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RADICAL MARKETS

**UPROOTING CAPITALISM AND
DEMOCRACY FOR A JUST SOCIETY**

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2

Radical Democracy

A MARKET FOR COMPROMISE IN OUR SHARED LIVES

Kentaro Adachi started saving voice credits as soon as he reached voting age. He resented the liberal governments that held power for decades. He was angry when the Yasukuni Shrine to Japan's war dead was converted into a memorial for foreign victims of imperialism. Despite his frustration, for years he never spent more than a few voice credits on a parliamentary election or referendum. He was saving up to spend on the cause of his life.

Kentaro spotted his first bear rustling in the forest behind his family's lakeside cottage in Hokkaido prefecture. Bears were a regular sight during his childhood, and as their population grew, thanks to environmental conservation efforts, they went from a novelty to a menace. His father assiduously trained him in how to avoid attracting them and how to scare them away by a controlled burn of forest brush and loud shouts, and how to retreat undetected. Until, that is, the day one carried his father deep into the forest.

What possessed his father to go into the forest so soon after cooking, with the sun so low, Kentaro would never learn. When he found him, all his battered father talked about in his last minutes was Kentaro's responsibility to his mother, the care he must take of his sister, and the importance of the Buddhist incantations that had comforted him throughout his life. His father was a kind and devoted man, but Kentaro could not help seeing him as a weak and effeminate pacifist, the kind of man Japan was filled with after eighty years of postwar peace. Kentaro vowed to never allow himself to become like that.

Kentaro trained his body and worked every day to support his family.

Although he seldom articulated it, his defining aspiration since the day he found his father dying in the woods had been simple: to master marksmanship and single-handedly control the bear population in his rural neighborhood.

Kentaro was not a rule-breaker. To win some of the gun rights enjoyed by Americans, Norwegians, and Swiss, he patiently campaigned and gathered vote commitments for years. At last, a national referendum to allow personal ownership of hunting rifles in rural areas was on the ballot thanks to the commitments of voice credits he had collected. He now could take the $\sqrt{400}$ (400 voice credits) of the $\sqrt{800}$ he had accumulated over the past forty years to cast 20 votes in favor of this issue so dear to his heart.

After the votes were tallied, the country was shocked to find that despite 75% of voters opposing the initiative, it won an overwhelming victory with 60% of votes cast. The average opponent had cast 1.5 votes against it, but the average supporter of personal hunting rifle ownership cast a stunning 6.75 votes. A poor use of votes, perhaps, with many other referenda squeaking by 52–48 and a hung parliament. Yet Kentaro felt vindicated. His voice had finally been heard. The fight of his life was won. And it was time to finally cull those bears, so no other child in Hokkaido prefecture would be left fatherless as he had been.

The idea of saving up for an important vote, in the same way we save up money to buy a car or a house, seems farfetched. We are used to a political system in which each person casts one vote and the majority prevails. Yet Kentaro may cast more than one vote, allowing him to exert more influence on an issue that he cares about than he could under the one-person-one-vote system (which we will henceforth call *1p1v*), if he is willing to give up influence on issues he cares less about. He possesses the same right to participate as everyone else, and accumulates credits to spend on votes at the same rate as everyone else, but he chooses to focus his votes on the issue most important to him. This freedom came with an important proviso: the voice credits are used to cast votes according to a quadratic or square root function. One voice credit ($\sqrt{1}$) buys one vote on a given issue; $\sqrt{4}$ buy two votes; $\sqrt{400}$ buy only 20 votes; and so on.

In this chapter, we will show that these two elements—the capacity to save up voting power, and the square root function—would be a much-needed cure to the pathologies of the traditional voting systems used in democracies. We call this system Quadratic Voting, and in this chapter, we show how it creates a

Radical Market for politics.

Origins of Democracy

In Ancient Greece, the strength of a phalanx, the most common military formation of the time, was largely a matter of numbers: a larger phalanx beat a smaller phalanx. By identifying the host with greater numbers, one could thus predict the outcome of a battle. Majority prevailed without sword ever meeting shield.¹ By some accounts this was the origin of majority rule in Athens's governing body, the Assembly, which consisted of all those adult male citizens, regardless of their social status or property holdings. The Assembly had the power to pass laws, issue decrees, grant special privileges, and punish political leaders with ostracism and other sanctions, including death. Every member of the Assembly had one vote.

Yet the Athenians were aware of the dangers of majority rule. In one famous incident that occurred during the Peloponnesian War, the Assembly condemned to death a group of generals for failing to rescue survivors and recover the bodies of the dead after a naval victory off the Arginoussai Islands. Later, the Assembly was persuaded that a storm had prevented the generals from acting, and condemned to death the generals' accusers.² Events like these made many Greek thinkers deeply skeptical of democracy. They were concerned about the shifting passions of the mob and its susceptibility to demagogic leadership, as well as the disruptive power of the poor, who were in the majority, to redistribute wealth from the rich to themselves.

After the defeat of Athens in the Peloponnesian War, a loss blamed in part on the bad decisions made by the majority, Athenians introduced a more moderate form of democracy. It gave more power to independent bodies, including a commission that proposed legislation, and a People's Court, which had the power to strike down decrees that had been passed by the Assembly but that violated the laws. The members of all these bodies were selected by lot. This new system required multiple majority votes involving different groups of people, which amounted to needing a supermajority to get anything done. Thus began a long tradition of attempts by democratic governments to limit majority rule.

Perhaps the most successful such effort in the classical world was the "mixed constitution," under which different social classes—typically, the masses, the aristocracy, and a hereditary ruler—were assigned ways to influence government

and veto outcomes they disapproved of. In the Roman Republic, for example, the Senate was dominated by aristocrats but certain important offices were reserved for plebeians. The constitution gave ordinary people a voice, but advantages to ancient families and wealthier citizens.³ The idea was to prevent the masses from expropriating the wealth of the rich through the sheer power of numbers that would otherwise prevail under straight majority rule, while also giving the masses the power to block the rich from exploiting them. This system, which lasted centuries, was the greatest governance success of its time. But eventually the large number of veto points led to gridlock, which powerful leaders such as Julius Caesar resolved with extraconstitutional acts, leading eventually to civil war, dictatorship, and then empire.

Over the next millennium democratic institutions retreated, but then slowly reappeared during the Middle Ages. Anglo-Saxon kings sought advice from lords about the state of their realm and convened the king's advisory council, called the witan, to receive reports, a practice that eventually evolved into a parliament. These early British institutions did not employ simple majority rule based on 1p1v. The British House of Commons began to use majority rule in the fifteenth century, but Great Britain had a classic mixed constitution, with the aristocracy able to exert power through the House of Lords and the monarch able to act on his own on some issues. In practice, political outcomes were decided by implicit supermajority rule.⁴ In the Roman Catholic Church, canon law provided that many decisions would be made by majority rule, but a complicated set of laws permitted outvoted minorities to appeal to higher officials and to prevail if they could persuade those officials that the majority vote had been contaminated in some way—by the personal interests or motives of voters in the majority, or simply because it was wrong.⁵ Under the doctrine of *maior et sanior pars*, a minority comprising people with superior judgment, such as those with greater experience and wisdom, could overrule a majority—a form of weighted voting, which we will discuss in greater detail below.⁶

Democracy made limited progress in these early years for many reasons. Rulers did not want to cede power to the public; religious and political traditions favored monarchy or aristocracy; and the constant threat of civil and foreign war required that strong leaders be in place. But the inherent limits of democratic institutions also played a role, as would become clear in the modern era.

The Rise and the Limits of Democracy

It took a long time for democracy to shake its reputation as mob rule. In the mid-seventeenth century, Thomas Hobbes argued that absolute monarchy was the only secular remedy for the “war of each against all” that would prevail in the “state of nature.”⁷ Even though Hobbes defended monarchy, his secular and instrumental justification for it contrasted with previous arguments based on the Divine Right of Kings, and could be turned against them. This paved the way for Britons to demand restraints on royal power, as they did in the Glorious Revolution at the end of that century. This revolution overthrew King James II, who was viewed as overstepping the bounds of monarchical power and thereby confirmed the ideal of the limited or constitutional monarchy.

John Locke’s defense of the revolution helped establish the modern conception of liberal democracy. The king now had to share power with a Parliament that represented, however imperfectly, the interests of the people. Locke and other Enlightenment figures, including Voltaire and Jean-Jacques Rousseau, developed the secular theory of sovereignty and located it collectively in the people. The works of these thinkers influenced Thomas Jefferson, who wrote in the American Declaration of Independence that “governments are instituted among men, deriving their just power from the consent of the governed.”⁸ The ideas of the Enlightenment also lay behind the French Revolution and a dramatic expansion of the franchise in Britain.

Such liberal thinkers were united in rejecting monarchical privilege in favor of placing authority in the hands of the people, but they struggled to explain how the people should wield their power. Democracy, yes, but what does democracy mean? And how to avoid the self-destructive and chaotic effects of mob rule they knew from classical history?

THE UNITED STATES

The framers and early interpreters of the American Constitution had to confront the hazards of majority rule as they engaged in the first large scale experiment in democracy. They wanted to allow the majority to govern, but they worried that majorities would violate the rights of minorities. “If a majority be united by a common interest, the rights of the minority will be insecure,” noted James Madison.⁹

The framers thus divided the national government into three branches to “check and balance” each other, and limited the majority’s voting power by placing the final decisions on the presidency with intermediary electors and on

senators with state legislatures. They also created numerous supermajority rules. To ratify a treaty, a president must obtain a two-thirds supermajority of the Senate.¹⁰ To overcome a presidential veto, two-thirds of each house must vote for a bill.¹¹ A supermajority is needed to amend the Constitution.¹²

These arrangements helped protect minorities, like religious dissenters, the planter aristocracy in the South, the merchants of the North, and the wealthy everywhere.¹³ Yet the founders did not simply want to protect any minority at any time: they sought to protect people with interests they considered legitimate, and who could not depend on being able to join a majority coalition to protect their interests.

The founders worried that if legitimate minority interests were not protected, the survival of the union would be at stake. Most citizens find themselves, at one time or another, in a minority group of like-minded people: those with very important interests or preferences that are not shared by the rest of the population. Those with the most intense preferences who are repeatedly victimized in the political process have strong incentives to rebel or secede. Threats of such rebellions became a central theme of US history, and the fear of disunion animated many of the framers' choices. Supermajority rule institutionalized the power of minorities with intense preferences so that it flowed through peaceful political channels.

Yet the framers were also aware of the opposite problem: gridlock. Before the Constitution, the states operated under a document called the Articles of Confederation. The national government could act only with the support of the states, and most actions required a supermajority or unanimous vote. Rule by unanimity and other high voting thresholds in politics is vulnerable to the same problem that property rights create in economic relations (see [chapter 1](#)): the ability of a person to hold out for unreasonable concessions, with the result that either gridlock or unfairness results. The holdout problem led to paralysis, decline in international stature, and a near collapse of cooperation among the states. Even in the middle of the Revolutionary War, the national government could not raise sufficient revenue. After the war, it was unable to put down rebellions and could not raise the revenue necessary to protect commercial shipping from pirates. There was always some state that either objected to the initiatives or, more commonly, simply wanted to pay less to support them. So the American framers settled on a compromise between the extreme of tyranny of the majority and paralysis.

History has shown this balance to have endured passably well, despite a

bloody Civil War. But Americans continue to struggle with the limits of the supermajority and check-and-balance system. The United States avoided the instability of many European democracies, but the tyranny of the majority at the hands of a conservative majority, or political paralysis induced by conservative interests, became the central theme of American political history. Racial, ethnic, and religious minorities who suffered various types of abuse could not obtain legislative relief because they were outvoted.

In the second half of the twentieth century, federal courts stepped in to rectify the problem of conservative tyrannies by recognizing the rights of minorities to effective political representation, equal education, and other benefits and resources. In one formula, members of “discrete and insular minorities”—minority groups who had historically been excluded from politics—could not be burdened by legislation that targeted them or that did not have a strong public justification. As courts expanded the range of judicially protected minority rights, Congress stepped in with civil rights laws. This would turn out to be the greatest contribution of American legal and political thought to the problems of majority rule.

But, like the central planning we saw in the previous chapter, judicially enforced rights rely heavily on the benevolence, wisdom, and legitimacy of a respected elite. Federal judges are unelected and unaccountable to the public: this is what enabled them to advance minority rights in the first place, but it also put them in a precarious position in a country with strong democratic norms. Moreover, after the courts struck down a first generation of obviously discriminatory laws that deprived African Americans of the franchise, education, and the like, they faced significantly more complex laws that seemed to have a strong public-interest justification but also burdened minorities in a way that often seemed unfair. Consider some familiar examples:

- A stop-and-frisk law that reduces crime but disrupts the lives of mostly minority men.¹⁴
- Eminent domain projects where a city forces the sale of several private properties, possibly at below value to the owners, to build a park or revitalize the downtown.
- An anti-same-sex marriage law like California’s Proposition 8, which reinforces traditional notions of marriage supported (at the time) by most Americans but that deprives gays and lesbians of advantages enjoyed by opposite-sex couples.

- Controls, aimed at reducing violence, on weapons that are typically used in military contexts but that may also be used for hunting and militia training.
- Sanitation and antidrug laws that interfere with religious rituals of minority religious groups.

People hold different and strong opinions about these laws, but the laws all pose the same dilemma. Each one helps (or plausibly helps) the majority and possibly the public at large, including even some members of the affected minority. But the law also puts a burden on the minority, one that may seem unfair and in some cases sufficiently egregious to cast into doubt the desirability of the law in question. Yet the tradeoffs are so complex that judicial intervention often seems arbitrary. In many cases, judges appear to substitute their policy preferences for those of the legislature that enacted the law—a practice that has no justification in democratic or constitutional theory, and that is a thinly disguised form of rule by an elite.

FRANCE AND THE EUROPEAN CONTINENT

While the United States pioneered the practice of liberal democracy, much of the theory emerged in Europe, especially during the French Revolution. One French revolutionary in particular, the Marquis de Condorcet, pioneered the mathematical study of voting.¹⁵ Condorcet's 1785 classic, "Essay on the Application of Analysis to the Probability of Decisions Rendered by a Plurality of Voices," not only highlighted the virtues of democracy, but also revealed its paradoxes.

Addressing the ancient Greeks' worries about the ignorance of the masses, Condorcet's "Jury Theorem" considered a situation in which all members of a community share a common interest but may have different information. He argued that, merely as a matter of statistics, if people are more likely right than wrong about what is in their collective interest, make up their minds independently, and can vote, large populations will outperform small governing elites as their large numbers will overwhelm mistakes. The Jury Theorem goes some way toward quieting the ancient worry that the public cannot govern itself because it lacks the wisdom of the elites.

But while Condorcet saw the potential of democracy, he also realized it lacked the capacity of markets to produce outcomes (political rather than economic) that coherently reflect the conflicting preferences of citizens. To see why, imagine that three people (Antoine, Belle, and Charles) are asked to vote

among three possible outcomes: Louis XVI's head will be chopped off; he will be restored to the throne; or he is given his freedom as a private citizen. Suppose that each voter ranks the outcomes differently. For Antoine, who fears most that Louis will lead a counterrevolution: chop off head, restore, go free. For Belle, a royalist: restore, go free, chop. For Charles, who hates the monarchy but also dislikes violence: go free, chop, restore. We first ask them to cast a vote in a contest between chop and restore. Chop prevails by a 2–1 vote because both Antoine and Charles prefer chop to the alternatives, and only Belle does not. Next, we ask them to vote for restore versus go free. Restore prevails by a 2–1 vote, because Antoine and Belle prefer restore to the alternatives, while only Charles does not. Finally, the voters consider chop versus go free. Go free prevails over chop by 2–1. But this means in aggregate there is no determinate outcome: execution beats restoration, restoration beats freedom, but freedom beats execution.

It would appear hopelessly ambiguous who should win. The problem is that Antoine, Belle, and Charles cannot vote based on how intensely they care about the different proposals. The voting system is a straitjacket that throws out information. A vote can tell you only whether a person prefers one outcome to another, but not how much that person prefers the outcome. If we could directly measure how much the three outcomes affect the well-being of each person in our trio, then we could select the outcome that makes them jointly better off. For example, if restoration of Louis XVI would cost Antoine *his* head, while execution of the king would cause a revolution that greatly harmed all three of our voters albeit at different levels, then letting Louis XVI go free is the best outcome from the standpoint of the three voters. Regular voting can't pick this outcome.

Kenneth Arrow, a student of Vickrey's, Nobel Laureate, and perhaps the most eminent economist of the twentieth century, would later formalize and generalize this argument in his famous "impossibility theorem," showing that no voting rule in which individuals rank candidates could overcome problems of this sort.¹⁶ Note, in contrast, that in market transactions it is possible for people to signal the intensity of their preferences for goods and services—by offering to pay more or less. This is an important reason why many economists believe that the price system allows efficient outcomes while voting does not.¹⁷

Anticipating Arrow's insights, Condorcet eventually concluded there was no solution. When asked in the early 1790s to draft a constitution for the revolutionary government, he advocated a variety of checks, balances, and

supermajority rules to restrain popular democracy and protect the liberties of individuals in much the same way that his American predecessors had.¹⁸ Condorcet's worries about voting paradoxes evidently trumped his confidence in the Jury Theorem. Condorcet's thought and related ideas spread throughout continental Europe and helped lay the foundations for European democratization during the nineteenth century. Yet the European democracies suffered paradoxes even more troubling than those Condorcet discovered.

One is strategic voting, the idea that in standard democratic systems, especially those like the US system based on plurality rule, voters tend to cast votes based partly on their desire to "make their vote count."¹⁹ For example, in the United States, two parties prevail and voters are usually forced to support the winner of one or the other major party primary, even if they detest both candidates.²⁰ As we discuss further below, this problem appears to have been particularly severe in the 2016 US election.

The most alarming example, however, was the rise of the Nazis. In his book *The Coming of the Third Reich*, historian Richard Evans observes that no more than 10% of the German public ever were strong supporters of the extreme right.²¹ Yet in the 1930 election, Hitler won an additional 10% from people who cast protest votes against a political system that they saw as corrupt and unresponsive to their needs, catapulting the Nazi party to a leading position as the major right-of-center party in the German parliament. In the following election, in 1932, many middle-class Germans voted for the Nazis as their only chance to prevent Stalinist Red Terror from spreading to Germany, doubling the Nazis' share and allowing Hitler to become Chancellor. At the same time, fear of Hitler led many Jews, minorities, workers, and leftists to vote for the Communists, further reinforcing the middle-class fear that if Hitler lost, Communists would prevail. This downward spiral of mutual fear, violence, and mistrust ushered in Nazi dictatorship the next year.

Even before Hitler eliminated all democratic institutions, he was able to crack down on dissenters while actually increasing his popular backing. How? Many of Hitler's initial moves to curtail dissent and the rights of leftists and minority groups were popular in this atmosphere and so helped Hitler to draw into a coalition with him the two major parties of the German mainstream right. After all, these groups were *minorities*, and unpopular—even dangerous—ones at that. Yet what the more traditional German right failed to anticipate is that once the Communists and Socialists were eliminated from the political stage, the centrist Catholics with whom the traditional right had long aligned became the

next target.²² After that, Hitler suppressed his traditional-right allies and then even dissenting groups within the Nazi party.

At each stage, Hitler enjoyed effective majority support from those remaining within the polity, so in some sense each purge was “democratic” even as it undermined the universalistic basis of democracy. This is the logic of political scientist Richard McKelvey’s theory of “majoritarian cycling”: majority rule with no check on the ability of majorities to exploit and repress minorities can easily degenerate into the rule of a narrow clique or even the dictatorship of a single person.²³ As German Protestant theologian Martin Niemöller famously put it,

First they came for the Socialists, and I did not speak out—Because I was not a Socialist. Then they came for the Trade Unionists, and I did not speak out—Because I was not a Trade Unionist. Then they came for the Jews, and I did not speak out—Because I was not a Jew. Then they came for me—and there was no one left to speak for me.²⁴

The continental European experience with democracy left strong cautions against majority rule and 1p1v without strong protections for minorities or those whose interests were disproportionately affected by given policies. Yet, as in the United States, Europeans found no simple way to build these protections into democratic systems.

BRITAIN

Unlike Continental Europe and the United States, Britain democratized through gradual reforms rather than sudden convulsions. The Glorious Revolution and further political developments established the supremacy of Parliament over the monarch in the UK by the Age of Enlightenment. Yet the franchise was restricted to adult males who possessed land yielding an income of forty shillings—fewer than one in every thirty Britons.²⁵

Beginning around the time of American Independence, the British Philosophical Radicals began to press for extension of the franchise. The group, founded by politician William Beckford and philosopher Jeremy Bentham, favored public policy based on the “utilitarian” principle of achieving “the greatest happiness for the greatest number.” Their work led to the Reform Act of 1832, which doubled the franchise to include all males with wealth equal to the previous standard, eliminating the requirement that the wealth take the form of

land, and it also reapportioned parliamentary seats to make them more representative. Yet, while the Radicals fought for broader representation, they were confused and divided about exactly how far this push should proceed.

Bentham reasoned that broader representation should bring policy closer to his utilitarian principle, but in his definitive 1829 defense of his doctrines, he anticipated the majoritarian cycling problem we mentioned above and worried that a majority would find it advantageous to dispossess or even enslave a minority.²⁶ Such an outcome would not promote the greatest happiness for the greatest number, Bentham argued, because those enslaved would lose more than the enslaving majority would gain.

Bentham's legacy was carried on by his closest colleague James Mill and Mill's son, John Stuart Mill. Both Mills favored expanding the franchise but harbored serious reservations about universal suffrage in the near term. James believed that some property qualification was needed to avoid excessive influence of those parts of society that have no stake in the nation's prosperity, but favored allowing the majority of men to vote.

John Stuart went further, becoming the first member of Parliament to advocate women's and eventual universal suffrage. Yet he too worried about tyranny of the majority, based in part on his fear that the masses of uneducated people would exercise political influence unwisely. He briefly advocated giving more votes to those with extensive education or strong interests in an issue, only to abandon this proposal as impractical because of the impossibility of determining who had this superior knowledge or interest.²⁷ He considered a variety of other devices to allow those with special knowledge and interest to have greater influence, such as making voting inconvenient and burdensome in terms of time and travel so that only those with a strong interest would exercise the right to do so. He also advocated long legislative terms to give greater independence to an elected and partly representative elite. Yet, ultimately, Mill was frustrated by his inability to find an appropriate solution to avoid the "collective mediocrity" that seemed to spread as democracy advanced in the UK.

Radicalizing Democracy

The creators of modern democracies thus built a new political order, but they were uneasy with their handiwork. Failures to protect minority rights, the tyranny of the majority, paradoxical victories for bad candidates, repeated use of majority rule to establish dictatorship, and the tendency of democracy to ignore

the views of the very knowledgeable: all reflected the inability of democracy to give consideration to the intensity of people's needs and interests, and to the superior wisdom or expertise of certain voters. There is a better way to allocate resources to people with stronger needs and interests, and reward those who demonstrate special talents or insight—markets.

MARKETS FOR COLLECTIVE DECISIONS

Politics is concerned with creating “goods” (which economists call “public” or “collective” goods) that affect the entire population or large groups of people—in contrast to the “private goods” exchanged on traditional markets that individuals consume by themselves. Examples of public goods include clean air, military defense, and public sanitation. Private goods are currently allocated through markets. Public goods can't be using standard markets, or at least not with good results. As the legendary economist and Nobel Laureate Paul Samuelson explained in his 1954 article, “The Pure Theory of Public Expenditure,” standard markets are designed to allocate private goods to those who value them the most.²⁸ This is clearest in an auction—where the highest bidder is assumed to be the person who values the good most—but the price system as a whole works as a kind of decentralized auction.

Yet the logic of public goods is fundamentally different: rather than being allocated to the single individual who values them most, the overall level of public goods must be determined to maximize the total good of all members of society. In order for collective decisions about such public goods to bring “the greatest happiness to the greatest number,” as Bentham suggested, every citizen's voice must be heard *in proportion* to how important that good is to that citizen. Standard markets will not accomplish this because those who care most will always be willing to pay more than anyone else.

In standard markets, the cost of more of any good, such as food, is proportional to the amount of that good you want. If you want twice as many burgers you usually pay twice as much. Suppose we tried to decide on public goods in the same manner. Suppose every citizen could increase or decrease the amount of pollution by paying a price proportional to the amount of this change. Unless this price was reasonably high, many citizens would submit conflicting demands to change the policy; this “excess demand” would, in a normal market, bid up the price of influence. Eventually only the few citizens who care most about the issue (in either direction) will end up with any say. Such a market

would replace the tyranny of the majority with the tyranny of the most motivated, or richest, citizen willing to pay more than anyone else.

This argument has been enormously influential in explaining many maladies of modern politics. Building on Samuelson's ideas, economist and political scientist Mancur Olson argued that small groups of well-organized special interests can use expenditures, lobbying, and other forms of political action to persuade the government to act in their interest rather than for the public good.²⁹ Much of the public ignores complex issues, like bank regulation, while the banks who can profit from government fund lobbying organizations that control the agenda. Many economists are cynical about collective decision-making because it seems so easy to manipulate.

But not all of them view it this way. Again, enter our hero, William Vickrey. He realized that the problem with applying the principle of an auction to politics lay not in the auction itself but in the way that principle had been misinterpreted. As we saw, selling political decisions to the single highest bidder leads to terrible outcomes, because it treats a public good like a private good. The idea behind an auction, Vickrey realized, *is not* allocating the good to the highest bidder. Instead it is that *each individual must pay an amount equal to the cost that her actions impose on others*.³⁰ In a standard auction of private property, this "externality" of my winning is denying the good to another bidder, so the highest bidder should win at the price equal to the losing bid of the second-place bidder. But, as Edward Clarke and Theodore Groves realized independently in the 1970s, a decade after Vickrey's work, this principle also suggests a way to organize *collective* decisions that produce public goods, and not just economic markets involving private goods.

In the case of collective decisions, people affected by the possible public good should have the right to vote as much as they wish, but everyone should have to pay the cost that her votes impose on others. When you buy corn from a store, the price represents the value of the corn in its next-best social use. To buy it you must therefore compensate society for what it gives up by allocating the corn to you. When you hit someone with your car, the law requires you to compensate her for the injury, the pain and suffering you inflict on her. Similarly, in voting, you should have to pay for the harm you impose on people by outvoting them in referenda (or other types of elections) in which a collective decision is made. The amount you pay equals the amount by which your vote denies your fellow citizens the value they would obtain from the different outcome they would prefer.³¹

So just how was this scheme supposed to work? How do we calculate how much harm one person causes to others by swaying an election with his vote(s)? A hint was provided a few years later by Groves in his work with economist John Ledyard and in related, unpublished work by Aanund Hylland and Richard Zeckhauser.³² They realized that the price individuals should pay for influencing public goods should not be proportional to the degree of influence an individual has, but *to its square*.

To see why, consider an example. A power plant benefits all residents in a town by supplying them with low-cost electricity, but it also emits pollution. While the benefits of the power plant are well-reflected by the price residents pay for power, the harms caused by the pollution are uncertain: they include possible negative health effects, which will depend on the preexisting health conditions of residents, and foul odors that might bother some people more than others. The government can issue regulations that force the power plant to install machinery that reduces the amount of pollution, but it's not sure whether to do so. The government can issue regulations of increasing strictness; the stricter the regulations are, the greater the reduction in pollution but also the higher the electricity bills. The question, then, is how much people care about pollution. To answer this, the government could hold a referendum that asks people to vote on a tolerable level of pollution.

Yet this idea suffers from the tyranny of the majority. The problem is that most people might not care much about pollution, and their vote will carry the day, but there will be others, probably in a minority, who care a great deal. This group might include asthmatics, elderly people, and others with health conditions; nature-lovers and outdoorspeople who are sensitive to natural conditions; and owners of certain businesses, for example, laundries or perfumeries, which may need to install insulation to protect their operations from the bad air. If we care about the overall or aggregate well-being of everyone in the town, then we need a way of determining whether the intense preferences of the minority outweigh the weak preferences of the majority. A referendum that operates based on majority rule cannot serve that function.

Let's imagine that instead of holding a referendum, the town undertakes an ambitious experiment. It asks each citizen to report how much each extra unit of pollution will cost in terms of dollars. (In other words: how much would she be willing to pay to avoid that extra unit?) Most citizens may be willing to put up with a bit of pollution that is hardly noticeable, but the more pollution there is, the more dangerous each additional unit becomes. Citizens fill out a form

indicating how much it would be worth to them to stop pollution from increasing 1 to 2 parts per million, 2 to 3, 3 to 4, and so forth. Economists call these numbers a “marginal cost schedule.” The city knows the value of pollution to weigh against this: it is just the market price (less cost) for the power that could be produced by creating this pollution. To determine the best standard, the government will compare this schedule of benefits of pollution to the total cost borne by all citizens. The optimal standard is at the point where the benefit of the next unit of pollution is exactly offset by the total cost to all citizens of the next unit.

Figure 2.1 shows these relationships as a function of the amount of pollution in parts per million.³³ The declining line shows the value of economic activity that generates pollution, which decreases as the power plant has limited capacity and the town only needs so much electricity, so the more power is produced, the less valuable on net it is. The bottom upward-sloping line represents the marginal cost to a particular citizen, Nils, who owns a laundry and thus suffers a disproportionate share of the harm from pollution. The intermediate upward-sloping line is the total marginal cost to people other than Nils. The top upward-sloping line is the total marginal cost to all citizens of pollution, which is the vertical sum of the other two upward-sloping lines.

If Nils were not living in the town, the optimal amount of pollution would be the point shown by the base of the right dotted line (point A), the intersection of the cost to those other than Nils, and the benefits of pollution. However, once Nils is added, pollution becomes a bit costlier because of the harm imposed on Nils and thus its optimal level drops to the base of the left dotted line (point B).

So how much should Nils have to pay in order to strengthen the clean-air standard to take into account his well-being? According to Vickrey, Clarke, and Groves, he should have to pay the amount by which the reduction in pollution that he seeks costs others living in the town (who are thereby denied the net benefits of those last units of electricity). This additional cost is how much value others would have received on net had pollution occurred at A rather than B, meaning at a level where (for others) the additional pollution was worth it to produce extra electricity. In other words, because Nils owns a laundry that is harmed by too much pollution, the price of electricity must be raised. This discourages some use of electricity from which others would benefit more than pollution harms people *other than* Nils. Nils’s entry tips these uses to being not worth it and thus eliminates the net benefit of this electricity production before he arrived. Nils should have to pay the value beyond the cost of production these

others would have gained from the electricity had he not demanded less pollution. This quantity is given by the shaded triangle in the figure.

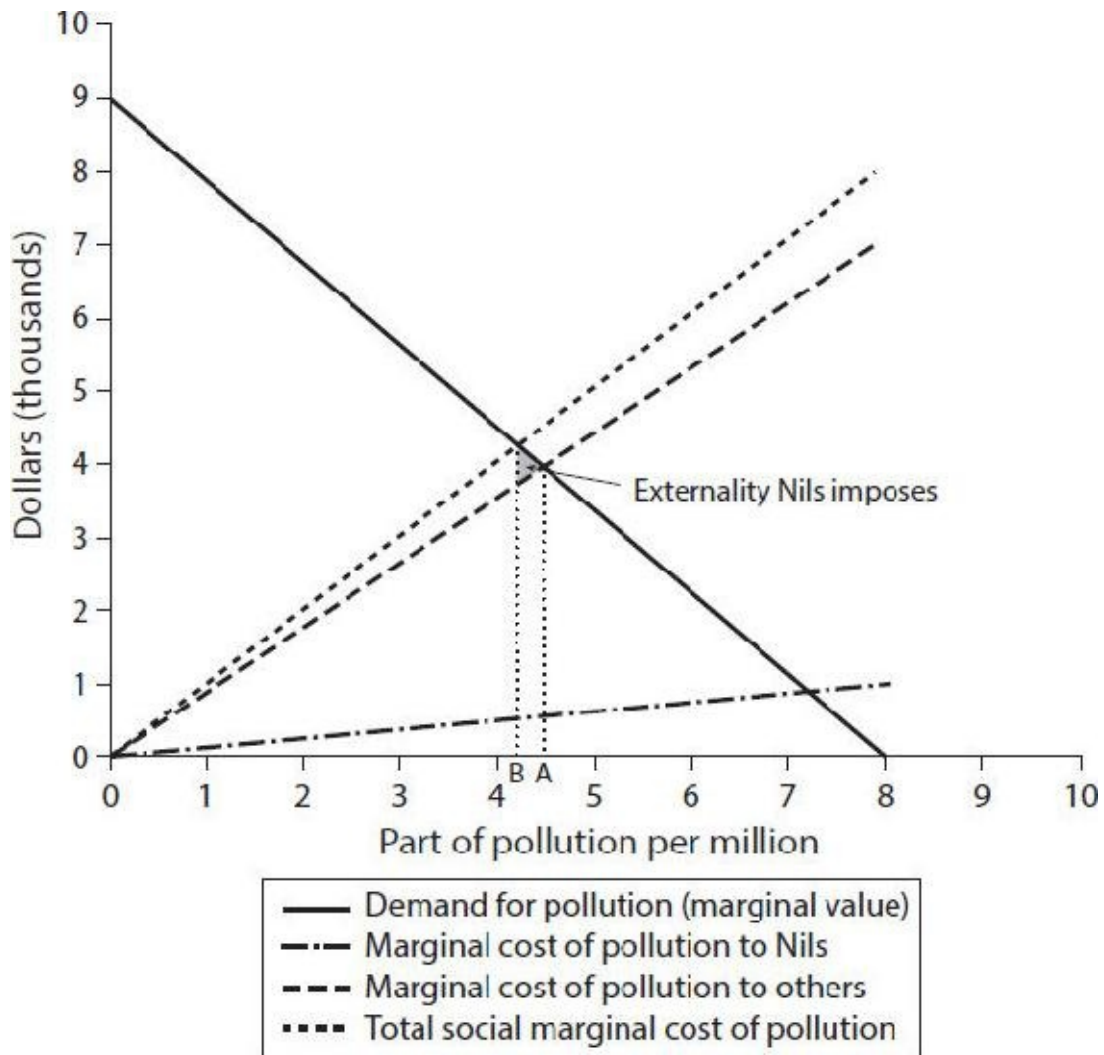



FIGURE 2.1: Determining the optimal level of pollution and how much Nils should pay for his request. *Source:* Adapted from N. Tideman & F. Plassmann, *Public Choice* (2017). <https://doi.org/10.1007/s11127-017-0466-4>.

Because it is a triangle, its overall area grows as the *square* of the distance between B and A. This is what we call “quadratic” growth—based, yes, on the same quadratic function that we saw in [chapter 1](#). To better understand this quadratic growth, let’s imagine that in addition to owning a laundry, Nils had bad asthma, and his cost schedule was twice as high. The gap between the cost schedules with and without Nils would be twice what it was. Clearly this would cause the gap between A and B to grow (to double, to be precise). However, it

would also cause the vertical gap at B between the lines to double. Because the area of a triangle is half the product of its base and height, this means that reporting twice as much harm, and causing twice as large a reduction in pollution, would cost Nils four times as much. More generally, the proportionate effect on both the height and width of the triangle implies a general quadratic growth of payments in the amount of influence an individual has. Nils should thus pay *quadratically* in the gap between B and A; that is, the payment should be proportionate to the *area* of the triangle with two sides of length (proportional to) the distance from B to A, rather than proportional to just the *length* from B to A.

Another way to look at this is that, as Nils seeks larger reductions in pollution, his demands become costlier to others in two different ways. First, he is seeking a larger reduction in pollution, which straightforwardly harms others by preventing them from consuming electricity for which they would be willing to pay the cost (to everyone other than Nils). But, second, he is requesting the elimination of *increasingly beneficial* pollution-generating economic activity. While the costs and benefits of a slight reduction below A are perfectly balanced for those other than Nils, once pollution has been reduced by a bit, we start to approach more productive uses of electricity where the benefits significantly outweigh the costs. Thus, by seeking more reduction in pollution Nils is not just asking for more mitigation of pollution, but also costlier mitigation (at the margin). His cost should thus grow not linearly but quadratically in his request. If you imagine a triangle like this () it almost perfectly provides a representation of the effect of his decision. With each incremental reduction in pollution (horizontally), the harm to others becomes “wider” (vertically).

We have described a highly idealized way in which the town could make a collective decision that aggregates the well-being of all rather than allowing a majority to dictate outcomes that benefit it at the expense of others. But can people actually provide such complex cost schedules? One would be right to be skeptical—the insights of Vickrey, Clarke, and Groves did not lead to practical reform. It took another three decades before economists would see how these ideas could be used to design a voting system.

Quadratic Voting

After returning from his trip to Rio in 2007, chronicled in our preface, one of us became fascinated with the problem of assembling land. While thinking about

how landowners might vote on whether to accept a developer's offer without disadvantaging the few owners who really want to stay in their homes, he stumbled on a solution in 2009 that allows the Vickrey-Clarke-Groves idea to apply to practical voting.³⁴

To see how it works, let us return to the example with which we began this chapter. Suppose that Japan holds periodic referenda on important issues, like gun control or immigration reform. Every citizen is given a budget of "voice credits" every year, which he may spend on referenda that year or save for the future, as Kentaro did. To convert voice credits to votes, a voter can dip into his budget and spend as much of the balance as he wants to buy votes—but the cost of a number of votes is its square in voice credits. Thus, we call this system Quadratic Voting (QV). One vote costs one voice credit, which from now on we'll denote as $Q1$. $Q4$ buys you 2 votes (the square root of four), $Q9$ buys you 3, and so on. The square root is also known as the "radical" (another word for root), hence "radical democracy"—which is a kind of Radical Market, except it is one in which the goods are public rather than private. A referendum is approved if the votes in favor exceed the votes against.

Consider the gun control referendum Kentaro voted in. Every Japanese has the right to vote for or against the proposal. Rural voters like Kentaro strongly favor the proposal. In the story, he spends $Q400$ for 20 votes; other rural voters spend $Q81$ for 9 votes, $Q121$ for 11 votes, etc. Most Japanese people live in cities and disapprove of guns. However, most of them have other priorities than gun control, given how low crime is in Japan and how the proposed reform exempts urban areas; they buy one vote against for $Q1$ or two votes for $Q4$. The government counts the votes: if the number of votes in favor of gun rights exceeds the number of votes against, the reform is adopted. In the story, the intensity of the support of Kentaro and other rural voters is enough to win the day and outweigh the mild opposition of city-dwellers.

This system enables people to cast votes that reflect the strength of their preferences. The key defect of the current system—that one can effectively register only three preferences: yes, no, indifferent—is eliminated. This makes two important things possible. First, a passionate minority can outvote an indifferent majority, solving the problem of the tyranny of the majority. Second, the outcome of the vote should maximize the well-being of the entire group, not the well-being of one subset at the expense of that of another.

Yet recall that for this to be true, by Samuelson's rule, every citizen must vote *proportionally* to how much she cares about the issue. How exactly does

QV achieve this, avoiding the free-rider problem?















Recall that the problem with a standard pricing model of public goods, where influence is based on a one-to-one relationship with how much you pay, is that those who care most about an issue want to buy all the votes, while those who care only a little buy none. The problem is that votes are too cheap for those who care a lot, but too expensive for those who care little. The way to solve this is to make *the next vote* more expensive to those who have already bought many votes than it is to those buying their first vote. This can induce those who care little to at least buy a few votes and restrain those who care a lot from buying too many. This is precisely what QV does, as we illustrate in [table 2.1](#), which shows the total cost of votes and the marginal cost (the cost of the next vote).

What's important is not so much the total cost of each number of votes, but that the *marginal* cost of casting *the next* vote grows proportionally to the number of votes cast. The table shows the marginal cost of casting a vote as a function of the number of votes cast. It shows that this is always (within $\text{Q}1$)³⁵ proportionate to the number of votes cast. It costs twice as much at the margin to cast four votes as to cast two votes ($\text{Q}7$ rather than $\text{Q}3$); twice as much to cast eight votes as to cast four votes ($\text{Q}15$ rather than $\text{Q}7$) and so on. For this reason, this quadratic rule is the only one that induces rational individuals to buy votes in proportion to how much they know and care about the issue, as we now explain.

If, all else equal, Kentaro values being able to change the outcome in his favor twice as much as his neighbor Meiko would value changing it in her favor (against gun rights), Kentaro will pay twice as much at the margin as Meiko does. For example, Kentaro buys sixteen votes while Meiko buys eight votes. The exact number of votes that Kentaro and Meiko buy depends on their estimates of how likely it is that they will be pivotal voters, or other reasons that Kentaro and Meiko are motivated to vote. So, if Kentaro buys sixteen votes for $\text{Q}256$ (16^2), this does not mean that the value he places on the project is equal to the value of $\text{Q}31$. But assuming that Kentaro and Meiko have similar degrees of motivation to vote as a proportion to how much they care about the issue, it does mean that Kentaro will always vote twice as much as Meiko will.

TABLE 2.1: Votes and their cost under QV

Votes	Total cost	Marginal cost
1	$\text{Q}1$	$\text{Q}1$
2	$\text{Q}4$	$\text{Q}3$
3	$\text{Q}9$	$\text{Q}5$
4		

	 16	 7
5	 25	 9
6	 36	 11
7	 49	 13
8	 64	 15
16	 256	 31
32	 1024	 63

QV achieves a perfect balance between the free-rider and the tyranny of the majority problems. If the cost of voting increased more steeply, say, as the fourth power of votes cast, those with strong preferences would vote too little and we would revert to a partial tyranny of the majority. If the cost of voting increased more slowly, those with intense preferences would have too much say, as a partial free-rider problem would prevail.

Thus, under QV, the communities can determine which group of people—the supporters or opponents—is willing to give up more total voice for the project even though it does not know how much any individual (or the group) values the project. Crucially, QV gives weight both to numbers and to the intensity of interests. A large group of people with weak preferences might outvote a very small group of people with intense preferences but not a somewhat larger group of people with intense preferences.

QV does not perfectly achieve the greatest happiness for the greatest number, which we will call “optimality,” but rather only approximately so. The quality of this approximation depends on how closely different individuals share the same degree of motivation to vote in proportion to the value they place on changing the outcome. For perfectly rational and selfish individuals who only care about the outcome of the vote, the only motivation to vote is the chance that their vote changes the outcome. For such individuals, the conditions under which QV achieves optimality are closely related to the conditions for perfect competition in a market economy.³⁶

But when citizens are not perfectly rational and selfish, QV may run into greater problems. If citizens vote for reasons other than their narrow desire to influence the outcome they most want, QV will perform well to the extent that these other motivations are largely uncorrelated (in proportion to individual values) with how individuals are affected by the issue at hand. If, for example, the supporters of gun control do not really care about the issue but are induced by social motives to cast many votes in favor of it, it may pass despite it being appropriate for it to fail, unless similar social motives propel the proponents to

vote more as well.³⁷ A similar problem may arise from collusion, vote-buying, or fraud, just as in 1p1v systems.³⁸ As with 1p1v, guarding against such possibilities will require strict legal enforcement against fraud and abuse; social norms against pressure, vote-buying, and collusion; and a sense of a civic duty to participate in proportion to one's knowledge.

A more fundamental issue QV raises is what notion of value or “happiness” it maximizes or should maximize. This brings us to a fundamental problem: how can we measure “the greatest happiness for the greatest number”? How is it possible to compare the happiness of one individual to that of another? Many economists have argued that this task is impractical. They suggest that all we can hope to do is ensure that no one's happiness can be increased without decreasing anyone else's, a condition called *Pareto efficiency*, and that the total happiness is distributed fairly.

Just like markets, QV (approximately) ensures Pareto efficiency. A natural notion of fairness is to divide influence over public goods equally: give every individual an equal endowment of influence or voice measured in units of that voice.³⁹ If markets with equal incomes are a natural model of a just distribution of private goods, we hold that QV with equal voice is a natural model of just choices about collective decisions.⁴⁰

QV addresses the problem of varying intensities of preferences by allowing those with stronger preferences a way to influence the outcome in proportion to the strength of their preferences. They may still lose to the majority, but they will not lose to a majority with weak preferences (unless the majority is extremely large). Majorities will prevail over minorities—as they should—when the intensities of everyone's preferences are similar. But when minorities have sufficiently intense interests, they can protect their interests from majority domination. Furthermore, as we will revisit below, QV provides a satisfying resolution to the paradoxes of democracy we discussed at the beginning of this chapter.

QV in the Wild

Political systems are slow to change. Why would anyone want to adopt QV without evidence that it works? To address this problem, we created a company, QDecide (pronounced Q-Decide, and formerly Collective Decision Engines), to commercialize QV for practical everyday purposes. The venture has given us a chance to test, learn about, and improve QV. We hope that these explorations

will lay the foundation for QV in the political realm. Below are some of the ways we've used QV so far.

POLLING AND MARKET RESEARCH

Political polling began as a way to predict election outcomes, and such “horse-race” polls remain the bread and butter of the industry. But more useful to political leaders in shaping their policy priorities are the battery of issue opinion surveys that try to measure public views and their intensity. The most common method is the “Technique for the Measurement of Attitudes” proposed by psychologist Rensis Likert in 1932.⁴¹ In a Likert survey, participants are asked to rate a variety of issues on a scale from “strongly disagree” to “strongly agree” or something similar. Participants can choose any point on this scale they wish.

Unsurprisingly, in practice most participants in Likert surveys cluster to the extremes. [Figure 2.2](#) shows an example. “Very strongly against” is -3 and “very strongly in favor” is 3 , with more moderate opinions arrayed in between. The distribution of responses displays a characteristic “W” shape, with most participants clustering toward the extremes, some expressing indifference, and few in between. Most researchers agree that the W shape does not display the true distribution of preferences, which in reality is most likely a bell-shaped or normal curve. In the case of abortion rights, for example, most people are in the middle, with a small number who are extremely pro or con. But since the Likert test does not force respondents to truthfully display the intensity of their preferences, respondents tend to exaggerate—to “shout” their views, saying “very strongly” in favor or against rather than “just a little.” We see the same pattern in Amazon reviews: nearly everyone claims to love (five stars) or hate (one star) a product, when most people are likely in the middle. And even when people try to respond accurately, the Likert test reveals very little. Does a person who “very strongly” opposes abortion rights mean that she will vote against any candidate who supports those rights, or just that it is one among many factors that she will take into account?

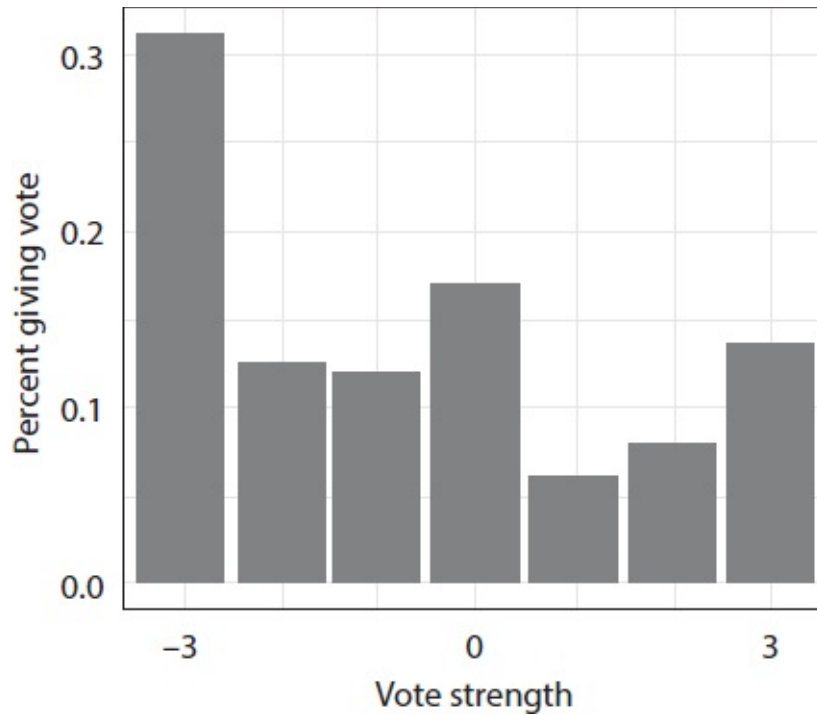


FIGURE 2.2: Frequency of participants' expression positions ranging from strong disagreement to strong agreement with a national ban on abortion in the United States. *Source:* Adapted from David Quarfoot, Douglas von Kohorn, Kevin Slavin, Rory Sutherland, David Goldstein, & Ellen Konar, Quadratic Voting in the Wild: Real People, Real Votes, 172 *Pub. Choice* 283 (2017), p. 6.

QV offers a solution to this problem. Rather than allowing respondents to freely express any position they wish, a poll based on QV endows each participant with a budget of voice credits and allows her to spend the credits on the range of issues available as she wishes. We have patented the use of QV and related methods to solicit opinions digitally. [Figure 2.3](#) displays the software interface, called “weDesign,” developed by our colleague Kevin Slavin and others at QDecide to enable this implementation.

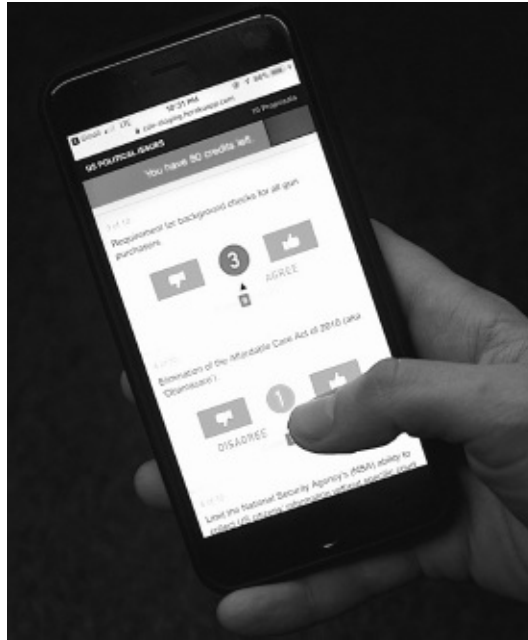


FIGURE 2.3: A user interacting with QDecide’s weDesign software on an iPhone. Photo: CDE.

Participants start with a pool of credits and may use them to “buy” as many votes as they wish in favor of or against each issue. The cost in credits of votes is, of course, quadratic. While this relationship sounds abstract and complex when described mathematically, it is simple and intuitive for most users when engaged in this visual and tactile manner: participants see their credits dwindle at an increasing rate as they express opinions. Even math-phobes are able to navigate the system smoothly.

Respondents are asked to use their fixed budgets to buy votes across a range of issues: abortion rights, healthcare, minimum wage, and so on. If a respondent truly cares about only one issue (which is very unlikely), she will spend her entire budget to buy relatively few votes to take a position on one issue. If she cares about many issues, she must decide how to allocate her votes across them. She may discover, for example, that while she cares a lot about abortion rights, she doesn’t want to use up so many credits to vote in favor of them that she can’t even buy one vote in order to take a position on Obamacare or the minimum wage.

Typically, respondents (especially those with less formal training in mathematics) quickly run into a constraint, running out of credits, and then returning to correct course. Economist Sendhil Mullainathan and psychologist Eldar Shafir have shown in their 2013 book that running into this type of

“scarcity” quickly focuses the minds of participants so that they complete the survey carefully.⁴² In practice, it also seems to deeply engage users: they typically spend a third longer working on QV surveys than a standard Likert survey, even though the same fraction in both cases completed the survey. Respondents in QV surveys also participate more actively, revising their answers to reflect their preferences much more frequently and often providing feedback that taking the QV survey had helped them learn their own preferences more accurately by forcing them to make difficult, even frustrating tradeoffs.

To test whether QV manages to solve the problems with Likert, in 2016 Q Decide’s chief data scientist and now professor of mathematics education David Quarfoot, along with several co-authors, ran a nationally representative survey with thousands of participants that took versions of the same poll using Likert, QV, or both depending on which group they were assigned to.⁴³ Figure 2.4 pictures a representative set of responses, on the question of repealing Obamacare, with the Likert survey on the left (with its signature W-shape) and the results from QV on the right.

Two things are noteworthy. First, QV produces a roughly bell-shaped distribution, the sort of distribution of responses that characterizes most individual preferences. The QV results are thus much more plausible as a representation of population preferences than is the artificial W shape from Likert.⁴⁴ Second, while Likert conceals the range of intensity of preferences by grouping all, or nearly all, of the responses at the extremes, QV reveals these gradations. QV shows, for example, the greater intensity of preferences for repealing Obamacare, compared to those for retaining it, which helped fuel the success of Republicans in the 2016 election.

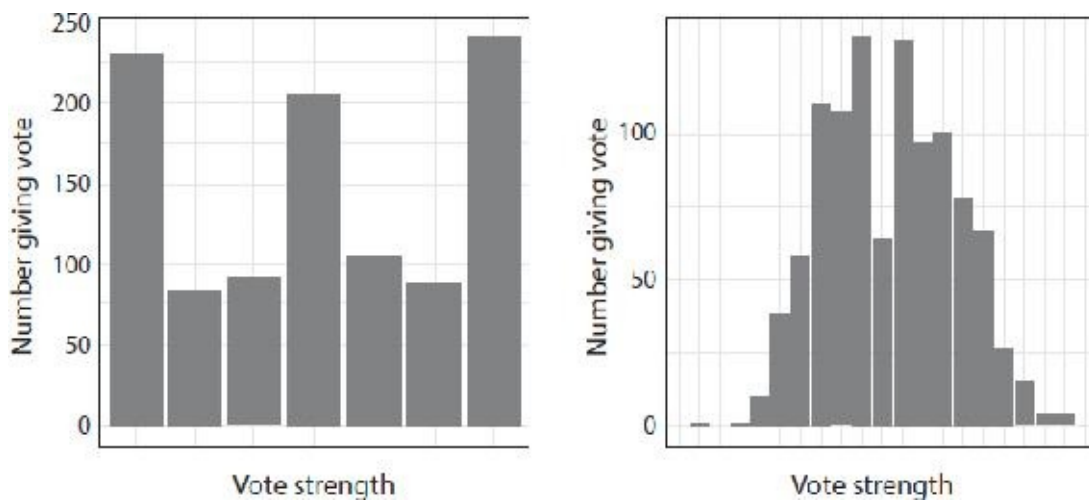


FIGURE 2.4: Participant opinions on Obamacare under a standard Likert (left) and QV (right) survey. “Vote strength” in both graphs represents degree of support (on left) or opposition (on right) for Obamacare. *Source:* Adapted from David Quarfoot, Douglas von Kohorn, Kevin Slavin, Rory Sutherland, David Goldstein, & Ellen Konar, *Quadratic Voting in the Wild: Real People, Real Votes*, 172 *Pub. Choice* 283 (2017), p. 6.

A nice illustration of this second point is [figure 2.5](#), which shows the voting patterns for two different voters who expressed the most extreme preference on almost every issue under Likert. The survey involved ten public policy questions, and the respondents in both cases gave in to the temptation, possible under Likert, to say that they cared maximally (either pro or con) about nearly all of them. This is not possible under QV. Under QV the participant on the left showed herself to actually have a reasonably strong interest in a range of issues, though to varying degrees. However, the voter on the right cared about only three issues, and to varying extents. All this richness of individual preference is hidden under Likert, but revealed by QV. Quarfoot and his co-authors show that these additional details predicted the willingness of participants to take actions that were potentially costly to them, indicating that their findings were meaningful rather than spurious. They asked participants if they wanted to receive emails about various issues, and found the likelihood that a participant signed up for emails was predicted by the variation in preference intensity that was revealed in the QV results and lacking in the Likert results. Other research on QV has shown a tight correlation between QV votes and voting turnout intentions on referenda.⁴⁵

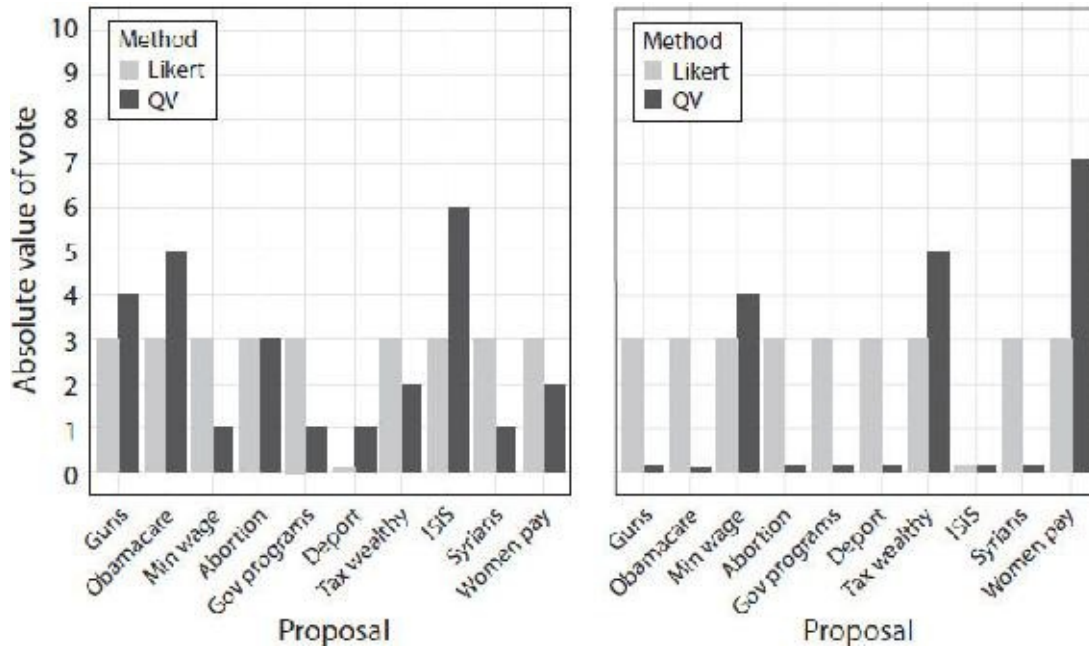


FIGURE 2.5: The differing QV preferences of two participants who both voted at the extremes on almost all issues on Likert.
Source: CDE.

Leaders, political campaigns, and political scientists have begun to explore whether using QV to elicit public opinions allows them to more accurately answer the questions so crucial to their jobs: how can we form a platform and reach compromises that will respect the strongly held views of a range of citizens? In the coming years, experiments with QV will offer a proving ground for the practical utility of QV.

RATING AND SOCIAL AGGREGATION

Rating and social aggregation systems fuel today’s digital economy. Reputation systems are the crucial trust mechanisms that allow “sharing economy” services like Airbnb, VRBO, Uber, and Lyft to win consumer acceptance and give providers the confidence to adopt the system.⁴⁶ They play a core role in the popular search services offered by Amazon, Google, Apple’s app store, and Yelp. Yet a growing body of evidence suggests these systems are badly broken. As noted above, almost all reviews cluster toward five stars, and a few at one star, making the resulting feedback biased and what statisticians call “noisy,” that is, not very accurate.⁴⁷ Other online platforms, such as Facebook, Reddit, Twitter, and Instagram, gather limited information because they only allow

“likes,” and other limited forms of response, rather than allowing participants to exhibit exceptional enthusiasm, or distaste, for particular content.

With QV, users could have voice credits that they receive for participation (say, a certain number for every stay, ride, or post) that they then could use to evaluate the performance of others on the system. The cost of votes pro and con would grow quadratically and participants could save their credits for future interactions or use saved credits for those about which they feel more strongly at present. Such a system combines the best of both tipping and rating, creating a real cost to expressing enthusiasm, but also discouraging free-riding and allowing other participants to benefit from the feedback.

A version of this system is being implemented by a social network called Akasha, based on the increasingly prominent Ethereum cryptocurrency.⁴⁸ QV fits with the framework of cryptocurrencies, which require formal governance rules to allow for the decentralized management they rely on, so using it also for social aggregation in such a context is natural. However, the exact implementation is unclear at the time of this writing, and not available to the public; much in the world of cryptocurrencies is secretive. However, we hope that broader use of QV in these contexts will provide a more powerful test than political polling of how QV would work if adopted in social settings where norms and values would adapt to its use.

BROADER APPLICATIONS

The commercial applications of QV do not end there, however. Collective decisions pervade our society and economy. Corporations are governed by groups of shareholders and must respond to the demands of groups of employees.⁴⁹ Residential and commercial real estate is frequently governed by cooperatives, in which co-owners vote on issues of common interest. Book groups, warrior guilds in massive multiplayer online video games, unions, clubs, friends choosing a restaurant, start-ups hiring new workers, academic funders allocating grants, crowds funding new products, citizens funding campaigns, and colleagues scheduling a meeting: all must frequently make collective decisions that bind all members.

Most people share their lives in these and other ways. But because no good mechanisms exist for making collective decisions, these aspects of life are often extremely frustrating, leading many people to avoid them when possible. An inconvenient but all too common solution to the agony of arguing with one's

fellow co-op members over whether to repair the building's roof this year or next year, is to own one's own house. If a better mechanism could be invented, and be used as a default method of helping people make group decisions across many areas of life, then the shared portions of life would expand and the private portions would contract. QV, based on a platform that allows people to vote in collective choices across many areas of life, would be a step in that direction.

But the real goal is to extend QV to political decision-making. What would such a system look like?

Democracy Squared

MULTI-CANDIDATE, SINGLE-WINNER ELECTIONS

Recall that in many 1p1v systems, voters can find themselves in the position of having to vote for the lesser of two evils, leading to the possibility of a candidate everyone dislikes winning based on a cycle of fear of other leading candidates.⁵⁰ A recent example of this was the 2016 US presidential election, in which both eventual nominees of major parties were widely loathed, while other members of their parties had broad public support. QV, when properly applied to multi-candidate elections, avoids this possibility.⁵¹ In such a system, voters could cast as many votes as they wish in favor of or against any candidate. The total cost in voice credits would be the sum of the squares of all votes on individual candidates: the quadratic cost kicks in at the candidate, not the election, level.

Why would such a QV system avoid the pitfalls created by strategic voting? Recall that the driving force behind it is that voters feel compelled to vote for one of the two leading candidates to avoid “wasting” their votes. We propose a system in which votes could be cast either in favor of or *against* candidates, and one could vote for (or against) as many candidates as one wishes. As a result of the quadratic pricing, it is cheaper to divide one's credits between votes for a favored candidate and votes against his or her opponent(s), than to spend credits only on the favored candidate. This means that any voter inclined to favor awful candidate A just to spite appalling candidate B would also wish to register her opposition to B in even greater measure. These strategic votes would thus cancel out and sink any two candidates who are widely despised, allowing less hated candidates to rise up. In fact, for any candidate to get positive votes she would have to be more highly regarded than most of the other candidates.⁵²

In the 2016 US example, we can guess at what might happen under QV based on Likert surveys on preference intensity for candidates taken during the

campaign. A consensus moderate Republican candidate would have been most likely to win under QV among the major candidates considered by the survey.⁵³ The eventual winner of the election, Donald Trump, would have come in last of all candidates.

Yet beyond this specific result, this logic suggests that QV is not limited to binary referenda, or continuous public goods decisions. For almost any collective decision problem, there is some form of QV that achieves the socially optimal outcome. As such, QV offers a coherent basis for a complete democratic system.

REPRESENTATIVE DEMOCRACY

Designing a representative system is not within the scope of this book, but we offer a few thoughts here. Voting for representatives under a system of QV could take different forms. Consider, as one of many possible approaches, a system as similar as possible to the US political system, but where elections were conducted using QV. The QV system would operate at the level of the office—at the district level for representatives, at the state level for senators, and at the national level for the president. At every election, a voter could spend as much or as little of her budget on as many votes as she can afford, spread among all of the candidates at all levels—for, against, or zero. This allows voters to focus on the level of government they care about most—perhaps more local in case of people who are rooted to their community, perhaps more national for young, mobile types. The theory behind QV applies to representatives in the same way that it applies to referenda. Under the QV system, the representative will be chosen whose expected performance maximizes the aggregate well-being of voters. Knowing this, candidates will select positions that maximize the welfare of their constituents, just as they choose positions accommodating the preferences of swing voters under majority rule.

In turn, QV could be applied to a representative body itself. Every legislator would receive a certain number of voice credits upon election and could allocate them across the issues most important to her constituents. Representative institutions face the same problem of preference aggregation that exists in the referendum-style votes. Each representative serves a different group of constituents who have different interests. A particular bill will affect those groups in different ways—some greatly, others hardly at all. This means that representatives who seek reelection will also vary in their interests in passage of

the bill.

Under the current system, party leaders must bribe, cajole, and threaten legislators. The Emergency Economic Stabilization Act of 2008, which was needed to address the financial crisis, was initially blocked in the US House of Representatives. Leaders were able to pass the bill only after arranging for a range of payoffs, including a reduction in the depreciation schedule for improvements to restaurant buildings; extension of tax credits for solar energy installations; and tax exemptions or subsidies for a number of entities such as film and television producers, rum producers in Puerto Rico and the Virgin Islands, racetrack facilities, manufacturers of wool products and toy wooden arrows. Yet for each ugly “success story” such as this, there is a corrupt bargain that harms the country and causes years of gridlock. Under QV, legislators whose constituents care little about some legislation would save their credits for a future vote, while those whose constituents care a lot would be decisive pro or con.

While a better basis for collective decisions, QV, like 1p1v, is more a foundational paradigm for collective decision-making than a literal rule. Many institutions would be built around and incorporate QV in a variety of ways that are hard to imagine. But we hope the potential of QV is visible.

NATURE OF CURRENCY AND SCOPE OF TRADE

The survey application of QV does not allow a full expression of preference intensity because there is no way for participants who care about *all* the issues more than other people to reveal this fact. Some people don’t care much about politics, others care a lot. The latter group might be willing to give up something else they care about—money, for example—in order to have greater influence than the first group. But the survey doesn’t allow this.

Consider an economic, private goods analogy. If trade is only possible among, say, fruit, every individual will get her favorite fruits but there will be no way for people who produce fruit to sell it to get other necessities. The division of labor and the benefits of trade depend on broadening the scope of trade. The same is true in QV: the more uses that can be made of voice credits, the more benefits QV brings by allowing individuals more freedom to choose how and where to use their influence.

Of course, such freedom carries risks. Just as some people foolishly squander their savings on goods and services, allowing saving and spending of saved (or

perhaps even borrowed) voting credits could leave some individuals vulnerable. But in general, we believe that, with appropriate regulations, the broader the scope of use of voice credits, the better.

A Radical Market for Reasoned Compromise

How much value would QV generate? In general it is much harder to estimate the effect of political than economic institutions on inequality and growth. The only serious attempt to do so that we know of estimates the effect of democracy on growth, and finds that the introduction of democracy to a country on average causes a 20% increase in national income.⁵⁴ While there is no reason to expect QV to bring precisely the gains over 1p1v that democracy brought over pre-democratic forms of government, this seems a reasonable benchmark. As we have highlighted, democracy as currently practiced is highly imperfect. It seems plausible that QV will improve, at least in terms of its effects on economic productivity, over existing democracy as much as democracy did over the average system it replaced.

But that understates the economic benefits. Despite centuries of progress, markets for public goods are hopelessly deficient. If we are right about QV, then it should bring markets for public goods in line with markets for private goods, with incalculable benefits for all citizens.

Yet, as with the COST, some of the most powerful ways QV could reshape our society are the hardest to quantify: its effect on social institutions and cultural imagination. While perverse election outcomes, gridlocked legislative votes, and protests over “judicial activism” are the most visible manifestations of our dysfunctional politics, they may not be the most important ones. Even more insidious for our political system are polarization, a political discourse plagued by sound bites and platitudes (or worse, hate speech), a sense of helplessness among much of the public, rigid political boundaries that poorly align with the actual views of the public, resentment of political elites, and decay in public trust.⁵⁵

The influence of QV on such problems would be indirect and hard to predict. Yet there are reasons to be hopeful. QV empowers citizens to express their views in a fundamentally richer and deeper way than 1p1v allows. It encourages citizens and politicians not just to try to win over poorly informed swing voters or to motivate disaffected members of their own base, but to engage with people who have different views. It would allow citizens to focus their voting on topics

of their true passion and knowledge, rather than force them to vote on issues on which they feel ill-informed and thus liable to conform to stereotypes and party identification.

Because QV penalizes extreme views by making them costlier to express, it encourages moderation and compromise. By offering broader freedom, subject to a budget constraint, it gives citizens greater responsibility and control over collective decisions. In the same way that participation in public protests often gives citizens a sense of ownership over policy choices, QV would offer citizens the chance to feel their voice had been more fully heard, both helping them win on the issue most important to them and reconciling them to the losses they suffer. These features are much like the social effects of market economies for private goods. Because citizens tend to resent and feel coerced by rationing in planned economies, they experience the abandonment of planning as a blossoming of freedom, as was so clear with the collapse of communism in the 1980s and 1990s. When people have the freedom to choose what to spend their money on, they are afforded a sense of dignity and responsibility for the things they have and choose to forgo. A political culture based on such a market mentality could give people a stronger sense of dignity and responsibility in politics.

As with the COST, the most enthralling potential benefits of QV are the most speculative and concern the way that it would change our relationship with our fellow citizens. Most people live in urban settings and interact with others over telecommunications networks, implying their well-being is closely tied to and influenced by others around them. In such large-scale, connected societies, it is usually easier to provide benefits to many people as a group than to individuals separately. Information is easily shared by many; applications for social interaction have little value if used only by a few; public transport shared by many is often more economical than individual vehicles. Yet such large-scale services at present are either provided by monopolistic corporations or by dysfunctional public authorities. Fear of the failures of these providers often leads us to wastefully retreat from public life behind the walls of our homes, our gated communities, our private servers, and our individual cars.

As early as the 1950s, economist John Kenneth Galbraith called this the paradox of “public poverty” among “private affluence”: while children are “admirably equipped with television sets,” “schools were often severely overcrowded and ... underprovided.”⁵⁶ He complained that a “family which takes its air-conditioned ... automobile out for a tour passes through cities that

are badly paved, made hideous by litter, blighted buildings and posts for wires that long since should have been put underground.”

QV offers a different path, toward a balance of affluence between private and public at all levels. It shows that the public goods that we all share can be provided as efficiently and smoothly as the market provides us smartphones and mattresses. It gives us a path toward truly shared and cooperative lives in our local communities, our online social networks, and our national governments. It allows a world where our choices between the private and richly varying levels of public life are determined by the natural development of social relationships rather than by our fear of the incompetence or corruption of collective institutions.