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On the Buyability of Voting Bodies

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On the Buyability of Voting Bodies

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Abstract

We study vote buying by competing interest groups in a variety of electoral and contractual settings. While increasing the size of a voting body reduces its buyability in the absence of competition, we show that larger voting bodies may be more buyable than smaller voting bodies when interest groups compete. In contrast, imposing the secret ballot---which we model as forcing interest groups to contract on outcomes rather than votes---is an effective way to fight vote buying in the presence of competition, but much less so in its absence. We also study more sophisticated vote buying contracts. We show that, regardless of competition, the option to contract on both votes and outcomes is worthless, as it does not affect buyability as compared to contracting only on votes. In contrast, when interest groups can contract on votes and vote shares, we show that voting bodies are uniquely at risk of being bought.

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I.   Introduction

Vote buying is a rather common form of corruption. And it is widely viewed as an important obstacle to the adoption of welfare enhancing policies and economic growth. Unsurprisingly, it has a long history. For example, in 1757, George Washington ran for a seat in the Virginia House of Burgesses, the colony's main legislative body at the time. Concerned about the effects of drink on his soldiers, Washington ran an upstanding campaign on the platform of temperance. He was soundly defeated by 270 to 40 votes. The following year, Washington changed his platform and his tactics in another run for the same seat. To aid his chances, Washington offered voters an average of one and a half quarts of various alcoholic beverages in exchange for their votes. The difference in outcome was impressive. Against the same opponent, Washington won by 310 to 45 votes. (Ford, 1896.)

Since Washington's times, there have been considerable changes in the size of elections, the secrecy of the ballot, and the sophistication of vote buying contracts. For example, the total number of voters in Washington's elections was only about 350. The expansion of the voting franchise—perhaps most dramatically with the passing of the 19th Amendment in 1920 extending suffrage to women—has lead to considerably larger numbers in modern times. Furthermore, the growth in the size of the U.S. population has led to a considerable expansion of the size of federal legislative bodies. For instance, the House of Representatives now numbers 435 members, whereas it had only 65 at the time of the first Congress of 1789. Similarly, with the admission of new states, the U.S. Senate has expanded from 26 members to its current total of 100.

One may wonder whether an increase in the size of a voting body makes that body more or less susceptible to vote buying.[2] If the cost per vote remained fixed, then, clearly, the direct effect of expanding the voting body makes vote buying more costly. This, however, ignores the strategic effect of *competition* in vote buying. In the face of competition, the scale of vote buying needed to secure the desired outcome depends on the response of a rival group. As Groseclose and Snyder (GS, 1996) have shown, the optimal way to blunt competition is to buy a supermajority of voters. However, the magnitude of the optimal supermajority varies with the size of the voting body and, indeed, it may be possible to economize on payments made for deterrent purposes as the size of the voting body grows. Thus, there is a countervailing strategic effect which is cost-reducing. An obvious question is whether this strategic effect can be sufficiently strong as to outweigh the direct effect.

A measure explicitly introduced to counteract vote buying was the imposition of the secret ballot. Motivated by Chartist principles and worried about the corruption endemic to its electoral process, in 1856, the Australian state of Victoria was the first to adopt the secret ballot in general elections. Britain and the U.S. soon followed. Yet, the effectiveness of the secret ballot as a deterrent to vote buying is debatable. Several studies indicate that the process of vote buying has simply shifted from simple schemes such as that employed by

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[2]We use the term voting body as a generic description for a wide range of institutions where decisions are made by voting. For example, legislatures, committees, and voters in general elections all constitute voting bodies.

Washington to more intricate ones (see, e.g. Cox and Kousser, 1981 and Heckelman, 1998). A recent example of how vote buying has adapted to the secret ballot can be seen in the Presidential election in Taiwan Province of China in 2000. In that election, the ruling National Party subsidized betting parlors to offer extremely favorable odds on the event that the party's candidate, Lien Chan, was elected (August, 2000). This way, the ruling party managed to circumvent the secrecy of the ballot by offering a vote buying contract that was contingent on the *outcome* rather than on the vote itself. A central question is under what circumstances such schemes can succeed, as well as the cost-effectiveness of outcome-contingent vote buying.

Washington's scheme, as well as that of the National Party in Taiwan Province of China, are relatively simple in the sense that only a single contingency—vote or outcome—is contracted upon. There are other vote buying schemes that are more sophisticated and involve multiple contingencies. For example, in the scandal of the 2002 Salt Lake City Olympic Winter Games, it was reported that certain members of the International Olympic Committee (IOC) were paid money in exchange for their votes, as well as a "bonus" conditional on the outcome of the vote—i.e., the success of the city's Olympic bid.[3] Thus, the contracts depended both on votes *and* outcomes. Such sophisticated vote buying contracts, where payments are contingent on an individual's vote as well as some aggregate measure, can be found as far back as nineteenth century Great Britain. For instance, Seymour (1915, p.167) details how in elections held in Liverpool in the 1830s the price paid for votes rose and fell like a stock price, depending on the current vote share of the candidates.

In this paper, we reexamine the model of Groseclose and Snyder (GS, 1996) to study how size, secrecy and sophistication affect the buyability of voting bodies. As we show, the effects of these three factors crucially depend on whether there is *competition* among interest groups seeking to influence voting outcomes.

Absent competition, increasing the size of the voting body provides effective protection against vote buying. In the presence of competition, this is no longer true. In this case, larger voting bodies may be more buyable than smaller voting bodies.

In contrast, the introduction of the secret ballot has little effect on the buyability of voting bodies in the absence of competition. Specifically, it does not affect the cost of vote buying but may reduce the likelihood through equilibrium multiplicity. In the presence of competition, however, the beneficial effect of the secret ballot is unambiguous: the cost of vote buying is increased and the likelihood decreased relative to the GS case where votes are directly contractible.

In terms of complexity, or sophistication, we examine both discriminatory and non-discriminatory vote buying. Here, discriminatory vote buying means that payments can be tailored to the individual preferences of voters. Non-discriminatory vote buying means that payments have to be the same for all voters who receive a bribe. Absent

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[3] See "Olympic 'vote buying' scandal" BBC News, December 12, 1998.
http://news.bbc.co.uk/1/hi/world/europe/233742.stm

competition, the option of discriminatory vote buying always increases the buyability of voting bodies—it is always cheaper than non-discriminatory vote buying. In the presence of competition, this in no longer the case. Indeed, we identify conditions where the legislature is more buyable under non-discriminatory contracts than under discriminatory contracts.

Turning to more complex contracts, we show that the ability to contract on votes *and* outcomes has no effect whatsoever on the cost of vote buying, as compared to the case where only votes may be contracted upon. This is true independent of competition. However, the irrelevance of additional contractual contingencies does not generalize. When interest groups can contract on votes and vote shares, vote buying becomes extremely cheap even in the presence of competition. This leaves the voting body uniquely at risk of "capture."

The remainder of the paper proceeds as follows. In section 2, we describe the model. Our model is exactly that of GS but for variations in the contractual environment. In section 3, we recapitulate the main result of the GS model, which characterizes the optimal discriminatory vote buying contract. Section 4 examines how policy responses to vote buying affect the buyability of voting bodies. Specifically, we study the effect of changes in size of the voting body and changes in the secrecy of individual votes. In section 5, we examine the effects of contractual complexity, or sophistication, on buyability. Section 6 places the results in the context of the broader literature. Finally, Section 7 concludes. Appendix A contains proofs of results presented in the main text, while Appendix B studies the robustness of results pertaining to non-discriminatory vote buying.

II.   The Model

Our model is identical to that of GS (1996) save for variations in the contractual environment.[4] There are an odd number, n, of voters choosing between two policies. The policies, which one could also think of as candidates or party platforms, are labeled a and b. The policy receiving the majority of votes is adopted.

Two interest groups, labeled A and B, are trying to affect the policy choice. Group A prefers policy a while group B prefers policy b. In a setting where the voters are legislators, the interest groups can be thought of as lobbyists or political action committees. In a setting where voters are citizens voting in an election, the interest groups may be thought of as political parties. In this interpretation, the policy options refer to which party gets to form the government.

Excluding the cost of buying votes, group A enjoys a payoff $W_A > 0$ when policy a is adopted and zero when b is adopted. Group B, on the other hand, enjoys a payoff $W_B > 0$ when policy b is adopted and zero when a is adopted. Thus, groups A and B have diametrically opposed policy preferences. To induce voters to vote for its preferred policy,

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[4]To ease exposition, we slightly modify the notation of GS. Readers desiring additional details or justification for the model may want to consult their paper.

each group can offer enforceable contracts.[5] We will vary, however, the contingencies on which these contracts can be based.

A natural question is how, exactly, these contracts are enforced when the contracts themselves are illegal. Clearly, parties entering into such contracts cannot rely on the courts for protection. We follow much of the preceding literature including GS and assume that (unmodelled) reputational effects are sufficient to make these contracts *self-enforcing*.[6] The stringency of this assumption varies depending on the nature of the contractual form. For some contracts, such as the spot exchange of a voter's ballot for cash, self-enforcement would not appear to be a problem. For others, such as contracts contingent on aggregate outcomes, payments necessarily come later in time than the casting of the votes and hence the reputational "glue" needed to hold these agreements together is correspondingly greater.

The net payoff to a group is its payoff associated with the adopted policy less any vote buying costs. Throughout, we assume that W_A is sufficiently large, such that offering contracts that successfully induce the adoption of policy a—if at all possible—is always preferred by group A over doing nothing.

Voters, indexed by $i = 1, 2, ..., n$, care about their actual votes and any transfers from the interest groups. Specifically, voter i's payoff is

$$U_i(c_i, t_i) = u_i(c_i) + t_i$$

where c_i indicates voter i's vote (choice), a or b. while t_i denotes any monetary transfers received from an interest group as a consequence of entering into a contract.

Of relevance is the change in a voter's payoff from switching his vote from b to a. Hence, define

$$v_i = u_i(c_i = a) - u_i(c_i = b)$$

and suppose that all voters have strict preferences over a and b; that is, $v_i \neq 0$ for all i. Next, almost without loss of generality, assume that the indices of voters are ordered such that v_i is a strictly decreasing function of index i. And, for future reference, define $v^{-1}(x) \equiv \min\{i | v_i \leq x\}$. Furthermore, suppose that the median voter, $M \equiv \frac{n+1}{2}$, prefers policy b; that is, $v_M < 0$. Hence, in the absence of interest group A policy b would be adopted, while policy a is only adopted when interest group A manages to buy the vote. All this is identical to the GS model.

To illustrate many of their results, GS often resort to a model with a continuum of voters and continuous relative preferences. Since they are only concerned with contracting over individual votes, pivotality plays no role in their analysis and, hence, the continuum model

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[5] We will sometimes refer to vote buying contracts as "bribes.". This is for succinctness only and not an expression of the legality (or lack thereof) of a particular contract.

[6] A similar assumption arises in the literature on legislative rules (see Gilligan and Krehbiel 1987, 1989) in terms of the commitment of the median floor legislator to the particular rule. Similarly, Baron (2000) makes the same assumption in studying transfers between the floor and the committee as a function of the bills reported out of the committee.

is perfectly adequate. In this paper, we are also interested in circumstances where (aggregate) outcomes are contractible. This makes pivotality important. Therefore, throughout, we adopt a setting with a discrete number of voters.

For obvious reasons, the preferences of voters in the neighborhood of the median voter are of special interest. To capture the flavor of GS's continuous preference model in our discrete voter setting, we assume that:

Assumption 1. $v_M - v_{M+1} \leq \frac{W_B}{M}$.

Assumption 1 merely rules out large jumps in the relative preference for policy a versus policy b between the median voter and the voter just to the right of the median. Most of the results contained in the paper do not rely on Assumption 1. Where a result does rely on this assumption, it will be explicitly invoked in the proof.

The extensive form of the game is as follows. First, A offers contracts to all voters, consisting of a non-negative transfer and a set of contingencies under which the transfer is made. Note that the contract offered to a particular voter may be the null contract, i.e., a promise of a zero transfer under all contingencies. Next, after observing A's offers, B offers contracts to all voters. Following this, each voter opts for *one* of the two contracts he has been offered and votes. Finally, the policy outcome is determined and payoffs are realized.

If B can do no better than to propose the null contract, we assume that it opts for this strategy. Also, if a voter is indifferent between accepting the contract offered by A and that offered by B, he is assumed to accept A's contract.

Multiplicity of equilibria for a given set of contracts does not arise in the setting proposed by GS, because the payoffs to each voter are independent of the actions of other voters. In general, however, this will not be the case. For example, when contracts are contingent on outcomes , the contract itself creates interactive incentives. To address this issue, we shall take a conservative view about the cost to A of successful vote buying.

Definition 1 *A vote buying contract is* successful *if and only if it* guarantees *adoption of policy a.*

Formally, a vote buying contract is successful if and only if all subgame perfect equilibria following the contract lead to the adoption of policy a.

Next, we define "coalitions" and "outside options," concepts frequently used in the analysis.

Definition 2 *A coalition for policy a consists of a set of voters who weakly prefer to accept A's contract and vote for policy a, given the contracts they have been offered.*

Note that any voter who is not in A's coalition is in B's coalition. Also note that a winning coalition is a coalition with a cardinality of at least $\#M$. Finally,

Definition 3 *Consider any pair of contracts and the resulting coalitions of voters. The* outside option *for a voter in the B coalition is the payoff that the voter would receive if he unilaterally accepted A's contract.*

III.   Preliminaries

In their seminal paper, Groseclose and Snyder consider the case where contracts are contingent only on votes and where the offers made are specific to each voter. That is, they consider discriminatory vote buying schemes. While this analysis clearly makes sense in situations where there are relatively few voters with preferences known to the lobbying groups, even in large elections discriminatory schemes are sometimes observed. (See, e.g., Quimpo, 2002.)

Here, we briefly recapitulate the main result of Groseclose and Snyder. Fix some coalition size m, such that $M \leq m \leq n$. Next, define $K(m)$ to be the minimum expected payoff earned by any voter $i = \{1, 2, ..., m\}$, where payoffs include transfers. Group A will choose bribes that induce a value $K(m)$ such that group B will (just) not wish to "invade" A's coalition in order to implement policy b. See GS for details.

For B to obtain its desired policy it must re-bribe at least $m - M + 1$ voters. Thus, B needs to offer transfers that exceed the voters' expected net payoffs under the vote buying scheme proposed by A. By definition, this amount is at least $K(m)$. For A to be successful, re-bribing must cost B at least W_B. This implies that for fixed m,

$$K(m) = \frac{W_B}{m - M + 1}$$

Conditional on m, $K(m)$ implicitly describes the least-cost successful vote buying scheme available to A. As GS show, for given m the least-cost successful contract is:

For $v^{-1}(K(m)) \leq i \leq m$,

$$t_i = \begin{cases} K(m) - v_i & if \quad c_i = a \\ 0 & if \quad c_i = b \end{cases}$$

For $i < v^{-1}(K(m))$ or $i > m$, the null contract is offered.

For future reference, we refer to a contract of this form as a $K(m)$ contract.

The cost of such a contract is

$$C_A(m) = \sum_{i=v^{-1}(K(m))}^{m} t_i$$

Without proof, we offer the following proposition which follows directly from Groseclose and Snyder.

Proposition 1 *Let $m^* \in \arg\min C_A(m)$. Then a $K(m^*)$ contract is a least-cost successful contract under discriminatory vote buying.*

When the option of offering discriminatory contracts is available, group A optimally tailors the contract offered to each voter to account for that voter's intrinsic preferences. Voters with intrinsic preferences favoring policy a receive smaller transfers than those with intrinsic preferences favoring b. Indeed, the size of the transfer is increasing up to the voter with index m^*, who is offered the largest transfer for voting for a. Group A optimally gives up on buying voters with intrinsic preferences toward b that are greater than those of m^*.

The central insight of GS is that, generally, $m^* > M$. That is, it tends to be optimal for A to buy a *supermajority*, because it decreases the total cost of deterring B.

IV.   Policy Responses to Vote Buying

A.   The Size of the Voting Body

One common intuition is that a "cure" for vote buying is to expand the size of the voting body. The intuition relies on the *direct effect* that such an expansion has on the costs of a single, monopsonistic lobbying group. While the size of the bribes remains the same, the lobbying group will have to bribe a larger number of voters. Clearly, this increases its costs. For marginal policies—policies where W_A is not too large—the lobbying group will therefore refrain from influencing the vote with a large voting body, but will influence it with a smaller voting body. Of course, in the case where there is no competition this intuition is correct.

The presence of competition, however, introduces a *strategic* reason for bribing voters on the part of group A. Indeed, it is this strategic effect that is responsible for the Groseclose and Snyder result that bribing a supermajority of the voters is optimal.

What does the presence of the strategic effect do to the intuition that larger voting bodies are less buyable than smaller voting bodies? To study this formally, we need a way to scale the preferences of voters such that the relative strength of preferences does not vary with the size of the voting body. To do this, we introduce a continuous and strictly decreasing preference function $v(\cdot)$ on $[0, 1]$ and impose a grid of size n (odd) such that voter i's relative preference v_i for a is given by $v\left(\frac{i-1}{n-1}\right)$. The larger n, the finer the grid. Notice that the median voter, who has index $i = \frac{n+1}{2}$, always has the relative preference strength $v\left(\frac{1}{2}\right)$ independent of n. To ensure that the intrinsic preferences of the median voter favors policy b, we assume that $v\left(\frac{1}{2}\right) < 0$.[7]

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[7]Instead of a grid that grows finer as n increases, we could have used a replicator set-up. This does not change the results.

Our main result is to show that the strategic effect can be sufficiently strong that it overcomes the direct effect. As a consequence, larger voting bodies may be more buyable than smaller voting bodies. Indeed, as we demonstrate below, the cost of bribing a voting body may be non-monotonic in its size.

To see this, consider the following simple example. Suppose that $W_B = 1$ and that the preference function is

$$v(x) = \begin{cases} \frac{1}{3} & \text{if} & x < 0.5 \\ -\frac{1}{1000} & \text{if} & 0.5 \le x \le 0.6 \\ -2 & \text{if} & x > 0.6 \end{cases}$$

That is, the voters are divided into three groups: 1) supporters of policy a (those with indices such that $\frac{i-1}{n-1} < 0.5$), 2) moderates (those with indices such that $\frac{i-1}{n-1}$ lies between 0.5 and 0.6) and, 3) strong supporters of policy b (those with indices such that $\frac{i-1}{n-1} > 0.6$).[8]

In that case, it is a simple matter to show that the least-cost optimal contract entails group A optimally bribing all its supporters as well as up to three moderates. Since strong supporters of policy b dislike policy a intensely ($v_i = -2$), it is never cost-effective for group A to bribe these voters. When there are three or fewer moderates, group A economizes on its overall payments by bribing all of them. Once there are three moderates in the coalition, however, group A no longer pays its supporters anything and, therefore, further expansion of the supermajority generates no savings.

Figure 3 displays A's total costs for this example, as the size of the voting body varies. It is interesting to note the points in the figure where the costs jump. These jumps occur when the number of moderates increases by exactly one voter—which happens when the size of the voting body increases by 10 voters—until there are three moderates, which occurs when the voting body consists of 21 voters.

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[8]Of course, this preference function is not strictly decreasing in the index. Changing the example to exactly fit this assumption is just a matter of adding tiny amounts of slope and making the preference function continous at the jump points. This can all be readily done while affecting the costs by only an infinitesimal amount. We opted not to do this here, because it obscures the fundamental intution of the example without adding any economic content. Detailed notes for a fully-fledge continuous example are available from the authors upon request.

Figure 1. Cost of Discriminatory Vote Buying as a Function of n
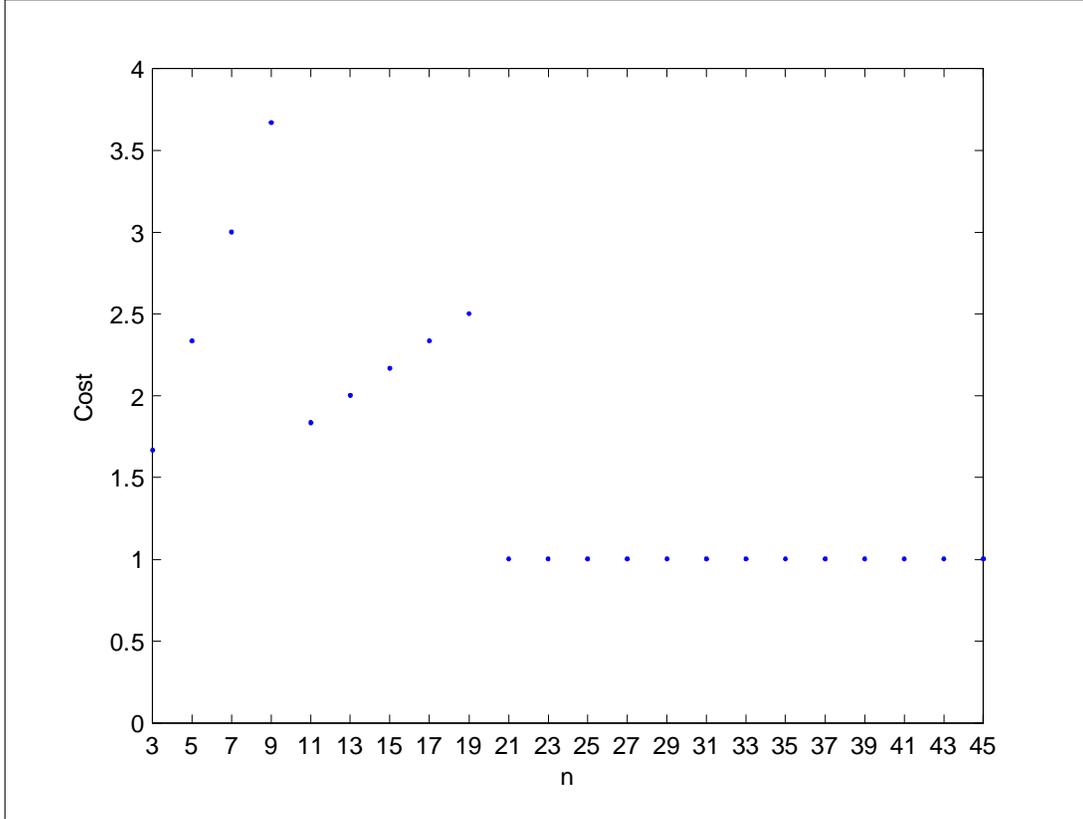
At these jump points, the strategic effect is operative. Consider the first jump point, which occurs when the voting body grows from 9 to 11 members. In that case, group A is able to cut by half the amount of the surplus, $K(m^*)$, it has to guarantee each of the voters in its coalition in order to deter B. This economization occurs for the standard supermajority reasons. Since this payment was previously being made to all intrinsic supporters of policy a as well as all the moderates, its reduction more than offsets the increasing costs associated with the direct effect of having to bribe two more voters.

The next jump point, which occurs when the voting body grows from 19 to 21 members, illustrates the same effect. Here, the amount of the surplus required to deter B falls to $\frac{1}{3}$. Hence, group A no longer has to pay its intrinsic supporters at all while it continues to save on payments to moderates. Once the number of moderates is three or more, there is no additional scope for economies due to the strategic effect. Hence, the direct effect dominates. But in the example, the direct effect is zero owing to the zero payments to supporters.

To summarize, we have shown:

Proposition 2 *It can be cheaper for group A to bribe a larger voting body than it is to*

bribe a smaller voting body.

B.   The Secret Ballot

A common strategy to deter vote buying is the imposition of the secret ballot. Clearly, the idea is that making individual votes unobservable severely prevents lobbying groups from contracting (formally or informally) on individual votes. An early expression of this idea is found in the Chartist Petition of 1838, which states:

> The suffrage, to be exempt from the corruption of the wealthy and the violence of the powerful, must be secret. (Webster, 1920, p. 145).

Indeed, the infusion of Chartist ideas is widely credited with the decision of various Australian territories to implement the secret ballot in the 1850s, with the English and several American states adopting the practice later in the 19th century (Newman, 2003).

In response to the secret ballot, interest groups have devised a number of clever strategies to continue to buy individual votes. One such strategy is known as the Tasmanian Dodge, which arose in response to the early Australian reform efforts. In this scheme, an interest group steals or forges a single empty ballot before the election. It then fills out this ballot and provides it to a voter. The voter casts the filled-out ballot while receiving a new, blank ballot from the polling station. The blank is then returned to the interest group in exchange for payment and the process is repeated.[9]

Robert Caro describes less subtle strategies used to circumvent the secret ballot in Texas in the 1930s:

> Election supervisors would, in violation of law, stand alongside each voter in the voting booths to make certain that each vote was cast as paid for. (p.719) Even if the voter was allowed to cast his ballot in secrecy, he had little chance of escaping unnoticed if he disobeyed instruction; each ballot was given a number that corresponded to the number on a tear-off sheet attached to the ballot, and a voter had to sign his name on the sheet before it was torn from the ballot and the ballot cast. (p. 721)

While safeguards have been put in place to counteract practices like these, it is interesting to note that recent initiatives designed to spur voter turnout may actually undermine the secrecy of the ballot. For instance, the state of California recently implemented a policy allowing voters to become "permanent absentee voters," which saves them the trip to the polling station. As with standard absentee balloting, voters are mailed paper ballots in

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[9]This practice is called "telegraphing" in Cambodia, and "lanzadera" (Spanish for "shuttle") in the Philippines. (Shaffer, 2002.)

advance of the election. They fill them out at home and send them back. It would be a simple matter for an interest group to buy these blank—but signed—paper ballots from permanent absentee voters. The interest group could then fill out the ballots as desired and mail them in.

Still another way to circumvent the secret ballot is "negative vote buying"—the practice of paying opposition supporters in exchange for their *not* voting in an election. Cox and Kousser (1981) offer a thoughtful analysis of the effects of this practice on voter turnout in New York state by reviewing newspaper articles describing various instances of (positive and) negative vote buying. (See also Heckelman, 1998.) Formally analyzing the case of negative vote buying requires amending the model to allow for a third choice, namely, abstention, and specifying payoffs for this choice. Since the spirit of the present paper is to further analyze the model of Groseclose and Snyder, which has no abstention, we omit consideration of this case.[10]

In certain instances, the above schemes to circumvent the secrecy of the ballot may be either infeasible (owing to adequate safeguards) or impractical (perhaps owing to scale, as in general elections). In that case, it may still be possible to circumvent the secret ballot by relying on contracts based on *outcomes* rather than individual votes. Since policy outcomes remain observable, such schemes are feasible in virtually all circumstances, and they scale in a practical fashion. A real world example can be found in the 2000 presidential election in Taiwan Province of China. Here, the ruling party set up subsidized betting parlors that offered extremely favorable odds on a bet that paid in the event that Lien Chan, the ruling party's candidate won the race (August, 2000). Thus, a voter accepting such a bet was entering into a contract where the ruling party's payment to him was entirely dependent on the outcome of the election.

When contracting is possible only over outcomes, is it still the case that lobbying groups can successfully bribe voters? How costly are such schemes to implement relative to contracting on votes directly? To study these questions, we analyze the case where the two interest groups are limited to offering (voter specific, that is, discriminatory) contracts contingent only on the policy outcome. Our first result shows that the introduction of the secret ballot is indeed beneficial. Specifically, when policy b enjoys supermajority intrinsic support (i.e., $v_{M-1} < 0$) then it is impossible for group A to offer bribes in such a way as to *guarantee* its most preferred outcome. (Recall that this is our definition of "successful.")

Proposition 3 *If $v_{M-1} < 0$, then successful vote buying contracts do not exist when only outcomes are contractible.*

One may wonder what goes wrong for group A when it can only contract over outcomes. The problem stems from the fact that incentives are only created in case a voter believes that he is pivotal. But when there is supermajority intrinsic support for policy B, there

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[10]In a companion paper (Morgan and Várdy, 2007) we study negative vote buying when the payoffs from abstention lie halfway between the payoffs from voting for a and the payoffs from voting for b. We show that the resultant least-cost contract is qualitatively similar to a $K(m^*)$ contract.

always exists an equilibrium in which voters ignore the contract offered by A and vote according to their intrinsic preferences. Clearly, in such a situation, no voter perceives himself as pivotal and, hence, the incentive effects of A's contract are nullified.[11]

While the previous result shows that A cannot *guarantee* its preferred policy outcome under supermajority opposition, does there exist *an* equilibrium in which A obtains its preferred policy? The next proposition shows that, even with the secret ballot, there exists an equilibrium in which A successfully buys the election. Interestingly, the contract offered by A to achieve this outcome at the lowest possible cost closely resembles the contracts derived by Groseclose and Snyder.

Proposition 4 *When only outcomes are contractible, a $K(M)$ contract is a least-cost contract such that there exists an equilibrium in which policy a is adopted.*

Furthermore, if $v_{M-1} > 0$, i.e., policy b enjoys simple majority intrinsic support, then a $K(M)$ contract is a least-cost successful contract.

Combining the results of Proposition 1 and 4, a cost ranking across simple contracts arises.

Corollary 1 *It is always cheaper for A to contract on votes than to contract on outcomes.*

The bluntness of the outcome-based contractual instrument limits A to buying a bare majority rather than a supermajority of voters. The reason is that the incentive effects of the contracts, which depend on a voter being pivotal, are completely undermined if A tries to buy a supermajority. Buying a bare majority rescues the incentive effects but is generally very expensive if it is to deter group B from re-bribing. The upshot is that the incentives for legislative capture are significantly reduced.

Propositions 3 and 4 suggest that, in the presence of competition, the introduction of the secret ballot offers quite a powerful remedy against vote buying. It is interesting to contrast this result with the effect of the secret ballot in the absence of competition. Let group A offer all voters whose intrinsic preference favor policy b up to the median an outcome contingent contract that pays $-v_i$ in the event that policy a is adopted and pays nothing if policy b is adopted. In that case, group A still cannot guarantee the adoption of its preferred policy.[12] However, if it is adopted, it costs group A exactly the same as when A could contract on votes directly. Therefore, if A succeeds, its cost under the secret ballot is no more than under an open ballot. Moreover, if A does not succeed, it will not have to

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[11] This result does not, in an essential way, rely on a voter believing that he is pivotal with zero probability. If a voter ascribed a small but positive probability to being pivotal, group A could pay him a transfer to switch his vote from b to a. But the necessary transfer becomes unbounded as the probability of being pivotal goes to zero in the limit.

[12] Again, notice that there always exists an equilibrium in which all voters ignore the outcome based contract and vote according to their intrinsic preferences.

pay anything. Hence, the introduction of the secret ballot will not deter group A from trying to buy the vote in the absence of competition.

Thus, the secret ballot is more effective as a means to prevent vote buying in the presence of competition than in its absence. Also, note that the secret ballot is not without costs; most notably the loss of accountability in settings such as legislatures. It is arguably important that constituents be able to hold an elected legislator accountable on the basis of his voting record.

V.   Complexity

Some real-world vote buying contracts are contingent on a combination of an individual's vote and the policy outcome. An example of such a contract came to light in the course of the bribery investigation into Salt Lake City's bid for the 2002 Olympic Winter Games. According to press reports, certain members of the IOC received payments ranging from $500,000 to $1 million in exchange for their votes. In addition, a "bonus" of $3-5 million was to be paid if the city won the Olympic bid.[13]How does vote buying change when one considers more complex contracts, with multiple contractual contingencies? Are policy making bodies such as the IOC more or less susceptible to outside influence under these circumstances?

In other instances, real-world vote buying contracts are less complex than the benchmark case studied in GS. For instance, in some circumstances, the assumption that one can tailor the payment in the contract to the preferences of an individual voter is clearly unrealistic. How does vote buying change when only non-discriminatory contracts can be offered? Does the inability to "target" payments to voters make the voting body more immune to influence?

To examine these questions, we consider three variations in the complexity of contracts. The first two variations allow for multiple contractual contingencies: contracts where payments are contingent on individual votes and policy outcomes, and contracts where payments are contingent on individual votes and vote shares. The third variation is, in some sense, the simplest possible vote buying contract—pure vote buying with the additional restriction that the contingent payment is non-discriminatory.

A.   Contracting on Votes and Outcomes

The possibility of conditioning bribes on both votes and outcomes would seem to offer strategic opportunities for A to reduce its costs of obtaining its preferred policy. As the next proposition shows, however, this is not the case. The least-cost successful contract

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[13] See "Olympic 'vote buying' scandal" BBC News, December 12, 1998.
http://news.bbc.co.uk/1/hi/world/europe/233742.stm

costs A exactly the same as when it contracted solely on votes and ignored the outcome altogether. Formally,

Proposition 5 *When contracts can be contingent on both votes and outcomes, then a $K(m^*)$ contract is a least-cost successful contract.*

Why does the possibility of conditioning on outcomes not help in any way? Notice that, while A could offer the $K(m^*)$ contract under the joint contingency of a vote for a and policy a being adopted, this would save no money in equilibrium. In addition, such a contract is vulnerable to exploitation by B. In particular, B can recruit a supermajority at arbitrarily small cost. As long as voters believe that B's supermajority coalition will hold together, there is no upside to switching one's vote to A. Hence, even though A could contract not to pay in the event of a loss, it is, in fact, optimal to pay. Indeed, this is essential in precluding B from attempting to recruit a supermajority.

The contract in the Olympic vote buying scandal does not correspond to the least-cost successful contract derived in Proposition 5. After all, the bonus payment is outcome-contingent. One obvious explanation for the discrepancy is that lobbying groups may be budget constrained. Indeed, Salt Lake City found itself with considerably more financial resources after its bid was successful than before, and this may have necessitated the bonus scheme. It is well-known that, even in simpler contractual settings, the introduction of budget constraints creates substantial complications in the analysis (see, for instance, Dekel, Jackson and Wolinsky, 2005). While we think that budget constraints have an important role to play in the analysis, we leave this for future research. Another possible explanation for the discrepancy is that outcome-contingent bonuses give IOC members an incentive to lobby colleagues. In terms of the model, this would mean that v_i is not a constant and can be influenced.

B.   Contracting on Votes and Vote Shares

As we saw above, the ability to contract on votes and outcomes provides no benefit for group A relative to conditioning only on votes. Of course, if votes are publicly observable, then the lobbying group might choose to condition on vote share instead of outcome. In an interesting paper, Dal Bo (2004) shows that, when voters care only about outcomes, this contractual contingency provides a powerful lever for a lobbying group in the absence of competition. Here, we examine this class of contracts in the presence of competition when voters care about their actual votes.

Let $\#a$ denote the number of votes cast for policy a. The number of votes for b is then $n - \#a$. We show that

Proposition 6 *When contracts can be contingent on votes and vote shares, the following is a least-cost successful contract:*

For $v^{-1}(K(M+1)) \leq i \leq M+1$

$$
t_i = \begin{cases}
\max(-v_i, 0) & if \quad c_i = a \ and \ \#a \geq M+1 \\
K(M+1) - v_i & if \quad c_i = a \ and \ \#a < M+1 \\
0 & if \qquad\qquad c_i = b
\end{cases}
$$

For $i < v^{-1}(K(M+1))$ or $i > M+1$, the null contract is offered.

How does the above contract work? Notice that, to be successful, group A must deter B from recruiting a bare majority, as well as from recruiting a supermajority. To deter B from recruiting a bare majority, group A must promise to pay recruited voters sufficiently lavishly in the event that their votes turn out to be pivotal. To deter B from recruiting a supermajority, group A must promise to pay recruited voters sufficiently lavishly in the event that their votes turn out to be part of a *losing* effort on behalf of A, even when they are not pivotal. The contract described in Proposition 6 achieves this by promising each voter a surplus of $K(M+1)$ under either of these events and, as in GS, this amount is sufficient to deter B.

Note, however, that if A manages to recruit a supermajority of voters, then, in equilibrium, voters in group A's coalition are neither part of a bare majority nor part of a losing effort. In other words, the circumstances where group A is required to reward voters lavishly are off the equilibrium path. On the equilibrium path, group A recruits a supermajority and compensates voters only for the disutility of voting against their preferred option. The contract described in Proposition 6 achieves this by promising voters zero net surplus in the event they are part of a winning supermajority coalition on behalf of A.

The intuition allowing group A to economize on payments on the equilibrium path works for any size supermajority. A natural question is why the least cost contract involves recruiting a minimal supermajority rather than a larger one. The reason is that the usual strategic motive for recruiting a supermajority, to lower the costs of deterring group B, is absent here. The costs of deterrence are incurred only off the equilibrium path. So savings in this regard are irrelevant. Instead, all that is left is the direct effect of having to compensate voters for voting against their intrinsic preference. Obviously, this direct cost is minimized by choosing the smallest possible supermajority.

Note that by contracting on votes and vote shares, group A is able to almost completely deflect the effects of competition. Hence, competition has almost no effect on A's cost of successful vote buying. Formally,

Corollary 2 *The least-cost successful contract when B is present costs A the same amount as when B is absent and $M+1$—instead of M—votes are required for passage of policy a.*

By conditioning on votes and vote shares, A can offer deterring incentives without actually having to pay for them in equilibrium. Corollary 2 thus highlights the susceptibility of

voting bodies to vote buying in rich contractual environments. The policy prescription here is clear. Contingent contracts along the line specified above must be made extremely costly, perhaps by penalties such as forfeiture of office or heavy fines.

Buying out the Competition

Following Groseclose and Snyder, we have so far assumed that it was impossible for group A to directly contract with B and thereby remove the threat of competition prior to contracting with the voters. Indeed, it is straightforward to show that, for the class of simple contracts (and, by extension, contracts contingent on votes and outcomes), contracting directly with B is cheaper for group A than contracting solely with the voters.

There are real-world situations in which buying out the competition is eminently feasible. For example, in the Lebanese parliamentary elections of 1960, the following incident occurred:

> [A] candidate (...) was offered $7,000 to quit the race for the less than $6,000-a-year Deputy's [member of Parliament's] job. With pay so small, why was the bribe so high? Explained one candid hopeful: "Any Deputy is sure to be invited to become a bank director—at $4,000 a year. Also, there's always the wayward young man whose parents will pay $1,500 to spring him from jail. And then a Deputy gets immunity from police searches of his car. Any time he drives out to the country, he can load up with $1,000 worth of hashish." (*Time*, Monday, Jun. 27, 1960)

With this example in mind, let us compare the cost of contracting on votes and vote shares with the cost of first buying out the competition. Clearly, to buy out group B, group A can make a take-it-or-leave-it offer of $W_B + \varepsilon$, for arbitrarily small ε. Group B will accept and, subsequently, A can contract with the voters under monopsony conditions. The total cost to A of this scheme is

$$C_A = \sum_{i=0}^{M} \min\left(-v_i, 0\right) + W_B + \varepsilon$$

In contrast, when A can contract on votes and vote shares, under a least-cost successful contract group A incurs a cost of

$$C'_A = \sum_{i=0}^{M} \min\left(-v_i, 0\right) - v_{M+1}$$

Thus, under the mild restriction that interest group B cares more about policy b than individual voter $M + 1$ cares about his vote for b, it follows that,

Remark 1 *When contracts can be contingent on votes and vote shares, it is cheaper for group A to only contract with the voters than to first buy out the competing interest group B.*

C. Non-Discriminatory Vote Buying

Often times, it may be difficult for lobbying groups to arrange payments in a discriminatory fashion. For instance, determining the exact preferences of individual voters may difficult. Another possibility is that, even if these preference are known, devising variable payment schemes may pose a considerable logistical challenge. Indeed, in many real-world instances of vote buying, interest groups rely on simple, non-discriminatory schemes. For instance, Robert A. Caro (1982) recounts a vote buying strategy undertaken by Lyndon Johnson who, at the time, was working for Maury Maverick in his run for Congress in 1934:

> Johnson was sitting at a table in the center of the room—and on the table there were stacks of five-dollar bills. "That big table was just *covered* with money—more money than I had ever seen," Jones says. (...) Mexican American men would come into the room one at a time. Each would tell Johnson a number—some, unable to speak English, would indicate the number by holding up their fingers—and Johnson would count out that number of five-dollar bills, and hand them to him. "It was five dollars a vote," Jones realized. "Lyndon was checking each name against a list someone had furnished him with. These Latin people would come in, and show how many eligible votes they had in the family, and Lyndon would pay them five dollars a vote."

This vote buying strategy was not unique to the Maverick campaign. Indeed, the practice of distributing fixed cash payments in exchange for votes, was (and perhaps still is) widespread. For instance, on p. 647, Caro writes:

> Texas was not the only state in which money was piled on tables to purchase votes, just as Mexican-Americans were not the only immigrants whose votes were purchased. (...) big oak desks of city officials were traditionally cleared on Election Day and covered with piles of cash. In the big cities of the Northeast, votes might cost more than five dollars each.

How do situations where vote buying is non-discriminatory compare to the case analyzed by Groseclose and Snyder? In particular, are voting processes more immune to outside influence under non-discriminatory vote buying than in circumstances where discriminatory contracts are possible? In this section, we address this question by considering competition in vote buying contracts when the contracts themselves are restricted to be non-discriminatory.

Let t_A be the (uniform) transfer offered by group A. Let $m(t_A)$ be the highest index i such that $v_i + t_A \geq 0$. Clearly, if B offers the null contract, then all voters $i = 1, ..., m(t_A)$ will accept the t_A contract offered by A and vote accordingly. We now characterize the minimal transfer that A can offer and still be successful.

Proposition 7 *Suppose that vote buying is non-discriminatory. Under the least-cost successful contract, group A offers payments in the amount $t_A = \frac{W_B}{M} - v_M$. Group B offers the null contract. All voters with indices $i \leq m(t_A)$ are in A's coalition and vote for A.*

It is interesting to contrast the structure of the least-cost successful contract in the non-discriminatory case with the discriminatory case of Groseclose and Snyder. In both cases, transfers can be viewed as consisting of two parts: 1) a compensatory payment to offset intrinsic preferences favoring b and, 2) a surplus payment to deter B from offering any contract other than the null contract. In the case of discriminatory contracts, the compensatory payments, $-v_i$, vary with the strength of preferences of the individual voter, while for non-discriminatory contracts they cannot. In the latter case, the compensatory payment, $-v_M$, is determined by the intrinsic preference of the median voter. Clearly, all voters with indices to the left of the median will be sufficiently compensated as well. Under both types of contracts, the surplus payment does not vary with the identity of a bribed voter. In the case of discriminatory contracts, the surplus payment is $\frac{W_B}{m^* - M + 1}$, which reflects the fact that group B can offer contracts to $m^* - M + 1$ selected voters to obtain a bare majority of support for policy b. In contrast, the surplus payment offered under non-discriminatory contracts is lower and equal to $\frac{W_B}{M}$. The reason is that group A is able to economize on the surplus transfer by recognizing that B cannot target selected voters to "pick off" A's coalition.

GS show that it is generally optimal for group A to buy a supermajority of voters when vote buying is discriminatory. The next proposition shows that the same result holds under non-discriminatory vote buying.

Proposition 8 *Suppose that vote buying is non-discriminatory and that Assumption 1 holds. Then, under a least-cost successful contract, A always buys a supermajority of voters.*

The intuition for this result is quite simple and almost identical to the proof. If A were to buy a simple majority under non-discriminatory vote buying, then it must be that voter M accepts the contract, while voter $M + 1$ chooses not to accept the same contract. By Assumption 1, the intrinsic preferences of M and $M + 1$ are not too dissimilar. Therefore, the net surplus of voter M under A's contract must be quite close to zero. (Else, $M + 1$ would also accept the contract.) But this implies that B can successfully invade A's simple majority by offering a very small bribe equal to M's net surplus under A's contract,which is almost zero, plus ε. Hence, under non-discriminatory vote buying, a contract in which A buys only a simple majority cannot be successful.

One may worry that this result heavily relies on the modeling assumption that neither of the lobbying groups can ration their transfers. After all, it seems that A would be happy to stop making payments once a bare majority coalition was obtained. However, this ignores the strategic effect of B's response in the presence of rationing. In Appendix B, we show that adding rationing to the model does not change the basic conclusion that buying a supermajority is optimal.

Which is less costly: Discriminatory or Non-Discriminatory Vote Buying?

Absent competition, discriminatory vote buying is cheaper than non-discriminatory vote buying. The reason is that compensatory payments are smaller under discriminatory vote buying while surplus payments are the same, namely, zero. With competition, however, it is no longer so clear which scheme is cheaper for A, because surplus payments are smaller under non-discriminatory vote buying. Hence, the ability to discriminate has both advantages and disadvantages for A. The advantage is that A does not have to pay its strongest supporters at all and can pay its weaker supporters less than it pays those who oppose policy a. The disadvantage is that B can also discriminate and therefore specifically target the "weakest links" in A's coalition. When discrimination is not possible, such a targeted counter attack is not feasible. Which effect ultimately dominates depends on the shape of the preference function v_i.

Circumstances where (non-)discriminatory contracts are cheaper may be readily identified through a simple graphical analysis. In the figures below, we fix the preferences of the median voter and change the shape of the preference function around this point.

A case where discriminatory vote buying is more cost-effective is shown in Figure 1. Illustrated in the figure are the preferences of voters, v_i, as well as the transfers made by A under discriminatory and non-discriminatory vote buying. Since m^* is close to n, the transfers paid by A to voters located to the right of the median are almost the same under the two schemes. Where the schemes differ is in the transfers made to voters located to the left of the median, most of whom intrinsically prefer policy a. In the discriminatory case, few of these voters receive transfers whereas, in the non-discriminatory case, *all* of them receive transfers. Thus, the discriminatory scheme is clearly cheaper.

Figure 2. Cheap Discriminatory Vote Buying
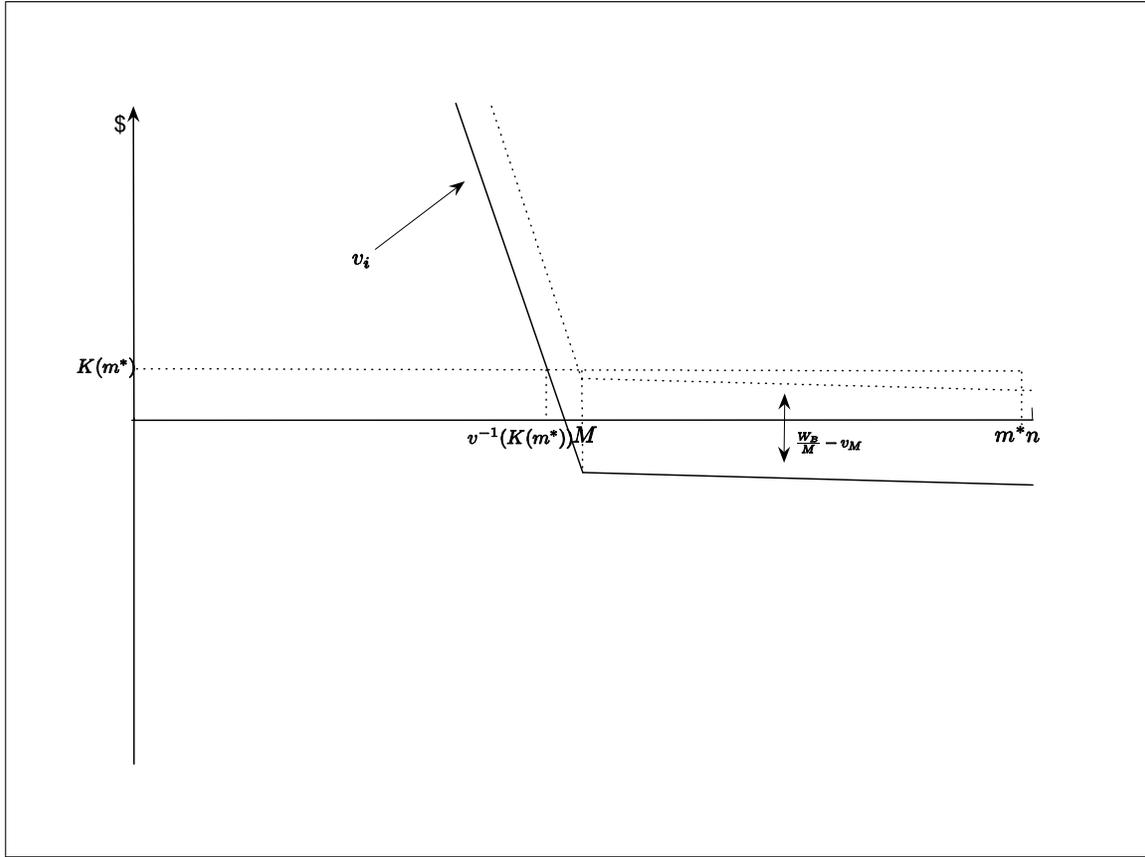
The opposite case, where discriminatory vote buying is less cost-effective, is illustrated in Figure 2. Since m^* is close to M, the transfers to deter B are considerably higher in the discriminatory case than in the non-discriminatory case. Moreover, owing to the steepness of the preference function to the right of the median, those receiving transfers from A under the two schemes are almost the same. Where the schemes differ is in the size of transfers to voters to the left of the median. The lack of intrinsic support for policy a means that under both schemes, all voters with indices smaller than M receive payments, but these payments are considerably larger in the discriminatory scheme than in the non-discriminatory scheme.

Figure 3. Cheap Non-Discriminatory Vote Buying
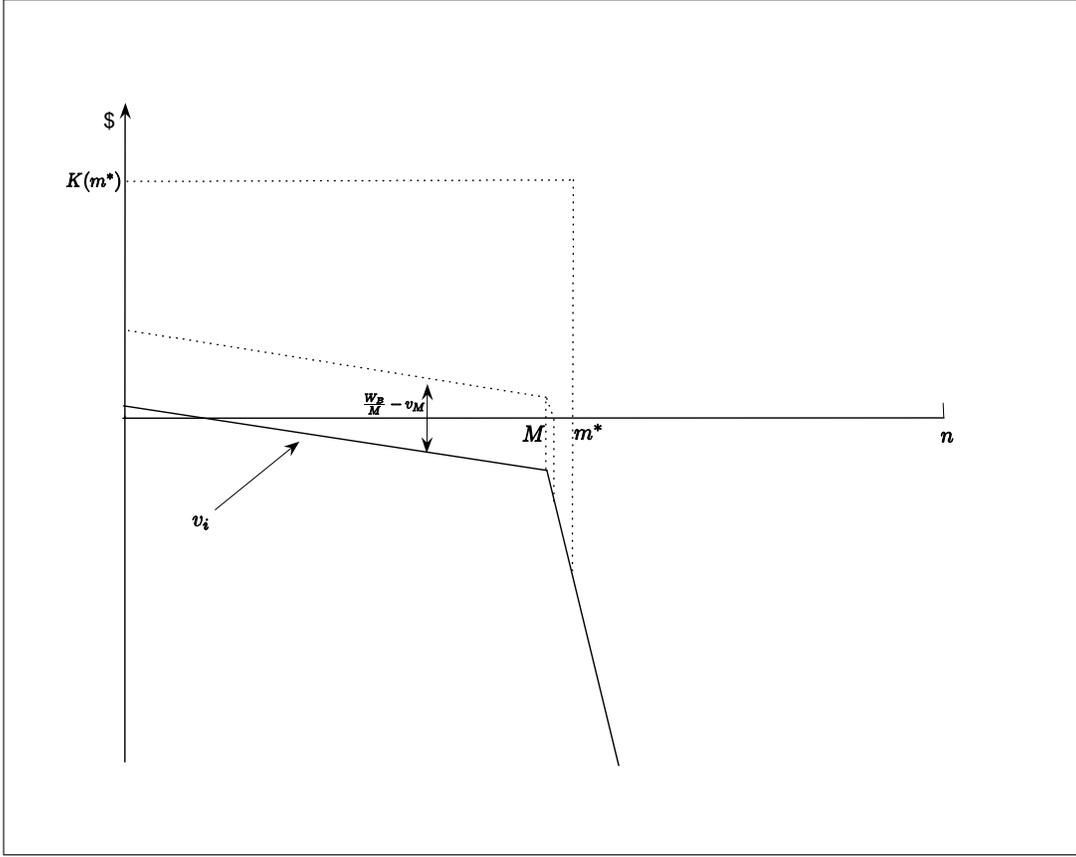
VI. Related Literature

Having presented the results of our paper, it is useful to place our analysis in the context of the existing theoretical literature on vote buying. Obviously, our paper builds on the seminal work of Groseclose and Snyder and extends their model in various directions, both in terms of the structure of the electoral system as well as the contracting environment.[14]

We are aware of two other papers that have considered complex vote buying contracts. Dal Bo (2004) studies contracts involving votes and vote shares; however competition is absent in his model. Dekel, Jackson, and Wolinsky (2005) study contracts based on votes and outcomes. However, their model differs from ours in many respects—voters are non-strategic, interest groups are budget constrained, and the process of vote buying is modeled as an alternating offer scheme.

Our paper is also somewhat related to the literature on how the structure of electoral

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[14]See also, Banks (2000).

systems affects corruption in government. Notable in this literature is Meyerson (1993) who examines how electoral systems differ in their ability to sort between corrupt and non-corrupt candidates running for office.[15] In contrast, our concerns are not about sorting among candidates with varying corruption levels. Rather, we are interested in how electoral systems differ in their susceptibility to vote buying.

There is a larger literature on the buying and selling of influence that differs significantly in both its concerns and modeling approach from our work and the papers above. Specifically, voting plays little role in this branch of the literature, as the policy is typically determined by a single player. Some of the earliest work in this area (see Tullock, 1972, 1980) models the policy maker as non-strategic and supposes that competition among interest groups takes the form of an imperfectly discriminating all-pay auction, or contest. One of the primary concerns of this literature is how variation in the structure of the auction affects rent-seeking expenditures by lobbying groups. The interested reader should consult Nitzan (1994) for an excellent survey. Another important approach to modelling competition for influence is the use of menu auctions (Bernheim and Whinston, 1986). Unlike the rent-seeking literature, here, the policy maker is modeled as a strategic player. The seminal work along these lines is Grossman and Helpman (1994) who apply this analysis to trade policy. Other notable work includes Grossman and Helpman (1996, 1999).

VII.   Conclusions

In this paper, we have studied the buyability of voting bodies such as legislatures, committees, and electorates, under a variety of circumstances. First, we have investigated how the cost of successful vote buying depends on the size of the voting body. We found that increasing the size of the body increases the cost of successful vote buying when there is only a single interest group seeking to influence the outcome. In contrast, when there are competing interest groups, larger voting bodies may actually be cheaper to buy than smaller voting bodies.

Competition also plays an important role in the effectiveness of the secret ballot as an anti-vote buying measure. Here, we have modelled the secret ballot as forcing vote buying contracts to be outcome-contingent rather than vote-contingent. In the presence of competition, this policy does have the intended effect: Successful vote buying is more expensive with the secret ballot than without it. In contrast, when there is only a single interest group, we show that the introduction of the secret ballot is much less effective as an anti-corruption measure.

Finally, we have studied how contractual complexity affects the buyability of voting bodies. Based on real-world evidence, we have compared buyability under discriminatory and non-discriminatory vote buying. While discriminatory vote buying is clearly cheaper in the absence of competition, we have shown that non-discriminatory vote buying may actually

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[15]See also Persson, Tabellini, and Trebbi (2003) for an overview.

be less costly when interest groups compete. We also studied the buyability of voting bodies when vote buying contracts can depend on multiple contingencies. Specifically, we have looked at contracts contingent on votes and outcomes, and contracts contingent on votes and vote shares. While the option to add outcome based contingencies to vote based contracts turns out to be worthless, the option to make contracts depend on vote shares as well as on individual votes turns out to be extremely valuable. Availability of such contracts puts voting bodies uniquely at risk of being bought, even in the presence of competition.

Taken together, what are the implications for policy makers? First, it is important to note that the presence of competition is by no means a guarantee that policy outcomes reflect the underlying preferences of voters. Perhaps more surprisingly, the presence of competition does not even necessarily *raise the costs* of interest groups seeking to influence policy. Indeed, sophisticated interest groups can construct contracts that nullify competition (almost) completely. Our paper also highlights that the effectiveness of various policy tools designed to curb influence depends crucially on the presence or absence of competition. One such tool, the extension of the voting franchise, is shown to sometimes have the perverse effect of making it cheaper for interest groups to wield influence, but only in the presence of competition. Another tool, the secret ballot, proves a robust deterrent in the presence of competition, but is of much less help in curtailing influence when competition is absent. Hence, in developing anti-corruption policies, policy makers have to think carefully about the contracting environment and the presence or absence of competition among interest groups seeking to wield influence.

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Proofs of Propositions

Proof of Proposition 3:

We will show that for any contract offered by A, there exists a subgame perfect equilibrium where policy b is adopted. To see this, suppose group A offers some arbitrary contract, group B does nothing, and voters vote according to their intrinsic preferences. Since A's contract is only contingent on outcomes, it is payoff relevant to voter i only to the extent that i is in a position to alter the outcome by his vote. Furthermore, since b commands a supermajority of intrinsic support, then, under the putative equilibrium, each voter has zero probability of affecting the policy by changing his vote. At the same time, changing one's vote from b to a leads to a first order payoff effect in the amount v_i. Therefore, voters can do no better than to vote according to their intrinsic preferences. Furthermore, since B obtains its preferred outcome at no cost, it can do no better than to do nothing.∎

Proof of Proposition 4:

First note that A cannot successfully buy a supermajority since, were A to do so, no member of the supermajority coalition would be pivotal. In that case, voting according to intrinsic preferences is optimal and policy b would be adopted. Hence, A must be buying a simple majority.

To successfully deter B with a simple majority, it must be the case that the cost to B of recruiting a single member of A's coalition is at least W_B. Thus, all members of the A coalition must obtain surplus of at least W_B when a is adopted

Next, notice that all voters in A's coalition who are promised a positive payment in the event that a is adopted must earn the same surplus. (If not, then such a contract is not least cost, since A could successfully offer a cheaper contract by lowering the payments to those receiving the higher surplus.). Thus, it must be the case that, if voter i is in A's coalition and receives a positive transfer, this transfer must be $W_B - v_i$. Finally, notice that an (outcome based) $K(M)$ contract is a least-cost contract satisfying these properties.

To see that there exist equilibria in which policy a is *not* adopted following the offer of the $K(M)$ contract by A, suppose that B does nothing and that all voters simply vote according to their intrinsic preferences. Then, if $v_{M-1} < 0$, policy b is adopted. Furthermore, since no voter is pivotal, voters can do no better than to vote according to their intrinsic preferences.

Finally, notice that when $v_{M-1} > 0$, all voters perceive the probability of being pivotal as being equal to one, if A offers the $K(M)$ contract and B offers any rationalizable contract,. Hence, voters can do no better than to accept the A contract and vote accordingly. Hence, in this case, the $K(M)$ contract is a least-cost successful contract.∎

Proof of Proposition 5:

For a contract to be successful, it must deter B from successfully recruiting a majority of any size. To deter B from recruiting a bare majority it must be the case that, for any bare majority recruited by B, the outside options of those recruited—which consist of the joint event of voting for a and a winning—must sum up to at least W_B.

We claim that the cheapest way of doing this entails a $K(m^*)$ contract. Suppose not. Then there exists a contract such that B is deterred from recruiting a bare majority which costs less than $K(m^*)$. Suppose under this alternative contract, B has to recruit $m' - M$ voters to obtain a bare majority. Clearly, B will choose the voters whose outside option under the contingency that they defect from B's coalition is the smallest. Therefore, it must be the case that the surplus of these voters under the contingency the joint of voting for a and policy a being chosen sums to W_B. Moreover, this must be true of all coalitions of size $m' - M$.

Next, notice that all voters recruited into A's coalition who are promised a positive payment in the event that they vote for a and a is chosen must earn the same surplus. Let this surplus amount be S. (If not, then such a contract is not least cost since A could successfully offer a cheaper contract by lowering the payments to those receiving the higher surplus.). Thus, it must be the case that, if voter i is in A's coalition and receives a transfer, this transfer must be $S - v_i$ under the contingency that i votes for a and policy a is adopted. But now recall that a $K(m^*)$ contract is in fact the least-cost contract satisfying this property while still deterring B. Contradiction.

Hence, if A offers a $K(m^*)$ contract, it will successfully deter B from recruiting a bare majority and furthermore, it is the cheapest possible way to do it.

Next, to deter B from recruiting a supermajority, it must be the case that the outside options, which consist of the joint event of voting for a and a losing, must sum to at least W_B. The $K(m^*)$ contract satisfies this condition. Hence, a $K(m^*)$ contract is a least-cost successful contract.∎

Proof of Proposition 6:

First, we show that the contract in the proposition is least-cost. Note that, in equilibrium, the cost of the contract is

$$\sum_{i=1}^{M+1} \max(-v_i, 0)$$

and recall that, in the absence of competition, the minimum cost of obtaining $\#a = m$ votes is

$$C_A(m) = \sum_{i=1}^{m} \max(-v_i, 0)$$

Therefore, the only contracts with potentially lower costs have $\#a = M$. What do successful contracts of that sort look like? To deter B from re-bribing one voter and obtaining his preferred policy, all voters voting for A must receive a surplus of at least W_B

in the event that A is approved with exactly M votes. Hence, these contracts are strictly more costly than the contract in the proposition.

It remains to show that the contract in the proposition is a successful contract. We claim that if A offers this contract, B can do no better than doing nothing, and voters $i \leq M + 1$ can do no better than voting for a.

First, suppose B does nothing and consider a deviation by any voter i currently voting for a. By deviating from a to b, the voter earns

$$\Delta U_i = -v_i - t_i$$

For $i < v^{-1}\left(K\left(M + 1\right)\right)$, $v_i > 0$ and $t_i = 0$. Hence this is strictly unprofitable. For $v^{-1}\left(K\left(M + 1\right)\right) \leq i \leq M + 1$, $t_i \geq -v_i$ and, therefore, $\Delta U_i \leq 0$. Hence this is also unprofitable.

Next, we show that B has no profitable deviation. Clearly, if B offers a contract that does not alter the policy, it does not benefit. Suppose B alters the policy by recruiting $k \geq 2$ voters from A's coalition. To induce these voters to switch, each must be paid the value of his outside option conditional on policy b being adopted or policy a being adopted with a bare majority (since these are the two possible contingencies associated with deviating from b to a when $k \geq 2$). That is, for all k, each voter must be paid an amount at least $K\left(M + 1\right)$ and, by construction

$$kK\left(M + 1\right) \geq W_B$$

for $k \geq 2$. Therefore, B has no profitable deviation. This completes the proof.∎

Proof of Proposition 7:

First note that, given A's offer, B's unique best response is to choose the null contract. To see this, note that B would have to recruit up to the median voter, M, if he wanted to implement policy b. To do so, he has to offer at least an amount $t_B = \frac{W_B}{M} + \varepsilon$, $\varepsilon > 0$. This offer will be accepted by all constituents with indices $i \geq M$. Thus, any contract in which B gets its preferred policy costs at least

$$C_B = W_B + M\varepsilon$$

and since this strictly exceeds the value to B of its preferred policy, B is strictly better off offering the null contract.

Thus, we have shown that A's offer constitutes a successful contract. It remains to show that it is also least-cost. Suppose that A offers a transfer $t'_A < t_A$, then by offering $t_B = t'_A - v_M + \varepsilon$, group B will attract all voters with indices $i \geq M$. For ε sufficiently small, this contract will cost B less than W_B and, hence, A's contract is not successful.

Therefore, the contract described in the proposition is indeed the least-cost successful contract.∎

Proof of Proposition :8:

For a supermajority of voters to receive payments from A, it must be the case that voter $M + 1$ is in A's coalition. This amounts to the condition that

$$v_{M+1} + t_A \geq 0$$

Substituting for t_A, we obtain

$$v_{M+1} - v_M + \frac{W_B}{M} \geq 0$$

Noting that $v_{M+1} < v_M < 0$, it is convenient to rewrite this inequality as

$$v_M - v_{M+1} \leq \frac{W_B}{M}$$

which holds by Assumption 1.∎

Rationing

One may worry that the supermajority result for non-discriminatory vote buying solely arises from the fact that A cannot ration the set of voters who take up its offer. Here, we show that this is not the case. Let us amend the model as follows. Suppose that each of the groups are restricted to offering each constituent either the null contract or a t contract where t is a fixed transfer that does not depend on the identity of the constituent. Thus, by offering null contracts to certain voters, a group can ration its transfers.

To obtain the supermajority result for the case of rationing, preferences need to approximate the continuous relative preference model of Groseclose and Snyder. Hence, we extend Assumption 1 to all voters. Specifically, we assume that

Assumption 2. For all i, $v_i - v_{i+1} \leq \frac{W_B}{M}$.

Proposition 9 *Let vote buying be non-discriminatory. Then, under a least-cost successful contract with rationing, A always buys a supermajority of voters.*

Proof. Suppose A successfully recruits a simple majority. That implies that all voters $i = 1, 2, ..., M$ must enjoy a payoff of at least W_B. The cost to A of this scheme is

$$C_A^M = (W_B - v_M) \left(M - v^{-1}(W_B) + 1 \right)$$

Now suppose A successfully recruits a supermajority of $M + 1$. This implies that all voters $i = 1, 2, ..., M + 1$ must enjoy a payoff of at least $\frac{W_B}{2}$. The cost to A of this scheme is

$$C_A^{M+1} = \left(\frac{W_B}{2} - v_M \right) \left(M + 1 - v^{-1}\left(\frac{W_B}{2} \right) + 1 \right)$$

From Assumption 2 it follows that

$$v^{-1}\left(\frac{W_B}{2}\right) - v^{-1}\left(W_B\right) \geq 1$$

Hence, $C_A^{M+1} < C_A^M$. ∎