Can you ‘‘buy’’ an American presidential election?

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Different kinds of competition have historically limited the influence of money in American politics. Competition among multitudes of ideologically motivated small donors mitigate special interests' abilities to transactionally ‘‘invest’’ in campaigns (*1*). Interest groups also compete directly with each other to control valuable government resources (*2, 3*), and parties compete to raise funds (*4*). As a result, it is difficult for one party's fundraising to dominate the other's. Institutional and cultural factors also limit the role of money in politics. Laws and norms against *quid pro quo* arrangements diminish how much donors can get in return for transactional campaign contributions (*5*). Disproportionate campaign spending can also benefit the other party when it becomes an issue in its own right, as in Wisconsin's recent supreme court election (*6*)—the most expensive judicial race in U.S. history.

But important changes in the structure of American politics threaten to disrupt this equilibrium, heightening concerns that elections can be ‘‘bought.’’ The Supreme Court's 2010 ruling in *Citizens United v. FEC* paved the way for large donors to finance national campaigns (*7*). The top 50 donors to 2024 U.S. federal elections collectively contributed over $2 billion, with the largest individual donor giving nearly $300 million (*8*). At the same time, the number of potential ‘‘megadonors’’ has risen: only eight Americans could have individually funded the $1.2 billion cost of the 1984 federal election cycle (*9, 10*), compared to more than 100 who could have covered the $16 billion spent in 2024 (*11, 12*). Additionally, presidential elections have grown much closer in recent decades, lowering the cost of swinging an election: Whereas three of the five elections in the 1970s and 80s were decided by double-digit popular vote margins, six of the last seven elections were won by less than five percentage points (*13*).

Here we investigate the risk of election ‘‘buying.’’ To do so, we first estimate how much a candidate could improve their chances of winning by strategically increasing their support by, for example, 500,000 votes across battleground states. Then we estimate the cost of implementing such campaign strategies. While reasoning about these strategies—which go beyond the scale of typical efforts—is inherently uncertain, this exercise helps us understand the potential risk of large donors to America's democratic integrity.

Margins of victory are predictably small

Consistent with many political observers' expectations, the 2024 presidential election was close, with a national vote margin of only 1.4 percentage points. A swing of 230,000 votes won by Democrats in a handful of swing states would have flipped the election outcome: 120,000 in Pennsylvania, 80,000 in Michigan, and 30,000 in Wisconsin. But it was less obvious ahead of time that it would be close in this particular way. In November 2024, the Cook Political Report, a widely-regarded election handicapping firm, listed seven states as potential ‘‘tossups’’ (*14*). One might have needed additional votes in all these battleground states, rather than simply the three that ended up being pivotal, to have materially improved the campaigns' chances of winning.

To account for this uncertainty, we start with the election forecasting model from the *Economist* magazine (*15*) that used data from national and state-level polls, prior elections, and economic fundamentals. The model yields simulations representing the joint forecast of the vote margins in the fifty states. Using these simulations, we then estimate how much each party can increase its *ex ante* chance of victory by, for example, obtaining 500,000 additional supporters—assuming those additional votes are strategically obtained in states to maximize a party's probability of winning under the model. Concretely, we frame the problem as a mixed-integer program, which we numerically solve. We use the forecast from October 1, 2024, roughly a month before the election, to ensure parties can enact the type of campaign strategies this exercise produces. (See the SI for optimization and modeling details.)

At the time of the forecast, Kamala Harris and Donald Trump were estimated to have 55% and 45% chances of winning the electoral vote. Fig. 1 plots how these probabilities increase for each candidate under a roughly optimal vote-getting strategy. To ensure the strategies are both simple and realistic, we require a candidate to receive at least 10,000 additional voters in any state where the campaign deploys resources, and we cap the maximum increase in votes at 5% of a state's actual turnout in the 2024 election. We find that around 100,000 additional voters would boost both campaigns' win probabilities by slightly less than 10 percentage points. A 70% chance of victory requires around 250,000 additional voters for Democrats, or around 500,000 for Republicans; with 500,000 additional votes, Democrats could raise their probability of winning to over 80%. This analysis assumes the *net* votes (i.e., the *difference* between the numbers of votes candidates receive) would increase by the stated amount. Accomplishing that result might require recruiting many more voters, as efforts to obtain voters in one party would likely be matched in part by efforts to obtain those in the other party—a point we return to below.

Our analysis indicates that most of the additional net votes—under these optimized strategies—should come from a small number of swing states. For example, assuming a party could optimally gain 500,000 net votes, Fig. 2 illustrates the optimal geographic allocation for Democrats and Republicans conditional on the publicly-available forecast. For Democrats, the additional votes would be concentrated in Pennsylvania 190,000), Michigan (140,000), and Wisconsin (110,000); for Republicans, in Michigan (180,000) and Pennsylvania (150,000), along with smaller blocs in Nevada (40,000), New Hampshire (40,000), Arizona (30,000), and Wisconsin (20,000). These differences represent real changes in vote counts, but are within the range of election to election fluctuations.

How much do additional net votes cost?

We next gauge the cost of gaining several hundred thousand net votes spread across a handful of states. Campaigns could employ a variety of methods for increasing their vote margins, ranging from advertising, to registration drives, to mobilization efforts that remind voters to cast a ballot or that may even transport them to the polls (*16*). Recent elections have also seen the development of unconventional and legally questionable tactics such as voter roll purges, voter intimidation, and lotteries for registered voters (*17*).

Parties can increase their margins by persuasion, mobilization of supporters, and de-mobilization of supporters on the other side. The cost of voter mobilization varies based on mode of contact (e.g., television ads, direct mail, or canvassing), type of election (e.g., presidential, midterm, or mayoral), and location. Though these studies have produced a wide range of estimates, published numbers generally do not exceed $1,000 per vote and are typically far less. For instance, in a meta-analysis of almost 60 canvassing RCTs, Green & Gerber (*16*) estimate an average cost per vote of around $100, increasing to around $800 in high-turnout elections. (See the SI for further details.) Such estimates do not account for targeting inefficiencies: If 25 out of every 100 mobilized voters end up backing the opposing candidate, the net partisan gain falls to 50 voters per 100 mobilized, half the nominal effect. Studies of television advertising—which estimate net partisan impacts, through both persuasion and mobilization—find comparable costs. For instance, Spenkuch and Toniatti (*18*) estimate that a net gain of one vote for a campaign costs around $200, while Sides et al. (*19*) estimate a cost of approximately $400. All of these estimates, however, likely understate the true average cost of adding hundreds of thousands of votes (*20*): The cost of an additional voter would likely increase—perhaps dramatically—with the number of recruited voters.

Implications

Our analysis indicates that parties could considerably improve their chances of winning a presidential election by turning out a few hundred thousand additional votes in a handful of swing states. Assuming the average cost of each additional net vote is $10,000—a figure ten times higher than nearly all published estimates of costs per vote—gaining an additional 500,000 net votes would cost $5 billion. While substantial, it is plausible that individual donors might indeed inject such large sums into upcoming elections.

This analysis is subject to several important caveats. First, it might be prohibitively difficult to mobilize or persuade so many additional voters through conventional campaign tactics. There might simply not be enough television air time to buy, doors to knock on, or employees to hire—though, it is less clear whether voter suppression tactics are subject to the same concern. Moreover, it is difficult to extrapolate existing literature on cost per vote to the strategies we identify, since the turnout levels they imply go significantly beyond past studies. Second, large-scale campaign spending can become an election issue in its own right, motivating turnout on the other side that could spill over to other states. Relatedly, a strategic move on this scale is sure to cause a response by the other party. High spending on one side can create an opportunity for the opposition to raise additional campaign funds. In other words, garnering a $5 billion *edge* might require raising substantially more than $5 billion, and winning 500,000 *net* votes might require gaining much more than 500,000 votes.

Nonetheless, while it's not certain that one could buy a presidential election outright, our analysis highlights the significant risks of large sums of money to democratic governance. Moreover, as noted above, the American political landscape has reshaped in ways that raise the risk of election ‘‘buying.’’ Modern presidential elections have been decided by thinner margins than just about any time since the post-Reconstruction period (*13*): The six elections between 1976 and 1996 would have required, on average, 1.7% of the popular vote to swing, compared to 0.2% for elections since 2000; see Fig. S1. Campaign finance laws have changed in recent decades, dramatically increasing the amount of money individual donors can deploy in political campaigns (*21*). Further, many more potential donors can afford to give extremely large contributions than in past election cycles (*11*). These donors might moreover be able to recoup—or even profit from—their contributions, for instance through favorable government contracts with their firms. Finally, threats of political retribution can diminish the ability of the party out of power to effectively fundraise or carry out normal campaign activities. As a result, extremely wealthy donors today might have both the means and the motives to give one political party a decisive fundraising advantage.

Looking forward, our results suggest the value of campaign finance reforms to limit the leverage of individual political actors. One might also consider mandatory voting to limit special interests' abilities to affect electoral outcomes, as has been done in Australia and other countries. Short of mandatory voting, increased participation would reduce any one person's influence over elections by raising the marginal cost of strategically turning out additional voters. While neither course promises to be easy, both would bolster America's tradition of democratic elections that reflect the will of voters, rather than donors. Ultimately, though, the fragility of recent American elections stems from their closeness. A presidential candidate backed by 55% of Americans is resilient to manipulation efforts. Only when a presidential candidate earns a mandate from voters will the risk of election ‘‘buying’’ truly disappear.

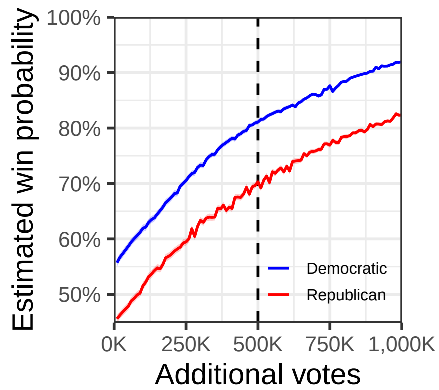

Figure 1: **Estimated probability of winning the election as a function of the number of optimized additional votes a candidate receives.**

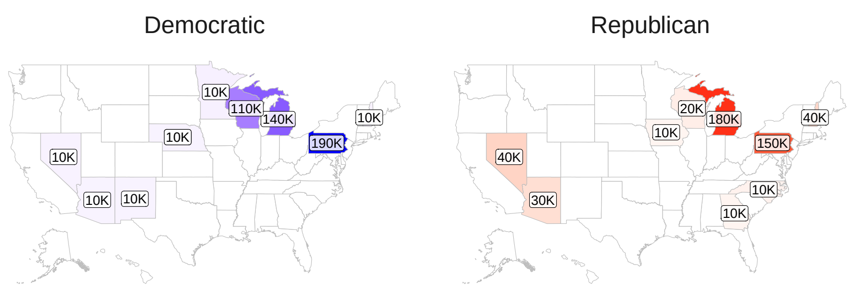

Figure 2: **Strategies requiring 500,000 votes, increasing each party's probability of winning (to 81% for the Democrats or 70% for the Republicans), based on a forecast conducted a month before the 2024 presidential election.**

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Supplementary materials

Materials and Methods

Fig. S1

Supplementary Materials for

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Materials and Methods

Election simulation

We base our analysis on a simulation of vote totals in the 2024 presidential election. Our simulation has two components: a model of the joint distribution of the candidates' voteshares in each state, and a model of the joint distribution of voter turnout in each state. Combining these two gives simulated vote totals for each candidate in each state.

Voteshares. To model the candidates' voteshares, we use the *Economist* magazine's 2024 election forecasting model (*15*). The model predicts the candidates' likely voteshares in each state based on a combination of national and state-level polls, prior elections, and economic fundamentals. (For simplicity, we ignore third parties.) We fit the model using relevant economic indices and polls as of October 1, 2024, roughly a month before the election. The model yields a joint distribution of the democratic voteshares in each state, and, in Maine and Nebraska, each congressional district. We use 10,000 draws from this distribution, which we split into 5,000 training and 5,000 evaluation samples (see below).

Turnout. Since the absolute number of votes a candidate wins by, rather than just the proportional difference between the candidates' votes, is important for our analysis, we also model turnout in each state. To do so, we use historical turnout data from U.S. presidential elections going back to 1976 (*22*) and annual estimates of state populations over the same period (*23*).

We use a simple linear modelling strategy. We first fit a linear regression predicting the proportion of the US population that turns out to vote in each presidential election using a linear model with the year as the only predictor. We then fit a linear regression predicting the proportion of each state's total population that turns out to vote in each presidential election using a linear model with year and national turnout proportion as predictors.

To simulate the joint distribution of turnout in each state, we first draw a sample of 10,000 years from the fitted normal distribution of the national turnout proportion in 2024, which we propagate using the state-level models to obtain samples of turnout proportion in each state, which we then multiply by the state's population in 2024. We again split the sample into 5,000 training and 5,000 evaluation samples.

Harmonization. To produce samples of vote totals, we simply scale the voteshares in each state by the corresponding turnout sample. Because the boundaries of congressional districts shift between 1976 and 2024, however, directly modeling turnout at the level of congressional districts is more difficult, so we only model turnout at the state level. To produce estimated vote totals for congressional districts in Maine and Nebraska, we calculate the congressional district turnouts that are both consistent with the state-level turnout and voteshare samples and the congressional district-level voteshare samples. In Maine, which has two congressional districts, this uniquely determines total turnout in each district; in Nebraska, which has three congressional districts, it does not. Consequently, we additionally choose the unique solution minizing the sum of squared differences between sampled and actual district-level turnout in the 2024 election.

Optimizing campaign strategies

To find efficient strategies for each party, we represent the problem as a mixed-integer program (''MIP''), which we solve numerically.

Problem formulation. Let $k = 56$ denote the number of distinct states and congressional districts in the US (that is, all 50 states, Washington D.C., the two congressional districts in Maine, and the three congressional districts in Nebraska), let $\mathbf{e} \in \mathbb{R}^k$ denote the vector of corresponding electoral votes, and let $\mathbf{t} \in \mathbb{N}^k$ denote the vector of corresponding actual turnouts in the 2024 election. Let N denote the number of samples from our simulation of vote totals. (We use $N = 500$ in our MIPs.) Let $\mathbf{T} \in \mathbb{R}^{N \times k}$ denote the matrix of simulated turnout samples, and let $\mathbf{V} \in [0, 1]^{N \times k}$ denote the matrix of simulated Democratic voteshares. (To find optimal strategies for the Republican party, we simply replace $V_{i,j}$ with $1 - V_{i,j}$ for all i and j.) Let $\mathbf{x} \in \mathbb{R}^k$ denote the additional votes the party of interest receives in each state or congressional district *if* they deploy resources there. Let $\mathbf{y} \in \{0, 1\}^k$ denote *whether* a party deploys resources in the corresponding state or congressional district. Let $\mathbf{W} \in \{0, 1\}^{N \times k}$ denote whether the strategy results in a win for the party of interest in a given sample and district, and let $\mathbf{z} \in \{0, 1\}^N$ denote whether the strategy results in a win for the party of interest in the corresponding sample. Then, our goal is to find a strategy $\mathbf{x} \cdot \mathbf{y}$ requiring at most B additional votes that maximizes the number of samples in which the party of interest wins the election. (For notational simplicity, we assume throughout that scalar operations on vectors and matrices are performed elementwise.)

These relations can all be expressed linearly in the form of a MIP as follows. First, our objective can be expressed as follows:

$$\begin{aligned} &\text{maximize} && \mathbf{1}^\top \mathbf{z} \\ &\text{where} && \mathbf{x} \in \mathbb{R}^k, \mathbf{y} \in \{0,1\}^k, \mathbf{W} \in \{0,1\}^{N\times k}, \mathbf{z} \in \{0,1\}^N. \end{aligned} \tag{S1}$$

To ensure that $\mathbf{x}$ represents a proportion of votes, we impose a non-negativity constraint:

$$\mathbf{x} \geq \mathbf{0}. \tag{S2}$$

To ensure that $\mathbf{W}$ captures whether a state or congressional district is won, we require that the votes deployed by the strategy there (i.e., $x_j \cdot y_j$) plus the votes already received by the Democratic party in that state or district (i.e., $V_{i,j} \cdot T_{i,j}$) exceeds one half of the total votes cast in that state or district (i.e., $T_{i,j}/2$) if the party of interest wins the election in that state or district:

$$\mathbf{V} + \mathbf{1}(\mathbf{x} \cdot \mathbf{y})^\top / \mathbf{T} \geq \frac{1}{2} \cdot \mathbf{W}. \tag{S3}$$

To ensure that $\mathbf{z}$ captures whether the strategy results in an overall win for the Democratic party, we require that the sum of electoral votes in states or congressional districts won exceeds 269, one half of the total electoral votes, if the party of interest wins the election in that sample:

$$\mathbf{We} \geq 270 \cdot \mathbf{z}. \tag{S4}$$

We cap the number of votes deployed in each state or congressional district at 5% of the actual turnout in that state or district:

$$\mathbf{x} \leq \frac{1}{20} \cdot \mathbf{t}. \tag{S5}$$

Additionally, we require that at least 10,000 votes are deployed in any state or congressional district where resources are deployed:

$$x_j \geq 10,000 \quad \text{for } j \text{ such that } t_j \geq 200,000; \qquad y_j = 0 \quad \text{otherwise.} \tag{S6}$$

(The second alternative in Eq. (S6) is required for districts with low turnout, as otherwise the constraints in Eq. (S5) and Eq. (S6) would be contradictory.) To capture the nested structure of the congressional districts in Maine and Nebraska, we require that the votes deployed in the state as a whole are equal to the sum of the votes deployed in the congressional districts:

$$x_{j_{\text{ME}}} = x_{j_{\text{ME-1}}} + x_{j_{\text{ME-2}}} \qquad \text{and} \quad x_{j_{\text{NE}}} = x_{j_{\text{NE-1}}} + x_{j_{\text{NE-2}}} + x_{j_{\text{NE-3}}}, \tag{S7}$$

where j_{ME} and j_{NE} denote the indices of Maine and Nebraska, respectively, and $j_{\text{ME-1}}$, $j_{\text{ME-2}}$, $j_{\text{NE-1}}$, $j_{\text{NE-2}}$, and $j_{\text{NE-3}}$ denote the indices of their congressional districts. Finally, we constrain the total number of votes deployed to at most B:

$$\begin{aligned} B \leq \mathbf{1}^\top \mathbf{x} - y_{j_{\text{ME}}} \cdot \left(y_{j_{\text{ME-1}}} \cdot x_{j_{\text{ME-1}}} + y_{j_{\text{ME-2}}} \cdot x_{j_{\text{ME-2}}}\right) \\ - y_{j_{\text{NE}}} \cdot \left(y_{j_{\text{NE-1}}} \cdot x_{j_{\text{NE-1}}} + y_{j_{\text{NE-2}}} \cdot x_{j_{\text{NE-2}}} + y_{j_{\text{NE-3}}} \cdot x_{j_{\text{NE-3}}}\right) . \end{aligned} \tag{S8}$$

(We subtract the votes deployed in congressional districts in Maine and Nebraska from the total number of votes when calculating the budget, as these votes are already included in the state totals if the state as a whole is won.)

We note that the the products of $\mathbf{x}$ and $\mathbf{y}$ in Eq. (S3) and of components of $\mathbf{y}$ in Eq. (S5) appear nonlinear. However, since $\mathbf{y}$ is binary, they can be expressed as linear constraints by the introduction of auxiliary variables and constraints. For instance, in the former case, we can introduce $\mathbf{p}$ satisfying

$$\mathbf{p} \geq 0, \qquad \mathbf{p} \leq \mathbf{x}, \qquad \mathbf{p} \leq M \cdot \mathbf{y},$$

where M is a sufficiently large constant. Likewise, we can replace products of the form $y_i \cdot y_{i'}$ with an auxiliary binary variable q satisfying

$$q \geq 0, \quad q \leq y_i, \quad q \leq y_{i'}, \quad q \geq y_i + y_{i'} - 1.$$

See, e.g., (*24*) for additional details.

Implementation. We implement the MIP described in Eqs. (S1)–(S8) in julia using the `JuMP` package (*25*), which we solve using the `Gurobi` solver (*26*), solving each problem instance to optimality. We draw 10 random samples of size 500 from the 5000 training samples of voteshares and turnout, and solve the MIP for each party and sample across a grid of budgets ranging from 10,000 to 1,000,000 additional votes in increments of 10,000. We then evaluate the out-of-sample performance of the strategies on the remaining 4,500 samples of voteshares and turnout in the evaluation set. For each number of additional votes, we select the strategies that maximize the number of samples in which the Democratic (resp., Republican) party wins the election out of sample. Finally, we re-evaluate the strategies on the full set of 5,000 evaluation samples, computing normal 95% confidence intervals for the resulting win probabilities. These are the values reported in Fig. 1 and Fig. 2.

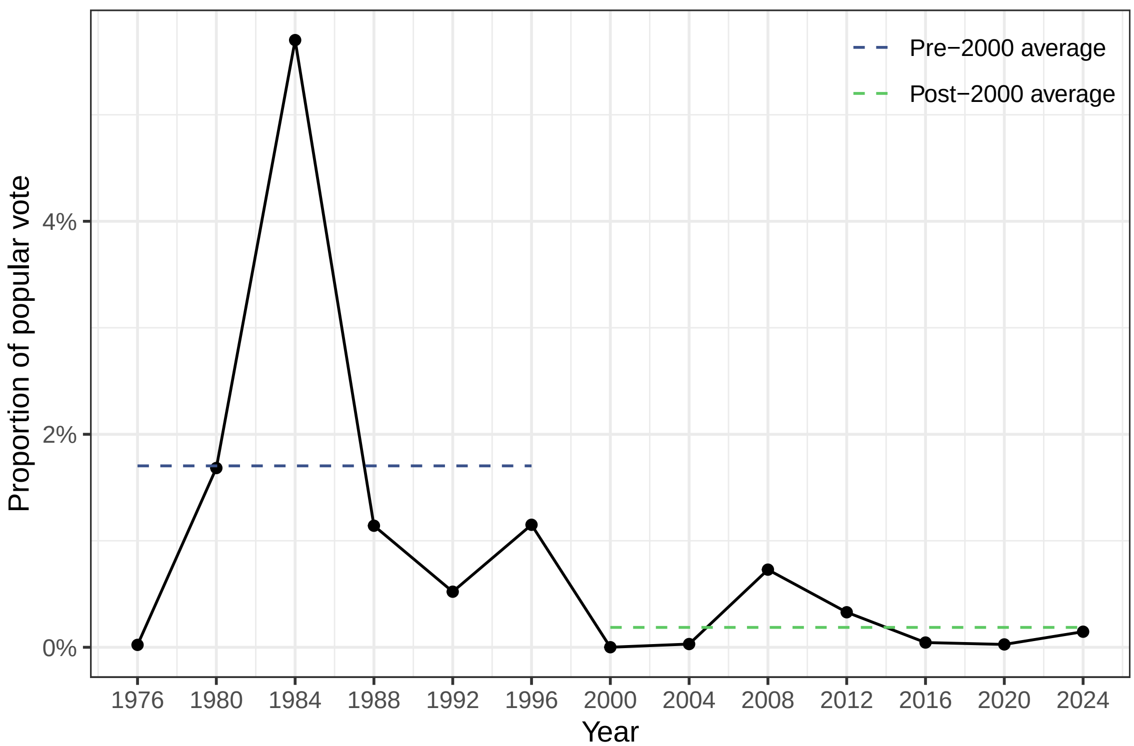

Figure S1: **Minimum numbers of votes required to swing presidential elections since 1976.** Dashed blue and green lines indicate the average minimum number of votes required to swing the election before and after 2000, respectively. With the exception of the 1976 election, which could have been swung by roughly 7,000 votes in Hawaii and 11,000 votes in Ohio, substantially fewer votes would have been required to swing the 2000 and subsequent presidential elections than elections in decades prior.