

# **The Median Voter Model**

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## **I. Introduction**

Most analytical work in public choice is based upon relatively simple models of majority decision making. These models are widely used even though the researchers know that real political settings are more complex than the models seem to imply. The use of such simple models can be defended for a variety of reasons: First, simple models allow knowledge to be transmitted more economically from one person to another than possible with more complex models. Second, simple models provide us with engines of analysis that allow a variety of hypotheses about more complex phenomena to be developed, many of which would be impossible (or uninteresting) without the frame of reference provided by simple models. Third, it is possible that simple models are all that is necessary to understand the main features of the world. The world may be less complex than it appears; in which case simple models that extract the essential from the observed will serve us well.

All of these defenses of simple models apply to the median voter model, which is, perhaps, the simplest possible model of majoritarian decisionmaking. There is no more transparent nor easily communicated explanation of political outcomes in a democracy than that all political outcomes reflect median voter preferences. Moreover, testable implications of the median voter model abound. If the median voter gets more or less what he or she wants, then anything that affects the median voter's assessment of the relative merits of alternative policies or candidates will also affect political outcomes. For example, the median voter's age, sex, income, information, ideology and expectations should all systematically affect public policy. To the extent that these predictions are largely borne out by empirical research, the median voter model can be regarded not only as a convenient method of discussing majoritarian politics and a fruitful engine of analysis, but also *a fundamental property of democracy*.

## II. Origins of the Median Voter Theory

For all of its simplicity, the median voter model is by no means obvious. Although majoritarian voting is clearly a very ancient method of group decision making, which doubtless has been used in tribal councils since before the dawn of recorded history, there is no clear statement of the median voter theorem until approximately 1950. For example, there is no mention of the concept of a pivotal or decisive voter in Aristotle's analysis of political decision making written in 330 B. C.. Condorcet (1785) an eminent French mathematician and philosopher discovered the idea of a pivotal voter and also noted how the accuracy of decisions can be improved by majority decisions in juries, but includes no clear statement of the median voter theorem. Political pundits have noted (and lamented) tendencies for candidate positions to converge in democratic elections, as did the occasional economic theorist, Hotelling (1929), but the median voter theorem awaited Duncan Black's work on majority voting (1948), and Anthony Downs' extension to representative democracy (1957).

That such a simple idea took so many centuries to emerge may seem surprising given the clarity of the result, but both the rational choice framework and statistical basis of median analysis also emerged at surprisingly late dates. In the case of political analysis, analysis of the properties of simple majority rule may have been delayed for historical as well as methodological reasons. The use of national elections to select governments or government policies is a fairly recent innovation for *national* political systems. Even in the United States where elections have used to select representatives to various state and local governmental bodies for many centuries, the members of the U. S. Senate were appointed rather than elected prior to the passage of the 17th amendment in 1913.

## III. An Illustration: Direct Democracy and the Median Voter

To appreciate the logic of the median voter model, consider a setting where three individuals: Al, Bob and Charlie are to choose a restaurant to eat lunch at. Al prefers a restaurant where lunch can be had for \$5.00, Bob favors a bit better fare at a restaurant serving \$10.00 lunches, and Charlie wants a gourmet restaurant where lunch will cost around \$20.00. Bob can be said to be the *median voter* because exactly the same number of individuals prefer a more expensive restaurant than Bob as prefer a less expensive restaurant than Bob, here one each. For

convenience assume that, given any two options, each member of the lunch group prefers restaurants with prices closer to their preferred restaurant to ones that are farther from it. Now consider some majority decisions over alternative restaurants:

OPTIONS	PATTERN OF VOTES			RESULT
\$10 vs. 20\$	A: 10	B: 10	C: 20	10
\$5 vs. \$20	A: 5	B: 5	C: 20	5
\$5 vs. \$16	A: 5	B: 5	C: 16	5
\$10 vs. \$5	A: 5	B: 10	C: 10	10

The *weak form of the median voter theorem* says the median voter always casts his or her vote for the policy that is adopted. *Note that Bob always votes in favor of the outcome that wins the election.* Note also Bob's preferred \$10 restaurant will defeat any other. If there is a median voter, his (or her) preferred policy will beat any other alternative in a pairwise vote. (The median voter's ideal point is always a Condorcet winner.) Consequently, once the median voter's preferred outcome is reached, it cannot be defeated by another in a pairwise majoritarian election. The *strong form of the median voter theorem* says the median voter always gets her most preferred policy.

#### IV. Illustration: Electoral Competition and the Median Voter

Similar results are associated with representative democracy where voters select policy makers rather than policies. The case of most relevance for the median voter model is that in which there are two major candidates or parties, one of which will be given the power make public policies until the next election. If voters cast their vote for the party or candidate closest to their most preferred feasible policy, it turns out that the candidate who is closest to the median voter always wins the election. This follows because the candidate closest to the median voter is also closest to the ideal points of more than half of the electorate. (This "distance-based" model of voter preferences is sometimes called the spatial voting model.) Consequently, the winning candidate always receives the vote of the median voter, and the *weak form of the median voter theorem holds*.

If candidates can freely choose policy positions to maximize their share of the votes, both candidates will attempt to adopt policy platforms that are closer to the ideal policies of the median voter than the other. Consequently, major party candidates will both tend to select platforms that are relatively close to the median voter's preferred policies. Moreover, as each candidate competes for the favor of the median voter, the positions of both candidates converge toward the policy positions that maximize the median voter's welfare. In the limit, both candidates adopt the same platforms, and both candidates receive essentially the same number of votes. However, it doesn't matter which candidate wins the election in this limiting case. In either case, the *strong form of the median voter theorem* will hold for national public policies. The median voter gets exactly what he or she wants--to the extent that the elected candidate delivers on his or her campaign promises.

This line of reasoning can be generalized within limits. In electoral contests between two policy alternatives, candidates or parties, if a median voter exists government policy will maximize the welfare of the median voter in equilibrium. Median preferences determine a very wide range of policies if this conclusion can be applied to the broad range of decisions made by majority rule in modern democratic societies.

## V. Illustration: The Median Voter's Demand for Public Policy

The strong form of the median voter model allows government policy to be modeled as a straightforward application of the rational choice model developed in microeconomics. For example, consider the following model of the median voter's preferred level of environmental regulation. Suppose that environmental quality is a function of regulatory stringency  $R$  and national income,  $E = e(R, Y)$ . Suppose also that the median voter gets a constant fraction " $a$ " of national income,  $Y^m = aY$ , which is decreasing in regulatory stringency,  $Y = y(R)$ . Suppose further that voters care about their own income and environmental quality. The constraints and definitions can be substituted into the median voter's utility function:  $U = (ay(R), e(R, y(R)))$ , which can be differentiated with respect to  $R$  to characterize the median voter's ideal stringency of environmental regulation  $R^*$ .  $R^*$  will satisfy  $U_Y aY_R + U_E (E_R + E_Y Y_R) = 0$ . The first

term is the median voter's marginal cost of environmental regulation and the last is his marginal benefit from more stringent environmental regulation

The median voter will select policies that equate her marginal benefits with her marginal costs ( $U_Y \Delta Y_R = U_E (E_R + E_Y Y_R)$ ). As these marginal costs and benefits change, so will the median voter's preferred environmental regulation. The implicit function theorem can be used to determine the comparative statics of environmental regulation with respect to parameters of the median voter's optimization problem.

## VI. Policy Implications of the Median Voter Model

Models have been developed for the median voter's demand for other forms of regulation, for public goods and services, for transfers to the poor and elderly, and for national and domestic defense by changing the constraints to fit the policy of interest. This is part of the versatility of the median voter model. It can easily be used to analyze a wide range of public policies. Given the strong form of the median voter theorem, such characterizations of the median voter's preferred policies provide (qualitative) forecasts of public policy in a well functioning democracy.

However, even without a specific characterization of the median voter's preferred policy, the median voter model has a number of clear implications. One implication is that public policies will tend to be moderate middle-of-the-road policies, e. g. drawn from the exact middle of the political spectrum. Such policies can be regarded as "moderate" essentially by definition. Another implication is that many, perhaps most, people will be at least partly displeased with the policies chosen. Voters tend to have different ideal point insofar as their tastes, age, income, tastes, ideology, or information differ. (However, although most people are dissatisfied with government policy, they may still prefer majoritarian decision rules to all the other methods of collective choice that they are aware of.)

A third implication is that increases in the dispersion of the distribution of voter preferences (increased radicalism) will have little, if any, effect on public policies unless increased dispersion also affects the median of the distribution of voter ideal points. *This implies that median voter policies tend to be relatively more stable than would have been the case if average rather than median voter*

*opinions determined policy.* The properties of median implies that public policies will be relatively stable (robust) through time as voters are subject to life's vicissitudes, technological progress, and political shocks.

To go beyond these general properties of medians, the strong form of the median voter theorem is usually invoked. Given the strong form of the median voter model, any change in circumstance that changes the constraints of the median voter or the identity of the median voter is predicted to have systematic effects on the size and composition of government programs. For example, the median voter's demand for government services tends to increase through time as median income increases and as government services become relatively cheaper than private alternatives. However, as in ordinary microeconomic analysis, not every median voter model yields unambiguous predictions about the effects of changes in the median voter's choice problem on the electoral demand for government services. For example, the median voters demand for government services depends in part on the tax system used to finance them. Government services are generally normal goods in the sense used by economists, however when financed by an income tax the tax price of those services increases as voter income increases. This tax-price effect may partly or totally offsets the normal-goods effect of increases in median voter income.

## **VII. The Normative Properties of Median Voter Policies**

The normative properties of median voter outcomes are clearly of considerable interest for political theorists. Insofar as median voter outcomes tend to emerge in open democracies, evaluation of median policy preferences allows the merits of unconstrained democracy to be assessed.

Although the median voter model implies that the median voter gets what "she wants," it does not imply that public policies will be efficient in the usual Paretian sense of welfare economics. There are many reasons for this. First, the median voter model implies that minority interests do not directly affect policies, essentially by definition, and thus every majoritarian policy is likely to impose externalities on the minority. Second, even within the majority, votes rather than the intensity of desire or willingness to pay determine policy in electoral settings.

Some voters who feel intensely about an issue may be willing and able to compensate others to adopt policies that differ from those otherwise favored by the median voter. Unrealized gains to trade may exist at the median voter's ideal policy.

A third source of normative difficulty for the median voter model is that the policy information available to the median voter is often fairly limited. It is clear that the task of assessing the relative merits of alternative policies can be a very time consuming and information intense task. Many policy analysts spend a lifetime to master the details of a single policy area such as tax or energy policy. In such areas, voters clearly cannot be fully informed about the choices that they confront. In the case where the median voter's expectations are none-the-less unbiased, the median voter will still receive, *on average*, the package of government services and policies that he or she wants, although mistakes will be made. In cases where informational problems lead to biased expectations about the consequences of policies, the median voter will not get what *truly* advances his or her interests, but rather what is misperceived as advancing those interests.

Fourth, voter ignorance opens the door to the strategic games of interest groups and the bureaucrats who may manipulate voters by appropriately subsidizing various kinds of information and act counter to median voter interests (agency costs, bribery) in policy areas where the median voter is unlikely to be well informed. (It can be argued that essentially the whole special interest group/rent-seeking literature is predicated on informational problems of these kinds in open democratic societies.)

## **VIII. A Theoretical Problem for the Median Voter Model**

There also is a well-known theoretical problem with majority rule that appears to reduce the applicability of the median voter model. A *median voter does not always exist*. For example, suppose there are three voters, Al, Bob and Cathy who must choose among three policy alternatives, I, II, and III. Suppose that Al prefers option III to II to I, while Bob prefers I to III to II and Cathy prefers II to I to III. Note that the pattern of votes will be,  $III > II$  and  $II > I$ , but  $I > III$ ! Majority rule can lead to inconsistent rankings of policy alternatives, and to unstable policy choices. Duncan Black (1948) pointed out that *single peaked* preferences are sufficient to guaran-

tee the existence of a median voter in one dimensional issue spaces. However, in 2-dimensional cases, a median voter exists *only* in cases where voter tastes are very symmetrically distributed (Plott, 1969). In other cases, intransitive cycles are endemic even if voter preferences are single peaked! In such cases, no median voter exists, and every policy has a non-empty *win set*. (The win set of policy vector  $z$  is the set of policy vectors which is preferred to  $z$  by a majority of the electorate.) The absence of a median voter equilibrium may also arise in models where candidates can manipulate information and voter turnout. Chaos and indecision are predicted features of majority voting in such models.

## IX. Empirical Support for the Median Voter Model

Although theoretical arguments suggest that the applicability of the median voter model may be very limited, the empirical evidence suggests otherwise. There is a large body of evidence that suggests median voter preferences over policies are (largely) of the sort which can be mapped into a single issue space while retaining "single peakedness" Poole and Daniels (1985) find that 80 -90% of all the recorded votes in the US Congress can be explained with a one dimensional policy space. Stratmann (1996) finds little evidence of cycling across Congressional votes over district specific grants.

Moreover, the median voter model has a very good empirical track record in public finance as a model of fiscal policy across states and through time. Recent studies show that the median voter model can explain federal, state, and local spending, as well as international tariff policies. Congleton and Shughart (1990) Congleton and Bennett (1995) suggest that the median voter model provides a better explanation of large scale public programs than comparable interest group models. This is not to suggest that the median voter always exercises the same degree of control over public policy irrespective of political institutions. Holcombe (1980) and Frey (1994) report significant policy difference between representative and direct forms of democracy that would not exist unless significant agency problems exist within representative government. Moreover, statistical tests can never prove that a particular model is correct, only that it is more likely to be correct than false. However, in general, the median voter model appears to be quite robust as a model of public policy formation in areas where the median voter can credibly be thought to understand and care about public policy.



The empirical evidence suggests that the median voter model can serve as a very useful first approximation of governance within democratic polities. As a consequence, the median voter model continues to function as an analytical point of departure for more elaborate models of policy formation within democracies in much the same way that the competitive model serves the micro economics literature.

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