter. The superscripts 'r' and 'p' stand for 'reform' and 'project' respectively, to indicate what members are voting on (e.g. a vote $v_i^r = y^r$ (n^r) is a vote favorable (unfavorable) to making unanimity the new decision rule). The principal conditions bribes on the observable elements of the game: the profile v^p and the collective decision regarding her project. We will now look at SPNE of this expanded game and see whether costless capture and inefficiencies are still possible.

Proposition 5 *a) When a procedure reform stage exists (for any value of M), costless capture cannot happen.*

b) When reform must be passed by unanimity (M=N), the cost of capture is raised to that of fully compensating a single voter: θ.

c) Inefficient capture might still happen in the game with a procedure reform stage, unless the constitution gives every voter the right to reform procedures unilaterally (M=1).

Proof: See Appendix.

The proof to part a) shows that if the principal makes offers that attempt costless capture (like the pivotal ones), then voters are better off by changing the voting rule and resisting capture. Before voting over the principal's project, it is a dominant strategy for all voters to pass reform and make themselves all pivotal to the "Yes" decision. This makes any offers attempting costless capture to fail at inducing the "Yes" decision.

[17] Adding the reform stage and making it public would serve no purpose. The principal could rig it just as she can rig the voting over her project. The project stage, though, is kept public. It may be thought that if voting in the project stage is public, it must be so in order to hold committee members accountable for their individual voting behavior, thus giving rise to vote-related costs. The results of this section are not substantially altered by considering such costs, but notation is heavier. We therefore stick with the basic payoff function: voters care only about the final decision and money.

Note however that the cost of capture is not necessarily raised much. If unanimity ($M = N$) is required to pass reform, the proof to part b) shows that there are ways to give one voter incentives to block reform (inducing the subsequent approval of the project at no extra cost) at the cost of fully compensating just that voter. Clearly, this still allows for inefficient capture. However, we show that the easier it is to pass reform (i.e. the lower M), the more expensive it gets for the principal to stop it and get her project through. In the extreme when $M = 1$–i.e. when every voter can pass reform unilaterally–boycotting reform and getting the project approved is so expensive that inefficient capture never happens (see the proof to part c)).

Clearly, setting $M = 1$ would be optimal in our set-up since all voters have the same preferences. In any realistic situation with heterogeneous preferences, however, making reform so easy would be problematic. Every member could dictate that a project he does not like should be dealt with under unanimity rule, and then go on to vote against it himself. Hence, setting $M = 1$ amounts to giving every member a veto over projects and renders any real life committee quite ineffective. Presumably, there is an optimal degree of "institutional flexibility" in terms of what majority rule M should apply to approve a change of the decision rule $d(v)$. This should balance the benefits of preventing inefficient capture more often against the costs of having the committee rejecting projects more often that are beneficial but do not command a complete consensus.

In real life we do not observe committees changing their majority rules all the time explicitly, but we do see them changing them implicitly. For example, legislators in the Congress of the United States have ample discretion to choose whether a project will have to go through, say, one committee or two. This alters the effective majority rule applying to the project. When a project is dealt with under simple majority in the floor, but has to survive the threat of veto in a number of committees, the project is effectively facing a supermajority rule.[18] If in our model we allowed for a fraction $f < \frac{1}{2}$ of committee members that are incorruptible (i.e. who will not accept bribes), then the committee would not need to change the majority rule to unanimity in order to prevent costless capture. It would be enough to change it to a supermajority of $1 - f$. The extension we just offered can thus account for the legislative discretion to change implicit majority rules as a way to raise the

[18] Tullock (1998) remarked that the effective majority rule applying to projects that would alter the status quo in the American Congress is around 60%, given the presidential veto power and the bicameralist structure. Raising the majority rule in our model has an analogous effect to that of adding veto powers in Myerson and Diermeier (1999).

price of capture.

8 When should votes be kept secret?

In this section we use our model to obtain general lessons on when secret votes will be convenient. We then analyze a striking contrast: while ballots are secret in general elections, votes are public in legislatures.

Consider for simplicity a committee with three members, each corruptible–or rational–with probability p. With probability $1-p$ members are non-corruptible and always vote the right way. Each committee member loses θ if a bad project is passed, and he attaches value η to retaining office. Reappointment depends on constituents being happy with the behavior of the representative or the body (depending on what constituents can observe). Suppose now that a bad project is under consideration at the committee. *Under secret voting*, if constituents see that the project is approved, they will know that at least a majority took bribes, but they will not know who in particular did so. Hence constituents will update their priors on the moral type of all members. It is immediate that, for any prior p, the posterior on *all* members will be greater than p after a bad project is passed. Because any common citizen has a lower chance of being corrupt (just p), let us accept that after a bad project is approved constituents replace all committee members with randomly sampled citizens. Thus, the game facing corrupt members before bribes are pledged displays a payoff structure analogous to the baseline game in (1); the only difference is that when a bad project passes, committee members suffer a disutility η from losing office on top of the outcome-related disutility θ. From Section 5 we know that under secret voting the cost of capture would be $2(\theta+\eta)$, as the principal can only condition payments on the collective decision.

We now analyze the case of *public votes*. Upon seeing a committee member voting for the bad project, constituents update their prior p to a posterior of 1 on that particular representative *only*. Thus, it is just that member who is not reappointed for sure when memberships are reconsidered (in the case of legislators, when they run for reelection). Before bribes are offered, the voting game for three corrupt members then looks exactly like the game in (2): costs η accrue to a member whenever he votes for the bad project, and costs θ accrue whenever the project is approved. From Section 6 we know that the cost of capture in that game is given by the expression $\min\{2(\eta+\theta), 3\eta\}$.

From the comparison of the costs of capture with secret and public votes, we see that,

Proposition 6 *When the measure θ of concerns for the final outcome is large relative to the* *accountability measure η (i.e. when $2(\eta+\theta)>3\eta$), public votes will allow for cheaper capture– so secrecy would be best. When, on the contrary, the costs from being held accountable are relatively strong (i.e. when $2(\eta+\theta)<3\eta$), secrecy is not necessary to protect committees.*

The intuition behind this proposition is simple. When the final outcome is what matters most to voters, pivotal bribes–as made possible by public voting–allow the principal to avoid compensating voters for the (relatively large) costs θ. This saves the principal more money than she has to pay from public votes making voters individually accountable. Things change when the vote-related costs stemming from individual accountability are relatively large (i.e. when $2(\eta+\theta)<3\eta$). In this situation the costs of capture are equal to $2(\eta+\theta)$ with either secret or public votes.

Given these general considerations we can now analyze the cases of voting in general elections and legislatures. The voter in a general election can be thought to care about who wins (i.e. $\theta > 0$), but he does not represent anyone else but himself (accountability is absent, so $\eta = 0$). From the analysis above, the costs of capture with public and secret votes are respectively zero and 2θ, so secrecy yields a strictly higher cost of rigging elections.[19][20]

Now let us consider legislatures. We said above that when the force of accountability is strong, capture with public votes costs the same as with secret votes. This would seem to suggest that public voting in legislatures can never strictly dominate secret voting.[21] However, under the collective accountability implied by secret voting, the legislature would always tend to have a proportion p of corrupt members. Under individual accountability, only corrupt members supporting bad projects fail to be reelected, while honest representatives can be kept in. So with public voting the legislature should converge to having only honest legislators. This yields a rationale for roll calls in legislatures: when accountability is strong (η is large) public votes do not allow for cheaper capture and do allow for the dynamic purification of the legislature.

Before concluding too enthusiastically that votes by representatives being public is always

[19] See Section 5 for why, when votes are secret, conditioning payments on the vote share is not likely to attain costless capture.

[20] The rigging of elections is an old concern (as made clear in the work of authors like Bentham and Mill) and there are historical accounts remarking that the secret ballot helped protect elections. A (cautious) opinion in that direction was expressed in 1881 by Charles Dodgson (a XIX century voting theorist better known as Lewis Carroll): *"forms of bribery were rampant in the days of open elections. The introduction of vote by ballot has, we may hope, largely diminished both..."*.

[21] Of course if the principal could observe individual votes through a spy under secret voting, making votes public would be strictly better as it would "level" the field between principal and constituents.

a good thing, we must mention two caveats. First, we have assumed throughout the section that constituents are in a good position to judge what is a "good" vote (see Maskin and Tirole, 2001, for an analysis of officials that cater to badly informed constituents). When accountability is weak (i.e. η is close to zero) we saw that secrecy will be best. The same applies when constituents are badly informed and they would reward representatives that vote for bad projects (i.e. $\eta < 0$). In other words, the rule emerging from our model is "Stick with secrecy unless the pressure stemming from individual accountability is strong *and* well advised." In the case of monetary policy, it has been indicated that the partiality induced through control by territorial constituencies is undesirable (Issing, 1999). Our model predicts that if this type of control overrides that by other desirable sources (the professional community, say), then voting should be kept secret in central banks such as the Bundesbank and the European Central Bank, where board members represent areas or countries. On the other hand, voting could be kept public in places such as the Bank of England, the Bank of Japan, and the Federal Reserve, where geographic attachments are not a problem. The model's predicted transparency pattern is the one we actually observe: voting is secret in the first two organizations and public in the following three.

A second caveat is that sometimes the principal may attain costless capture by promising transfers in the pivotal form *to constituents*, not to representatives. Admittedly, bribing entire constituencies may be difficult to do for a standard lobby. But it may not be so for the executive, who can transfer funds for public projects that affect the utility of whole constituencies (see Lizzeri and Persico, 2001, for a model where politicians use public programs to target redistributive transfers to certain segments of society). Now legislators face no electoral cost from voting for the principal's project, as constituents understand that such voting behavior is the price of bringing them, say, pork barrel projects. Hence, the relevant model is not that of Section 6 (with vote-related costs) but that of Section 4. Thus, legislative votes being public could at times help, rather than hinder, an undesirable influence.

9 Conclusion

This paper offers a model of influence over collective decisions. We isolate circumstances under which an outside party can manipulate the decisions of a committee while paying no bribes in equilibrium. This essentially requires that the outside party should be able to offer payments contingent on each voter providing a vote that is both decisive and favorable to her preferred option. The immediate implication of this result is that collective decisionmaking is not necessarily a good safeguard against the influence of special interests. An important literature in political science (mentioned in the introduction) has worried about the possible adverse effects of vote trading among voters. This paper fully exposes the dangers of trade between voters and an outside party.

On the one hand, our result on costless capture is a possible explanation for the observation that certain groups of society seem to obtain disproportionately large political favors relative to the amounts they invest in political influence. On the other hand, the relaxation of the assumptions producing the initial result allow us to depart from it in profitable ways. The various treatments thus obtained help us rationalize a number of important institutions and norms in political life.

Among other things, the model allows to analyze the important issue of the secrecy of voting. The lessons extracted from the model can be summarized thus: secrecy should be kept in order to raise the costs of capture, unless the pressure from individual accountability as introduced by public voting is strong enough and well advised (i.e. when the voter is himself a representative and his constituents are well informed). In this case public voting will not allow for cheaper capture and it will allow for improvements in the committee's moral composition. Secrecy is also good when the principal can play-off entire constituencies against each other by promising them projects–rather than by bribing their representatives.

10 Appendix

Proof of Proposition 3. *Vote-contingent bribes* We prove first that a) the principal can induce decision "Yes" by spending $2(\theta+\varepsilon)$ for any $\varepsilon \geq 0$. Then we prove that b) the principal cannot be certain to induce decision "Yes" by spending less than 2θ.

a) Suppose (w.n.l.o.g. as the game is symmetric) that players 1 and 2 are each offered a payment $\theta+\varepsilon$ in exchange for a "*yes*" vote, and zero otherwise. Member 3 gets no offers. It is easy to check that $[y, y, n]$ is the NE in dominant strategies, yielding decision "Yes".

b) The principal can offer bribes adding up to less than 2θ in many ways. It is immediate that no such way will afford making "yes" a dominant strategy for two voters.

Bribes contingent on the collective decision We first prove a) that the principal can, by spending $2(\theta+\varepsilon)$, induce a NE in (weakly) dominant strategies yielding "Yes". Then we prove b) that this is not feasible spending exactly 2θ (spending less cannot help).

a) Suppose the principal offers bribes $b = \theta + \varepsilon$ to players 1 and 2, conditional on the committee choosing "Yes". Player 3 gets no offers. By writing the normal form game it is easy to see that he profile $[y, y, n]$ involves weakly dominant strategies by all voters, and is therefore the best prediction for the voting game, yielding "Yes" at a cost arbitrarily close to 2θ.[22]

b) Now suppose the principal spends exactly 2θ offering members 1 and 2 bribes $b = \theta$ conditional on the decision being "Yes". Then there are four pure strategy NE and none of them involves the play of a dominant nor dominated strategy by any player: $[n, n, n]$, $[y, n, n]$, $[n, y, n]$ and $[y, y, n]$. Of these four equilibria, three yield a "No" decision, and therefore the principal cannot be confident to see a "Yes" outcome. It is straightforward to check that if 2θ is spent in other ways, things do not improve for the principal.■

Proof of Proposition 5. a) Denote with $[\#y^r \geq M]$ a voting profile on reform containing at least M "y^r" votes. To see costless capture is impossible suppose the opposite holds: the principal offers a bribe scheme $b^{cc}(v^p)$ that attains costless capture with players using (at least weakly) dominant strategies in both stages. If $b^{cc}(v^p)$ attains costless capture, it must have induced the failure of reform in the reform stage;[23] i.e. v^r must have been some profile $[\#y^r < M]$ that kept the decision rule as simple majority, then leading to costless capture in the project stage, yielding payoffs -θ for all voters. But failure of reform is incompatible with voters having used dominant strategies in the reform stage, yielding a contradiction.[24]

Proving b) requires first proving i) that if $M = N$, spending above θ is sufficient to block reform and subsequently get the project approved, and then ii) that if $M = N$, spending less

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[22] The reason why we take weak dominance to be enough is that voting "*yes*" dominates "*no*" everywhere except when the other two voters are voting "*yes*" as well, situation in which payoffs are bound to be the same for the third voter. Weak dominance works as well as a predictor in all other results–i.e. results are invariant to using one or another type of dominance. Our use of strict dominance throughout the paper is just for generating a more clear-cut exposition.

[23] The reason is that any profile $[\#y^r \geq M]$ in the reform stage makes the new decision rule for the project stage equal to unanimity. Under unanimity costless capture is impossible because only the profile $[y^p, y^p, y^p]$ yields decision "Yes" and this profile can only be made a NE at cost 3θ.

[24] The reason why failure of reform is incompatible with players using dominant strategies is as follows. Any voter deciding under any bribe scheme that could lead to costless capture in the event of reform failure will reason thus: "If I am not pivotal in the reform stage, I do not care what I vote regarding reform. If I am pivotal, then one of two things can happen. If I make reform go through, in the following 'project subgame' costless capture is impossible and my payoff is for sure larger than -θ. If I make reform fail, then costless capture happens in the subgame and I get -θ. So my weakly dominant strategy in the reform stage is to support reform". (Note that bribes can only be conditioned on project votes and on whether the project goes through, but not on reform votes, thus implying that if reform fails, then the equilibrium in the project subgame is the same regardless of how reform failed, and if reform is sucessful, the equilibrium in the project subgame will be something else, but also invariant to how reform succeeded.)

than θ cannot achieve this. Proving c) requires proving iii) that if $M = 1$, then inefficient capture is ruled out, and iv) that if $M > 1$, then inefficient capture can take place.

We prove points i) and iv) together. Suppose $\pi \in (M\theta, N\theta)$ and that passing reform requires at least $M > 1$ votes. Now suppose that $M - 1$ voters get offers: "ε if you vote "y^p" and more or less than $\frac{N-1}{2}$ others vote that way, and $\theta + \varepsilon$ if you vote "y^p" with $\frac{N-1}{2}$ others *and* the project goes through ", while the other $N - (M - 1)$ voters get offers like that plus a payment θ contingent on $[\#y^p = N]$. Then each one of the voters in the second group realize blocking reform is a (weakly) dominant strategy: "If I am not pivotal in the reform stage, I do not care what I vote, while if I am pivotal and block reform, the announced bribes will induce $[\#y^p = N]$ as a NE in dominant strategies in the project subgame, yielding a payoff ε to me, as opposed to zero if I support reform, which will make the project be rejected as no dominant strategies will exist in the subgame." Voters in the first group use a similar logic to find that their (weakly) dominant strategy is to support reform, although they are not enough to make it pass. Hence the profile $\{[\#n^r = N - (M - 1), \#y^r = M - 1], [\#y^p = N]\}$ is the SPNE involving dominant strategies in both stages (weakly in the first, strictly in the second). Reform fails and the project is approved at cost $(N - (M - 1))(\theta + \varepsilon) < N\theta$. From this expression, if $M = N$, the cost of capture is $\theta + \varepsilon$ (hence i) is proved). If $M = 1$ the cost of capture is $N\theta$, but for any $M > 1$, the cost of capture is lower than $N\theta$, hence inefficiency is possible, proving iv).

Now we prove ii): The principal cannot condition payments on v^r and subsequent play only depends on the offers made contingent on v^p and on whether the project is approved or not. Thus, payoffs are to be the same for any $v^r \neq [y^r, y^r, y^r]$. Therefore, any bribe scheme that does not offer some player a positive payoff for deviating from $[y^r, y^r, y^r]$–thus blocking reform and leading to the approval of the project–makes $[y^r, y^r, y^r]$ the NE in (weakly) dominant strategies of the reform game.

To finish with, we prove iii): For inefficiencies to be possible in principle, we need $\pi < N\theta$. So assume this. If reform is passed ($v^r \neq [\#n^r = N]$), the cost of getting the project approved is at least $N\theta$ (as, under unanimity, all N voters must be compensated) which the principal cannot afford, hence voters' payoffs are at least zero. For $v^r = [\#n^r = N]$ reform fails, but no bribe scheme will fully compensate all voters in the event of the project being approved (as $\pi < N\theta$), so at least one voter must get negative utility. But this voter can guarantee himself a nonnegative payoff by deviating from $[\#n^r = N]$ to pass reform (making unanimity the new decision rule) and then block the project by voting against it ($[\#y^p = N]$ is not a NE under unanimity). Hence, if every voter can pass reform, all voters must be fully compensated for the project to go through, ruling out inefficiency.■

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