

Of course, the American Dental Association may look at this differently. It may place more weight on the loss to city dentists' incomes than on the saving to consumers. From the dental profession's perspective there is indeed a misallocation, with too many dentists practicing in the city. If more dentists took rural practices, then the potential advantages of a city practice would not be "wasted" by competition and congestion. Taken as a whole, the income of dentists would rise if it were possible to keep the number of city dentists below the free-market level. Although dentists cannot place a toll on those who want to practice in the city, it is in the profession's self-interest to create a fund that subsidizes dental students who commit to establish a rural practice.

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The Strategy of Voting

The foundation of a democratic government is that it respects the will of the people as expressed through the ballot box. Unfortunately, these lofty ideals are not so easily implemented. Strategic issues arise in voting, just as in any other multiperson game. Voters will often have an incentive to misrepresent their true preferences. Neither majority rule nor any other voting scheme can solve this problem, for there does not exist any one perfect system for aggregating up individuals' preferences into a will of the people.*

What this means is that the structure of the game matters. For example, when Congress has to choose between many competing bills, the order in which votes are taken can have a great influence on the final outcome. We begin by looking at the voting process more carefully, figuring out just when an individual's vote matters.

* This deep result is due to Stanford University professor Kenneth Arrow. His famous "impossibility" theorem shows that any system for aggregating unrestricted preferences over three or more alternatives into a group decision cannot simultaneously satisfy the following minimally desirable properties: (i) transitivity, (ii) unanimity, (iii) independence of irrelevant alternatives, (iv) non-dictatorship. Transitivity requires that if A is chosen over B and B is chosen over C , then A must be chosen over C . Unanimity requires A to be chosen over B when A is unanimously preferred to B . Independence of irrelevant alternatives requires that the choice between A and B does not depend on whether some other alternative C is available. Non-dictatorship requires that there is no individual who always gets his way and thus has dictatorial powers.

1. THE TIE OF POWER

Recent presidential elections have emphasized the importance of the selection of the vice president. This person will be just a heartbeat away from the presidency. But most candidates for president spurn the suggestion of the second spot on the ticket, and most vice presidents do not seem to enjoy the experience. The prospect of twiddling one's thumbs for four or eight years, waiting for the boss to die, is hardly a fit occupation for anyone.* John Nance Garner, FDR's first VP, expressed this succinctly: "The vice-presidency ain't worth a pitcher of warm spit."

Only one clause of the Constitution specifies any actual activity for the vice president. Article I, Section 3.4 says: "The Vice-President of the United States shall be President of the Senate, but shall have no vote, unless they be equally divided." The presiding is "ceremony, idle ceremony," and most of the time the vice president delegates this responsibility to a rotation of junior senators chosen by the senate majority leader. Is the tiebreaking vote important, or is it just more ceremony?

At first glance, both logic and evidence seem to support the ceremonial viewpoint. The vice president's vote just does not seem important. The chance of a tie vote is small. The most favorable circumstances for a tie arise when each senator is just as likely to vote one way as the other, and an even number of senators vote. The result will be roughly one tie vote in twelve.† Of course senators' votes are far from random. Only when the two parties are roughly equal or when there is an especially divisive issue that splits some of the party lines does the vice president's vote get counted.

* No doubt they console themselves by thinking of the even worse plight of Britain's Prince Charles.

† The biggest chance that a fixed group of 50 Senators votes Aye and the remaining 50 vote Nay is $(\frac{1}{2})^{50} \cdot (\frac{1}{2})^{50}$. Multiplying this by the number of ways of finding 50 supporters out of the total 100, we get approximately $(1/12)$.

The most active tiebreaking vice president was our first, John Adams. He cast 29 tiebreaking votes during his eight years. This is not surprising, since his Senate consisted of only 20 members, and a tie was almost three times more likely than it is today, with our 100-member Senate. In fact, over the first 200 years, there have been only 222 occasions for the vice president to vote. More recently, Richard Nixon, under Eisenhower, was the most active vice president, casting a total of 8 tiebreaking votes — out of 1,229 decisions reached by the Senate during the period 1953–61. This fall in tiebreaking votes also reflects the fact that the two-party system is much more entrenched, so that fewer issues are likely to cross party lines.

But this ceremonial picture of the vice president's vote is misleading. More important than how often the vice president votes is the impact of the vote. Measured correctly, the vice president's vote is roughly equal in importance to that of any senator.

One reason that the vice president's vote matters is that it tends to decide only the most important and divisive issues. For example, George Bush, as vice president, voted to save both the administration's chemical weapons program (twice) and the MX missile program. This suggests that we should look more closely at just when it is that a vote matters.

A vote can have one of two effects. It can be instrumental in determining the outcome, or it can be a "voice" that influences the margin of victory or defeat without altering the outcome. In a decision-making body like the Senate, the first aspect is the more important one.

To demonstrate the importance of the vice president's current position, *imagine that the vice president is given a regular vote as President of the Senate*. When does this have any additional impact? For important issues, all 100 senators will try to be present.* If the 100 senators are split 51–49 or more

* Or senators on opposite sides of the issue will try to pair off their absences.

lopsidedly, then the outcome is the same no matter which way the vice president votes. *The only time the outcome hinges on the vice president's 101st vote is when the Senate is split 50-50, just the same as now, when the vice president has only a tiebreaking vote.*

We recognize that our account of a vice president's voting power leaves out aspects of reality. Some of these imply less power for the vice president; others, more. Much of a senator's power comes from the work in committees, in which the vice president does not partake. On the other hand, the vice president has the veto power of the president on his side.

Our illustration of the vice president's vote leads to an important moral of wider applicability: anyone's vote affects the outcome only when it creates or breaks a tie. Think how important your own vote is in different contexts. How influential can you be in a presidential election? Your town's mayoral election? Your club's secretarial election?

As with the Senate, the chance that the rest of the electorate reaches a tie, leaving you decisive, is at a maximum when each voter is just as likely to vote one way as the other. Mathematical calculation shows that the chances of a tie are proportional to the square root of the number of voters: increasing the electorate a millionfold reduces the chances of a tie by a factor of a thousand. In the Senate, with 100 voters, we saw that the chance of a tie in the most favorable circumstances was 1 in 12. In a presidential election with 100 million voters, it drops to 1 in 12,000. Because of the electoral college system, there is a greater chance that you will be decisive in affecting the electoral votes of your state. But the fact that the population is rarely split so evenly works the other way, and even a slight advantage for one candidate or the other reduces the chances of a tie drastically. So you might take 1 in 12,000 as an optimistic estimate of your influence in a presidential election. Considering these odds, is it worth your while to vote?

To explore this question, let us take a concrete example. Suppose one candidate, Mr. Soft Heart, has promised to raise the minimum wage from \$3.50 to \$5.00, and the other, Mr. Hard Head, is opposed to any increase. If you hold a minimum-wage job, work 2,000 hours a year, and expect to keep the job when the wage rises, Mr. Heart will mean \$3,000 a year more in your pocket than Mr. Head. Over the four years, this will amount to \$12,000. But the chance that your vote will bring this about is only 1 in 12,000. The expected advantage to you from your vote is only a dollar. It is not worth your while to vote if to do so you must sacrifice even 20 minutes of paid working time. Surveys find that most people value their leisure time at about half their wage rate. Therefore voting is not worth 40 minutes of your leisure time.

Even if you are unlikely to change the outcome, you can still add your voice to the crowd. But will it be heard? While it is clear that 100 million to 0 is a landslide, there is no apparent line where the change in one vote causes a landslide to become a simple victory. And yet if enough people change their vote, the landslide will become a tie and then a loss and finally a landslide in the other direction. This absence of a "bright line" dates back to the Greek philosopher Zeno, who tells the paradox in terms of creating a mound from grains of sand one at a time. It seems true that no one grain can turn a non-mound into a mound. And yet, enough grains will turn a molehill into a mountain. A vote is much like a grain of sand. It is hard to imagine how one additional vote will change anyone's perception of the outcome.*

What this tells us is that calculations of personal gains and costs cannot be decisive in motivating people to vote. For the proper functioning of democracy, however, it is very important that people do so. That is why we need social conditioning.

* Even though any single individual's opinion of the outcome is ever so slightly changed, a small impact on a large number of people may still add up to something.

From civics classes in elementary school to election-eve appeals to one's patriotic duty, societies work to get out the vote — even if individual voters don't have any major impact on the election.* Where patriotic duty is found insufficient, people are sometimes legally required to vote, as is the case in several countries, including Australia.

2. THE MEDIAN VOTER

So far our emphasis has been on pairwise elections. In such cases there is little strategy other than whether or not to vote. If you vote, you should always vote for the candidate whom you most prefer. Because your vote matters most when it breaks a tie, you want your vote to reflect your preferences honestly.† For elections with more than two alternatives, the decision is both whether or not to vote and what to vote for. It is no longer true that one should always vote for one's favorite candidate.

In the 1984 Democratic party primary, supporters of Jesse Jackson had the problem of trying to send a signal with their vote. They could predict that Jackson was unlikely to win. The polls told them that Gary Hart and Walter Mondale were the clear front-runners. There was a great incentive to vote for

* A much cheaper and potentially more representative way of deciding elections would be to run a poll. The current practice is a glorified poll; anyone who wants to participate, does so. The theory of statistics tells us that if the vote from a random sample of 10,000 gives one candidate a 5% edge (5,250 or more votes), then there is less than a one-in-a-million chance the outcome will be reversed, *even if 100 million people vote*. If the vote is closer we have to continue expanding the survey size. While this process could greatly reduce the cost of voting, the potential for abuse is also great. The selection of a random voter is subject to a nightmare of problems.

† Again, there is the qualification that you might care about the candidate's margin of victory. Specifically, you might want your candidate to win, but only with a small margin of victory (in order to temper his megalomania, for example). In that case, you might choose to vote against your preferred alternative, provided you were confident that he would win.

those at the head of the pack in order not to waste one's vote. This became an even bigger problem when there were seven candidates competing for the 1988 Democratic party presidential nomination. Supporters didn't want to waste their vote or campaign contributions on a nonviable candidate. Thus polls and media characterizations that pronounced front-runners had the real potential to become self-fulfilling prophecies.

There is another reason why votes may not reflect preferences. One way to help keep your vote from getting lost in the crowd is to make it stand out: take an extreme position away from the crowd. Someone who thinks that the country is too liberal could vote for a moderately conservative candidate. Or she could go all the way to the extreme right and support Lyndon LaRouche. To the extent that candidates compromise by taking central positions, it may be in some voters' interests to appear more extreme than they are. This tactic is effective only up to a point. If you go overboard, you are thought of as a crackpot, and the result is that your opinion is ignored. The trick is to take the most extreme stand consistent with appearing rational.

To make this a little more precise, imagine that we can align all the candidates on a 0 to 100 scale of liberal to conservative. The Young Spartacus League is way on the left, around 0, while Lyndon LaRouche takes the most conservative stance, somewhere near 100.

Voters express their preference by picking some point along the spectrum. Suppose the winner of the election is the candidate whose position is the average of all voters' positions. The way you might think of this happening is that through negotiations and compromises, the leading candidate's position is chosen to reflect the average position of the electorate. The parallel in bargaining is to settle disputes by offering to "split the difference."

Consider yourself a middle-of-the-roader: if it were in your hands, you would prefer a candidate who stands at the position

50 on our scale. But it may turn out that the country is a bit more conservative than that. Without you, the average is 60. For concreteness, you are one of a hundred voters polled to determine the average position.

If you state your actual preference, the candidate will move to $[99 \times 60 + 50]/100 = 59.9$. If, instead, you exaggerate and claim to want 0, the final outcome will be at 59.4. By exaggerating your claim, you are six times as effective in influencing the candidate's position. Here, extremism in the defense of liberalism is no vice.

Of course, you won't be the only one doing this. All those more liberal than 60 will be claiming to be at 0, while those more conservative will be arguing for 100. In the end, everyone will appear to be polarized, although the candidate will still take some central position. The extent of the compromise will depend on the relative numbers pushing in each direction.

The problem with this averaging approach is that it tries to take into account both intensity and direction of preferences. People have an incentive to tell the truth about direction but exaggerate when it comes to intensity. The same problem arises with "split the difference": if that is the rule for settling disputes, everyone will begin with an extreme position.

One solution to this problem dates back to the twenties and Columbia University economist Harold Hotelling. Instead of taking the mean or average position, the candidate chooses the *median* position, the platform where there are exactly as many voters who want the candidate to move left as to move right. Unlike the mean, the median position does not depend on the intensity of the voters' preferences, only their preferred direction. To find the median point, a candidate could start at 0 and keep moving to the right as long as a majority supports this change. At the median, the support for any further rightward move is exactly balanced by the equal number of voters who prefer a shift left.

When a candidate adopts the median position, no voter has

an incentive to distort her preferences. Why? There are only three cases to consider: (i) a voter to the left of the median, (ii) a voter exactly at the median, and (iii) a voter to the right of the median. In the first case, exaggerating preferences leftward does not alter the median, and therefore the position adopted, at all. The only way that this voter can change the outcome is to support a move rightward. But this is exactly counter to his interest. In the second case, the voter's ideal position is being adopted anyway, and there is nothing to gain by a distortion of preferences. The third case parallels the first. Moving more to the right has no effect on the median, while voting for a move left is counter to the voter's interests.

The way the argument was phrased suggested that the voter knows the median point for the voting population, and whether she is to the right or the left of it. Yet the incentive to tell the truth had nothing to do with which of those outcomes occurred. You can think about all three of the above cases as possibilities and then realize that whichever outcome materializes, the voter will want to reveal her position honestly. The advantage of the rule that adopts the median position is that no voter has an incentive to distort her preferences; truthful voting is the dominant strategy for everyone.

The only problem with adopting the median voter's position is its limited applicability. This option is available only when everything can be reduced to a one-dimensional choice, as in liberal versus conservative. But not all issues are so easily classified. Once voters' preferences are more than one-dimensional, there will not be a median. At that point, the possibility of manipulating the system becomes real.

3. NAIVE VOTING

The most commonly used election procedure is simple majority voting. And yet the results of the majority-rule system

have paradoxical properties, as was first recognized over two hundred years ago by French Revolution hero the Marquis de Condorcet.

In his honor, we illustrate his fundamental paradox of majority rule using revolutionary France as the setting. After the fall of the Bastille, who would be the new populist leader of France? Suppose three candidates, Mr. Robespierre, Mr. Danton, and Madame Lafarge, are competing for the position. The population is divided into three equally sized groups, left, middle, and right, with the following preferences:

	Left's Ranking	Middle's Ranking	Right's Ranking
1st	Danton	Lafarge	Robespierre
2nd	Lafarge	Robespierre	Danton
3rd	Robespierre	Danton	Lafarge

In a vote of Robespierre against Danton, Robespierre wins two to one. Then in a vote of Robespierre against Lafarge, Lafarge beats Robespierre two to one. But then in a vote of Lafarge against Danton, Danton wins two to one. Thus there is no overall winner. Who ends up on top depends on which vote was the last taken. More generally, this possibility of endless cycles makes it impossible to specify any of the alternatives as representing the will of the people.

Things become even more insidious when voting cycles are embedded in a larger problem. The will of the majority can leave everyone worse off. To show this problem, we update and expand the preferences above. Suppose the Seven Dwarfs are candidates in an election.* The voters are split into three equal factions — call them Left, Middle, and Right. The rankings of the groups are as follows.

* Any similarity between this story and the early stages of the 1988 Democratic presidential primaries is purely coincidental.

	Left's Ranking	Middle's Ranking	Right's Ranking
1st	Happy	Grumpy	Dopey
2nd	Sneezy	Dopey	Happy
3rd	Grumpy	Happy	Sleepy
4th	Dopey	Bashful	Sneezy
5th	Doc	Sleepy	Grumpy
6th	Bashful	Sneezy	Doc
7th	Sleepy	Doc	Bashful

Note that the cyclic ordering over Happy, Dopey, and Grumpy is equivalent to the cyclic ordering of Robespierre, Danton, and Madame Lafarge above.

If we start with Happy versus Dopey, Dopey wins. Then Grumpy beats Dopey. And Sneezy beats Grumpy. Next Sleepy beats Sneezy. Then Bashful beats Sleepy, and Doc beats Bashful. This is remarkable. A sequence of majority votes has taken us from Happy, Dopey, and Grumpy all the way to Doc, when every voter agrees that any one of Happy, Dopey, and Grumpy is better than Doc.

How did this happen? The elections were all decided by two-thirds majorities. Those on the winning side gained a position, while those on the losing end went down four slots on average. All voters had four wins and two losses, which on net puts them four places worse than where they started.

At this point you would be justified in objecting that these voters were responsible for their own misfortunes; they voted in a shortsighted way. Each pairwise contest was decided as if it were the only one, instead of being a part of a chain of votes. If the voters had only looked ahead and reasoned backward they never would have allowed themselves to end up with Doc. That's true. But the presence of a voting cycle makes the

outcome highly sensitive to the voting procedure. The next section shows how controlling the agenda can determine the outcome.

4. ORDER IN THE COURT

The way the U.S. judicial system works, a defendant is first found to be innocent or guilty. The punishment sentence is determined only after a defendant has been found guilty. It might seem that this is a relatively minor procedural issue. Yet, the order of this decision-making can mean the difference between life and death, or even between conviction and acquittal. We use the case of a defendant charged with a capital offense to make our point.

There are three alternative procedures to determine the outcome of a criminal court case. Each has its merits, and you might want to choose among them based on some underlying principles.

1. Status Quo: First determine innocence or guilt, then if guilty consider the appropriate punishment.
2. Roman Tradition: After hearing the evidence, start with the most serious punishment and work down the list. First decide if the death penalty should be imposed for this case. If not, then decide whether a life sentence is justified. If, after proceeding down the list, no sentence is imposed, then the defendant is acquitted.
3. Mandatory Sentencing: First specify the sentence for the crime. Then determine whether the defendant should be convicted.

The difference between these systems is only one of agenda: what gets decided first. To illustrate how important this can be, we consider a case with only three possible outcomes: the

death penalty, life imprisonment, and acquittal.* This story is based on a true case; it is a modern update of the dilemma faced by Pliny the Younger, a Roman lawyer working under Emperor Trajan around A.D. 100.¹

The defendant's fate rests in the hands of three judges. Their decision is determined by a majority vote. This is particularly useful since the three judges are deeply divided.

One judge (Judge A) holds that the defendant is guilty and should be given the maximum possible sentence. This judge seeks to impose the death penalty. Life imprisonment is her second choice and acquittal is her worst outcome.

The second judge (Judge B) also believes that the defendant is guilty. However, this judge adamantly opposes the death penalty. Her most preferred outcome is life imprisonment. The precedent of imposing a death sentence is sufficiently troublesome that she would prefer to see the defendant acquitted rather than executed by the state.

The third judge, Judge C, is alone in holding that the defendant is innocent, and thus seeks acquittal. She is on the other side of the fence from the second judge, believing that life in prison is a fate worse than death. (On this the defendant concurs.) Consequently, if acquittal fails, her second-best outcome would be to see the defendant sentenced to death. Life in prison would be the worst outcome.

	Judge A's Ranking	Judge B's Ranking	Judge C's Ranking
Best	Death Sentence	Life in Prison	Acquittal
Middle	Life in Prison	Acquittal	Death Sentence
Worst	Acquittal	Death Sentence	Life in Prison

* Similar results hold even when there are many more outcomes.

Under the status quo system, the first vote is to determine innocence versus guilt. But these judges are sophisticated decision-makers. They look ahead and reason backward. They correctly predict that, if the defendant is found guilty, the vote will be two to one in favor of the death penalty. This effectively means that the original vote is between acquittal and the death penalty. Acquittal wins two to one, as Judge B tips the vote.

It didn't have to turn out that way. The judges might decide to follow the Roman tradition and work their way down the list of charges, starting with the most serious ones. They first decide whether or not to impose a death penalty. If the death penalty is chosen, there are no more decisions to be made. If the death penalty is rejected, the remaining options are life imprisonment or acquittal. By looking forward, the judges recognize that life imprisonment will be the outcome of the second stage. Reasoning backward, the first question reduces to a choice between life and death sentences. The death sentence wins two to one, with only Judge B dissenting.

A third reasonable alternative is to first determine the appropriate punishment for the crime at hand. Here we are thinking along the lines of a mandatory sentencing code. Once the sentence has been determined, the judges must then decide whether the defendant in the case at hand is guilty of the crime. In this case, if the predetermined sentence is life imprisonment, then the defendant will be found guilty, as Judges A and B vote for conviction. But if the death penalty is to be required, then we see that the defendant will be acquitted, as Judges B and C are unwilling to convict. Thus the choice of sentencing penalty comes down to the choice of life imprisonment versus acquittal. The vote is for life imprisonment, with Judge C casting the lone dissent.

You may find it remarkable and perhaps troubling that any of the three outcomes is possible based solely on the order

in which votes are taken. Your choice of a judicial system might then depend on the outcome rather than the underlying principles.

5. THE SOPHISTICATES

The problems with majority rule go beyond manipulating the outcome through control of the agenda. Even sophisticated voters who exercise foresight can collectively outsmart themselves. We tell a story that illustrates the point, freely adapting the saga of President Reagan's nominees for the Supreme Court.

Judge Bork was the first nominee. Judges Ginsberg and Kennedy were known to be high on the list, and likely to be nominated should Bork not be confirmed by the Senate. If the Senate turned down all three, the likelihood was that the seat would stay vacant for the next president to fill.

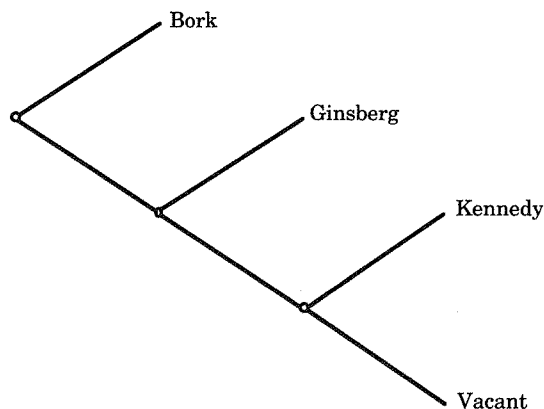
Imagine that the decision rests in the hands of three powerful senators. To avoid impugning the reputation of any actual persons, we will call the three A, B, and C. Their rankings of the four possible outcomes are as follows:

	A's Ranking	B's Ranking	C's Ranking
1st	Kennedy	Ginsberg	Vacant
2nd	Vacant	Kennedy	Bork
3rd	Bork	Vacant	Ginsberg
4th	Ginsberg	Bork	Kennedy

The first thing to observe is that leaving the seat vacant is *unanimously* preferred to nominating Judge Bork. Yet if these are the preferences and the senators correctly predict

the order of nominations as Bork, Ginsberg, and Kennedy, the result will be that Bork is confirmed.

We figure out the voting patterns by working backward up the tree.



If the vote comes down to appointing Kennedy versus leaving the seat vacant, Kennedy will win. By looking ahead and reasoning backward the senators can predict a victory for Kennedy if Ginsberg is defeated. Therefore, if Bork is turned down the contest becomes Ginsberg or Kennedy. In the Ginsberg versus Kennedy contest, Ginsberg wins two to one.

Reasoning backward again, right at the start the senators should realize that their choice is Bork or Ginsberg. Here, Bork wins two to one. Everyone is looking ahead and correctly figures out the consequences of their action. Yet they collectively end up with a candidate whose nomination, everyone agrees, is worse than leaving the seat vacant.

Now in fact it didn't turn out that way, and there are several reasons. No one was quite certain who the next nominee would be. Preferences changed as more information was learned about the nominees. The senators' preferences may not have been as we represented them. Equally important, we have ignored any possibility for logrolling.

This was a perfect opportunity for logrolling to arise. There were three 2:1 votes. Each of the senators was on the winning side twice and on the losing side once. The gain from each win was worth one position in their ranking, but the loss pushed them down three. It doesn't help to win two small battles and lose the big war. The possibility for mutual gain opens the door for logrolling, and with these preferences we expect Bork would be defeated.

6. ALL-TIME GREATS

After the White House, election to Cooperstown may be the next most coveted national honor. Membership in the Baseball Hall of Fame is determined by an election. There is a group of eligible candidates — for example, a player with ten years of experience becomes eligible five years after retirement.* The electors are the members of the Baseball Writers Association. Each voter may vote for up to ten candidates. All candidates capturing votes from more than 75 percent of the total number of ballots returned are elected.

One problem with this system is that the electors don't have the right incentives to vote for their true preferences. The rule that limits each voter to ten choices forces the voters to consider electability as well as merit. Some sportswriters may believe a candidate is deserving, but don't want to throw away the vote if the player is unlikely to make the cutoff. This same issue arose for voting in presidential primaries, and it appears in any election in which each voter is given a fixed number of votes to distribute among the candidates.

Two experts in game theory propose an alternative way to

* However, if the player has been on the ballot for fifteen years and failed to get elected, then eligibility is lost. For otherwise ineligible players, there is an alternative route to election. An Old Timers' committee considers special cases and sometimes elects one or two candidates a year.

run elections. Steven Brams and Peter Fishburn, one a political scientist and the other an economist, argue that “approval voting” allows voters to express their true preferences without concern for electability.² Under approval voting, each voter may vote for as many candidates as he wishes. Voting for one person does not exclude voting for any number of others. Thus there is no harm in voting for a candidate who has no hope of winning. Of course if people can vote for as many candidates as they wish, who gets elected? Like the Cooperstown rule, the electoral rule could specify in advance a percentage of the vote needed to win. Or it could pre-specify the number of winning candidates, and then the positions are filled by those who gather the most votes.

Approval voting has begun to catch on, and is used by many professional societies. How would it work for the Baseball Hall of Fame? Would Congress do better if it used approval voting when deciding which expenditure projects should be included in the annual budget? We look at the strategic issues associated with approval voting when a cutoff percentage determines the winners.

Imagine that election to the different sports halls of fame was decided by approval voting, in which all candidates capturing above a fixed percentage of the votes are elected. At first glance, the voters have no incentive to misstate their preferences. The candidates are not in competition with one another, but only with an absolute standard of quality implicit in the rule that specifies the required percentage of approval. If I think Reggie Jackson should be in the Baseball Hall of Fame, I can only reduce his chances by withholding my approval, and if I think he doesn't belong there, I can only make his admission more likely by voting contrary to my view.

However, candidates may compete against one another in the voters' minds, even though nothing in the rules mandates it. This will usually happen because voters have preferences concerning the size or the structure of the membership. Sup-

pose Dan Marino and John Elway come up for election to the Football Hall of Fame. I think Marino is the better quarterback, although I will admit that Elway also meets the standard for a Hall of Fame berth. However, I think it overwhelmingly important that two quarterbacks not be elected in the same year. My guess is that the rest of the electorate regards Elway more highly and he would get in no matter how I vote, but that Marino's case will be a very close call, and my approval is likely to tip him over. Voting truthfully means naming Marino, which is likely to lead to the outcome in which both are admitted. Therefore I have the incentive to misstate my preference and vote for Elway.

Two players may complement each other, rather than compete, in the voters' minds. I think neither Geoff Boycott nor Sunil Gavaskar belongs in the Cricket Hall of Fame, but it would be a gross injustice to have one and not the other. If in my judgment the rest of the electorate would choose Boycott even if I don't vote for him, while my vote may be crucial in deciding Gavaskar's selection, then I have an incentive to misstate my preference and vote for Gavaskar.

In contrast, a quota rule explicitly places candidates in competition with one another. Suppose the Baseball Hall of Fame limits admission to only two new people each year. Let each voter be given two votes; he can divide them between two candidates or give both to the same candidate. The candidates' votes are totaled, and the top two are admitted. Now suppose there are three candidates — Joe DiMaggio, Marv Throneberry, and Bob Uecker.* Everyone rates DiMaggio at the top, but the electors are split equally between the other two. I know that DiMaggio is sure to get in, so as a Marv Throneberry fan I give my two votes to him to increase his

* Marv Throneberry played first base for the '62 Mets, possibly the worst team in the history of baseball. His performance was instrumental to the team's reputation. Bob Uecker is much better known for his performance in Miller Lite commercials than for his play on the baseball field.

chances over Bob Uecker. Of course everyone else is equally subtle. The result: Throneberry and Uecker are elected and DiMaggio gets no votes.

Government expenditure projects naturally compete with one another so long as the total budget is limited, or congressmen and senators have strong preferences over the size of the budget. We will leave you to think which, if any, is the DiMaggio project, and which ones are the Throneberrys and Ueckers of federal spending.

7. "LOVE A LOATH'D ENEMY"

Incentives to distort one's preferences appear in other situations, too. One instance occurs when you can move first and use this opportunity to influence others.³ Take for example the case of charitable contributions by foundations. Suppose there are two foundations, each with a budget of \$250,000. They are presented with three grant applications: one from an organization helping the homeless, one from the University of Michigan, and one from Yale. Both foundations agree that a grant of \$200,000 to the homeless is the top priority. Of the two other applications, the first foundation would like to see more money go to Michigan, while the second would prefer to fund Yale. Suppose the second steals a march and sends a check for its total budget, \$250,000, to Yale. The first is then left with no alternative but to provide \$200,000 to the homeless, leaving only \$50,000 for Michigan. If the two foundations had split the grant to the homeless, then Michigan would have received \$150,000, as would Yale. Thus the second foundation has engineered a transfer of \$100,000 from Michigan to Yale through the homeless. In a sense, the foundation has distorted its preferences — it has not given anything to its top charity priority. But the strategic commitment does serve its true interests. In fact, this type of funding game is quite

common.* By acting first, small foundations exercise more influence over which secondary priorities get funded. Large foundations and especially the federal government are then left to fund the most pressing needs.

This strategic rearranging of priorities has a direct parallel with voting. Before the 1974 Budget Act, Congress employed many of the same tricks. Unimportant expenditures were voted on and approved first. Later on, when the crunch appeared, the remaining expenditures were too important to be denied. To solve this problem, Congress now votes first on budget totals and then works within them.

When you can rely on others to save you later, you have an incentive to distort your priorities by exaggerating your claim and taking advantage of the others' preferences. You might be willing to gain at the expense of putting something you want at risk, if you can count on someone else bearing the cost of the rescue.

The principle of forcing others to save you can turn the outcome all the way around, from your worst to your best alternative. Here we show how this is done using the votes of a corporate board of trustees facing a hostile takeover. Their immediate problem is how to respond. Four options have been proposed, each with its own champion.

The founding president is looking for a way to keep the company intact. His first preference is to initiate a poison-pill provision into the company charter. The poison pill would be designed to prevent any outside party from attaining control without board approval.

* One explicit example is the strategic game played between the Marshall and Rhodes Scholarships. The Marshall Fund's objective is to have the maximum influence over who is given a scholarship to study in England. If someone has the potential to win both a Marshall and a Rhodes, the Marshall Fund prefers to have the person study as a Rhodes Scholar; that brings the person to England at no cost to the Marshall Fund and thus allows the Marshall Scholarship to select one more person. Hence the Marshall Fund waits until the Rhodes Scholarships have been announced before making its final selections.

The two young members of the board feel the situation is more desperate. They believe that a takeover is inevitable and are concentrating on finding a way to make the present transaction more acceptable. Their preferred action is to look for a white knight, a buyer who is acceptable to management and the board. The management representation on the board suggests a third possibility. The present managers would like the opportunity to buy the company through a management buyout, an MBO.

The fifth member of the board is an outside director. He is cautiously optimistic about the present raider and argues that there is time to see how the offer develops.

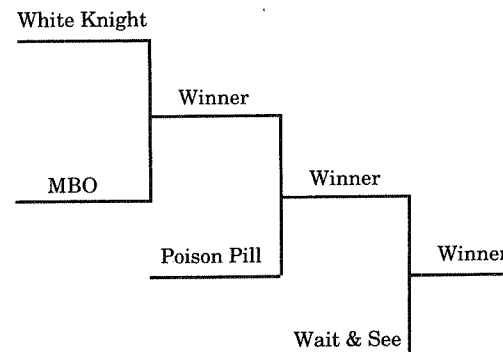
After these four options have been discussed, everyone ends up with a clear picture of where the others stand (or sit) on the four proposals. For example, the founder is a man of action; his worst outcome is the Wait & See position. The two young board members agree with the fifth that the MBO option is unattractive; whenever management competes with an outside bidder it opens the door to conflict of interest and insider trading, for managers are the ultimate insiders. The complete set of preferences is presented below.

	Founder's Ranking	Two Young Directors' Rankings	Management's Ranking	Outside Director's Ranking
1st	Poison Pill	White Knight	MBO	Wait & See
2nd	MBO	Poison Pill	Poison Pill	White Knight
3rd	White Knight	Wait & See	Wait & See	Poison Pill
4th	Wait & See	MBO	White Knight	MBO

Faced with these options, the board must make a decision. Everyone recognizes that the voting procedure may well influence the outcome. Even so, they decide there is a natural order to the decision-making process: begin by comparing the

active courses of action and then decide whether the best one is worth doing. They first compare an MBO with a White Knight, and the more preferred alternative is then compared with the Poison Pill option. Having found the best active response, they decide whether this is worth doing by comparing it with Wait & See.

This voting problem is represented by the tree below.



This tree should remind you of a tennis tournament in which some players are seeded. We are seeding "Wait & See" all the way into the finals, "Poison Pill" into the semifinals, and giving no seed to "MBO" and "White Knight."

Boxing and chess both work this way, too. There is a series of challenges that you must win in order to go against the presiding world champion. The U.S. presidential election process also works this way. When there is an incumbent president, that person is typically a shoo-in for his party's nomination. The opposing party runs a primary to decide who will go against the incumbent in the final elections. The primary process, the ensuing party nomination, and the presidential election can be thought of as a series of elimination elections. But back to the boardroom.

We suppose that the five board members have enough foresight to realize the consequences of their actions in successive rounds, and vote according to their true preferences. Back-

ward reasoning makes this problem easy to solve. You can work out the solution and see that the White Knight option wins (or you can jump to the next paragraph), but that is not the point of this story. We are interested in showing how the founder can improve the outcome from his perspective by making a commitment to distorted preferences.

How is it that the White Knight option wins under foresighted voting? The last election must be Wait & See versus something. In this final election everyone has an incentive to vote honestly, since this will determine the actual outcome. The three possibilities are easy to calculate:

- Wait & See vs. Poison Pill, *Poison Pill* wins 4–1.
- Wait & See vs. MBO, *Wait & See* wins 3–2.
- Wait & See vs. White Knight, *White Knight* wins 3–2.

Now we go back one previous round. The contest will be either Poison Pill vs. White Knight or Poison Pill vs. MBO. In the first case, both Poison Pill and White Knight are preferred to Wait & See. So whatever wins the second round will be implemented. The board members prefer White Knight to Poison Pill, 3–2.

In the second case, a vote for MBO is in reality a vote for Wait & See. Board members can anticipate that if MBO beats Poison Pill for the active course, it will lose out in the next comparison with Wait & See. So when deciding between Poison Pill and MBO, board members will act as if deciding between Poison Pill and Wait & See, with the result that Poison Pill wins 4–1. Thus the first-round comparison is truly between Poison Pill and White Knight. White Knight is chosen by a 3–2 margin and is then selected in each of the subsequent comparisons.

Once the founder recognizes what will happen, there is a strategy he can employ to get his most preferred option, the Poison Pill. Look what happens if the founder “adopts” the preferences of the outside board member. Of course it is es-

sential that this change of preferences is credible and is made known to all the other voters. Suppose the founder simply gives his vote to the outside director and leaves the meeting.

At first glance this seems nothing short of crazy; the adopted preferences are almost the opposite of his true ones. But look at the effect. The votes will now go as follows:

- Wait & See vs. Poison Pill, *Poison Pill* wins 3–2.
- Wait & See vs. MBO, *Wait & See* wins 4–1.
- Wait & See vs. White Knight, *Wait & See* wins 3–2.

The only active option that can beat Wait & See is Poison Pill. Right from the start the board members should predict that if Poison Pill ever loses, the outcome will be Wait & See. Yet both MBO and White Knight supporters prefer Poison Pill to Wait & See. They are forced to vote for Poison Pill as it is their only viable alternative; thus Poison Pill wins.

By transferring his support to the opposition, the founder is able to make a credible threat that it is either Poison Pill or Wait & See. As a result, all but the die-hard Wait & See supporters dump the White Knight option (which can no longer beat Wait & See) in favor of the Poison Pill. Superficially, this transfer of a vote doubles the strength of the Wait & See supporters. Actually, it leads to an outcome that is worse from their viewpoint — Poison Pill rather than White Knight. In voting, strength can be weakness. Of course, if the outside director sees through the game, he should refuse to accept the founder’s proxy.

If you regard this story as farfetched, something quite like it did occur in the 1988 Wisconsin presidential primary. The Republican governor of the state said that of the Democratic candidates, Jesse Jackson was the most interesting. Many commentators thought this was a Machiavellian attempt to get Republicans to cross over and vote for Jackson in the Democratic primary, thereby helping produce a more easily beatable opponent for Bush in the November election. Apparently,

Michael Dukakis was sufficiently easy for George Bush to beat, even without this help.

8. CASE STUDY #10: ALL OR NOTHING

Gin and vermouth: some prefer them straight, while others only drink them mixed, i.e., a martini. We've seen examples of both types of preferences. In election to the Football Hall of Fame, some would be happy with either Elway or Marino, but not both, while in cricket others find only the martini combination of Boycott and Gavaskar palatable.

Is the budget approval process all that different? How can it be improved? One suggestion is to give the president the power of a line-item veto.

We ask the Congress, once again: Give us the same tool that 43 governors have, a line-item veto, so we can carve out the boondoggles and pork — those items that would never survive on their own.

— Ronald Reagan, State of the Union Address, January 27, 1987.

Yet, it is possible that this may be a tool the president is better off without. How could that be?

Case Discussion

One reason is that without a line-item veto, the president is committed to taking what the Congress gives him; he cannot modify it piecemeal to better suit his preferences. Consequently, compromises made in Congress will be honored without fear that the president will pick and choose what segments to keep. Once Congress predicts they will lose all of the parts that would not survive on their own, the process of agreeing on a budget will become much more contentious, and a consensus compromise may not be found. Congress may be much less willing to serve the president a martini if he can remix it before presenting it to the nation.

Thus a president with a line-item veto might end up with less power, simply because the Congress is less willing (or able) to put proposals on his desk. A simple example helps illustrate the point. President Reagan wanted funds for Star Wars. Unfortunately for Reagan, the Republican party did not control the Congress. The Democrats' approval had to be bought. The budget offered the Democrats a package of social programs that made the defense spending tolerable. The willingness of the Democrats to approve the budget was contingent on the complete package. If they thought that Reagan could use a line-item veto to cut the social programs (in the name of pork), they would be unwilling to give him the Star Wars funds.

The debate about the effectiveness of the line-item veto for reducing deficits is best settled by looking at the experience at the state level. Columbia University economist Douglas Holtz-Eakin has examined the historical evidence:

Gubernatorial veto power is quite old. The President of the Confederacy had (but did not exercise) item veto power during the Civil War and 28 states (out of a total of 45) adopted a line item veto between 1860 and 1900. By 1930, 41 of the 48 states had a provision for line item veto power. The governors of Iowa and West Virginia acquired line item veto power in 1969.⁴

And yet, after looking at all these cases, Professor Holtz-Eakin was unable to see any reduction in the budget deficits of states whose governor had the line-item veto.