A walk down the middle lane of the Median Voter Theorem's Origins

A Research Essay submitted in partial fulfilment of the Degree of Master of Commerce (Economics) in the School of Economic and Business Sciences, University of the Witwatersrand

by

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Abstract

Now more than ever in recent history, the behaviour of politicians around the world have aroused significant interest. Events such as the Brexit turmoil, the rising trend of right-wing parties (despite the events of World War II), the election of a non-career politician such as Donald Trump, etc., all transpired in perceived democratic voting systems. It thus become clear, that political decision-making cannot be ignored in economic theorems and models.

The median voter theorem is a popularly used framework in public economics to analyse behavioural decisions made by two political parties within a democratic electoral system. According to the median voter theorem, the primary objective of the two political parties is to win the elections by maximising their popularity. The parties do so by adopting the preferences of the median voter. This research essay will explore the origins of the median voter theorem to determine why exactly the median voter is so pivotal and why the demand for public sector output reflects that of the median voter. It will further discuss the assumptions, discoveries and implications made by the two significant contribution authors Duncan Black and Anthony Downs.

The consequent discussion of the empirical robustness of the median voter theorem reveals that the assumptions made are too restrictive and have no empirical basis. The model should, however, not be fully discarded. The model can fulfil a function equivalent to perfect competition in the market. The relevance of this research essay is the recognition to treat political agents as behavioural entities who may not always behave rationally, especially in a world of imperfect information.

1. Introduction: The Median Voter Theorem's Origins

Now more than ever in recent history, the behaviour of politicians and voters within a polity and across many walks of politics around the world have aroused significant interest. The Brexit turmoil, the rising trend of right-wing parties in Europe, the election of a non-career politician such as Donald Trump, are electoral decisions that left several economists puzzled. Sørensen (1995, p. 119) argues that the public sector allocations are determined by complex decision-making processes in circumstances filled with considerable ambiguity. Economic theorists have thus begun to recognise the need to treat political agents as behavioural entities who may not always behave rationally, especially in a world of imperfect information. What economic tool can be used to analyse political behavioural decision-making? Does an economic theorem exist that can be applied to a broad range of political decisions made by democratic societies?

The median voter theorem is a popular framework in public economics to analyse political representation (Stadelmann, Portmann, & Eichenberger, 2012, p. 312). The theorem is an attempt to model the *behavioural* decisions made by two political parties. The model attempts to hypothesise *rational* voters' ordered preferences pertaining to a given tax schedule, a certain level of a public service or competing policy motions (Inman, 1978, p.45). Voter preferences or voter ideologies or are assumed to be normally distributed along a continuum from low to high demands or from left-to-right respectively. It follows that the median voter of the normal distribution bears the preferences of the majority of voters (Cho & Duggan, 2009, p. 852). More generally, the demand for public sector output reflects that of the median voter.

According to the median voter theorem, the primary objective of the two political parties is to win the elections by maximizing their popularity (Alesina, 1988, p. 796). The vote maximisation will only transpire if the party adopts the preferences of the median voter, who happens to resemble the ideal ideological position of the political centre. It follows that the "greatest advantage of the median voter theorem is that it allows one to analyse social conundrums via the preferences ordering of a single individual- the pivotal median voter" (Romer & Rosenthal, 1979, p. 144). One

crucial implication of the median voter theorem analysis is, however, the full convergence of the two parties' policies (Alesina, 1988, p. 796).

The definition of the theorem above begs the following three questions:

- Why exactly does the median voter reflect political outcomes?
- What is the motivation behind political parties to adopt motions that are close to the desired policies of the median voter, e.g. do they do so to maximise social welfare?
- What are the assumptions of the median voter theorem and does the median voter theorem reflect political outcomes of a democracy?

An exploration of the origins of the median voter theorem will explain the theorem and assist in finding answers to the first two questions above. The median voter theorem has two significant contributors, namely Duncan Black and Anthony Downs. Section 2 below will elaborate on these two authors' contributions to the median voter theorem, keeping in mind that Black (1948) and Downs (1957), in turn, built their notions on the work of other academics.

The detailed assumptions of the median voter theorem known today, stem from the contributions made by the authors discussed in section 2. In section 3, these assumptions will be explored with reference to various empirical studies to find an answer to the third question posed above. This exploration should aid in determining the robustness of the median voter theorem as it stands today and whether it is a powerful enough economic tool to analyse political decision making within a polity.

There is a well of qualitative and quantitative information regarding the median voter theorem. However, a thorough discussion of the origins of the median voter theorem and its evolution thereof is scarcely represented in the academic body. Many academic papers hint at one specific origin of the median voter theorem and / or briefly mention the authors above in their introduction.

The theorem (as its defined in the outline) only fully developed to what it is today with the introduction of the electoral systems in democracies. The self-centred notion of political entities

and personas to formulate policies to win elections rather than winning elections to form policies springs from the electoral political setting. This facet of the theorem has only been briefly mentioned by Congleton (2004). Discussing this distinction in more detail will also add to the academic body.

Another aspect that has not been considered by the existing academic body is to asses the historical timeline of the authors backgrounds. The consideration of the authors' background and specific contributions could potentially add to the value to the academic body.

All in all, the research paper intends to pull and interlink the origins mention in various academic papers on the median voter theorem. This allows for a more thorough representation of the origins of the median voter theorem and paints a broader picture of the evolution of the median voter theorem.

It must be noted that there are many critics to the voter theorem, especially in the empirical realm of the median voter theorem. Criticism does force academia to think about the problem in a different angle. Thus, part of the duty of academia is to entice further research, whether the theorem is valid or not. The median voter theorem may or may not turn out to have the strongest explanatory powers. Whatever the case, it forms part of the path of viewing the polity and its key personas as non-benevolent.

2. The Origins of the Median Voter Theorem

The median voter theorem has two significant contributors, namely Duncan Black and Anthony Downs. Black's single-peaked preferences is a powerful conclusion of voter preference ordering to analyse political decision making. This powerful conclusion, however, is often attributed rather to Anthony Downs (1957) who commercialised it around the 1950s (McLean, McMillan, & Monroe, 1996, p. xii). It is important to note, that Black and Down built their notions on the work of other academics. Exploring the contributions of these two authors will also highlight the work of other significant contributors to the median voter theorem.

The key contributions of Duncan Black were the single-peaked preference curves notion as well as the re-discovery of works by Condorcet and Lewis Carroll (the author of "*Alice in Wonderland"*).

Downs's key contribution, which stems from Harold Hotelling (1929) 'spatial competition theory', can be summarised by Rowley (1984) as follows: "Candidates (parties) would pursue policies designed to maximise votes - the public choice analogue to utility maximisation in the economic theory of consumption and to profit maximisation in the economic theory of production" (p.104).

The sub-sections below will elaborate on the assumptions, implications and re-discoveries made by these two significant contribution authors.

2.1) The Condorcet Winner: Duncan Black's notion of Single-Peaked Preference Curves

Duncan Black was a Scottish mathematician and economist born May 23rd 1908, in Motherwell, Scotland (Rowley & Schneider, 2008, p.77). In 1929, he enrolled for an MA in political economy and political philosophy; subsequently graduating with first-class honours in 1932 (Coase, 1994, p. 187). Black was appointed as an assistant lecturer at the Dundee School of Economics alongside Ronald H. Coase, a Nobel Prize winner in 1991 (Coase, 1994, p. 187). Black was appointed as an assistant lecturer at the Dundee School of Economics alongside Ronald H. Coase (Coase, 1994, p. 187). Dundee University was founded by the founders of the London School of Economics (Rowley & Schneider, 2008, p.78). Black refined his analytical economic toolbox between 1932 - 1934 at Dundee University. Black benefited greatly from discussions with his colleague Ronald Coase, who was, at the time forming his seminal paper on the 'The Nature of the Firm' " (Rowley & Schneider, 2008, p.79).

In 1934, after his move to Bangor, North Wales, Black began to apply his refined economic principles to the analysis of political representation systems (Rowley & Schneider, 2008, p.79). However, in 1935, Black set aside his analysis of political representation, as this work was nuanced and unlikely to advance a professional career of a young economist (Coase, 1994, p. 191).

Nevertheless, in the year 1942, Black discovered the median voter theorem, whilst serving as a civil member in the British World War II government (Coase, 1994, p. 191). Black published his version of the median voter theorem in a paper titled "*Regarding the Rationale of Group Decision-making*" in 1948. Grofman (2004) defined Black's median voter as follows:

> Black's median voter theorem states that, when preferences are single-peaked, majority rule preferences are transitive and the feasible alternative which lies highest on the preferences of the median voter is a majority winner (also known as a Condorcet winner); the median voter can, for an odd number of voters, receive a majority against each and every other alternative in a paired contest (p.43-44).

The terms "single-peaked preference" and "majority winner (Condorcet winner)" need to be further elaborated on for the definition of Black's median voter theorem to make sense. The term 'Condorcet Winner' hints at another contributing author of the median voter theorem. This concept will briefly be eludicated on before illustrating Black's '*single-peaked preferences'* notion.

The work of mathematician and social philosopher Marie-Jean-Antoine-Nicolas de Caritat, Marquis de Condorcet and his "*Essai sur l'Application de l'Analyse a la Probabilite des Decisions Rendues a la Pluralite des Voix"* (Essay on the Application of Analysis to the Probability of Majority Decisions) had long disappeared from the public eye when Black rediscovered it around 1948/49 (Rowley & Schneider, 2008, p.82). Apparently, Black was the first person to fully understand Condorcet (Tullock, 1991, p. 125). Eager to enhance his understanding of the median voter theorem, Black visited the British Museum and libraries in France to learn more about Condorcet (Coase, 1994, p. 195).

Condorcet theorised that a majority of individuals *are more likely* to be correct than just one single individual, especially if it assumption is made that each individual is more likely than not to select the 'better' choice between two competing alternatives (Young, 1988, p. 1232). This notion constitutes the reasoning behind majoritarian decision-making applied in numerous democracies.

To understand why the majority may likely be more correct than a single individual (Condorcet jury theorem) it is necessary to first understand the following concepts: Condorcet's Criterion, Condorcet Winner, or majoritarian candidate[1]. Consider Table 1 below:

Table 1

Voting Matrix with 60 Voters and Three Candidates

	A	B	c
a	-	23	29
b	37	-	29
c	31	31	-

Note: Reprinted from "Condorcet's Theory of Voting", by H.P. Young, 1988, The American Political Science Review, Vol 82, No. 4,p.123.

Each matrix represents the total number of votes received by the row candidate over that of the column candidate. Consider the comparison of candidate *a* versus candidate *b*. This is called a pairwise comparison on alternatives, or in short, an opinion. In Table 1, Candidate *a* received 23 votes and candidate *b* receives 37 votes. It follows that candidate *b* is preferred to candidate *a*. This conclusion can be written in short as the *proposition* $b > a$. The *propositions* of Table 1 are summarised in Figure 1 below:

Figure 1

- $b > a$
- $c > a$
- $c > b$

Condorcet's Criterion: Prepositions that need to hold to make candidate *c* a Condorcet Winner

In Figure 1, how does one determine the ranking of candidates *a*, *b,* and *c*? "The problem posed by Condorcet is to find the ranking of all the candidates that are most likely to be correct, that is, the ranking that would have produced the observed votes with the highest probability" (Young,

[1] The "*paradox of cyclical majorities"* is what Condorcet is most famous for. However, this was just an incidental by-product of what he truly wanted to ascertain: How can the majority make the correct decisions?

1988, p. 1233). It is clear from Table 1 and Figure 1, that c has a simple majority over both *a* and *b*, thus making *c* the *Condorcet winner*.

A preposition or a policy motion is said to be a Condorcet winner, if it beats every other alternative in a pairwise majority vote (Edelman, 2014, p. 210). Therefore, according to Condorcet, the "ranking that is most likely to be correct is *cba*" (Young, 1988, p. 1237). It is important to note here, that candidate *c* will only be best if following two propositions hold: *c* is better than *a* (*c* > *a*) and *c* is better than *b* (*c* > *b*). This is known as *Condorcet's criterion*. A "social choice function is said to satisfy the Condorcet criterion if, whenever there is a Condorcet winner, the social choice function selects it as the actual winner" (Edelman, 2014, p. 210). In summary, the Condorcet Winner or 'majoritarian candidate' is the one that "receives the most pairwise votes and hence receives a *simple majority* (Young, 1988, p. 1239). Condorcet proposed that "whenever a candidate obtains a simple majority over every other candidate, then that candidate is presumptively the 'best' " (Young, 1988, p. 1239).

However, is there always a clear-cut majority candidate? Unfortunately, the Condorcet winner may never arise, as the possibility exists where "candiate A wins a majority against B, who likewise beats C, who likewise beats A" (McLean, McMillan, & Monroe, 1996, p. x). Consider, for example, a scenario where 1/3 of the voters prefer A > B; 1/3 of voters prefer B > C; 1/3 of voters prefer C > A. There is no Condorcet winner in this scenario.

Black was the "first to call the situation where there is no Condorcet winner a 'cycle' " (McLean, McMillan, & Monroe, 1996, p. xi). Black came across this paradox of voting (or intransitivity) in 1946, four years after his median voter theorem discovery. Black (1991) described this discovery as follows:

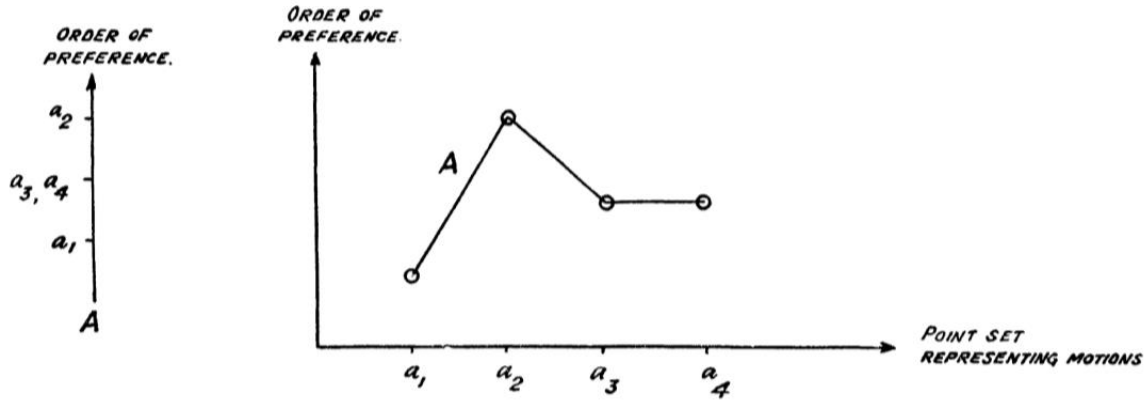
> I took it for granted that with a simple majority in use, the answer, irrespective of the shapes of the preference curves, would be determinate. Later, working out an arithmetical example in which an intransitivity arose, it seemed to me that this must be due to a mistake in the arithmetic. On finding that the arithmetic was correct, and the intransitivity persisted, my stomach revolted in something akin to physical sickness. Not only was the problem to

which I had addressed myself more complicated than I had supposed, it was of a different kind. The result would be determinate for only certain shapes of preference curves (p. 262).

Black "stumbled upon the conditions that underpin vote cycles and quickly recognized that, with vote cycles, there is no majority winner and no median voter theorem" (Rowley & Schneider, 2008, p.81). This "paradox can potentially occur when three or more decision-makers are given the choice between three or more alternatives" (Kurrild-Klitgaard, 2001, p. 135). In such cases, the result may be a 'cyclical' majority. In a "cyclical majority, each alternative can be beaten by another when compared in head-to-head contests" (Kurrild-Klitgaard, 2001, p. 135). Thus, with majority rule cycles in place, no stable equilibrium outcome can exist - no matter what alternative is selected, another alternative can always beat it (Kurrild-Klitgaard, 2001, p. 136). In his single-peaked preference curve notion, Black found a way to avoid the presence of cyclical majority rules, thereby proving his median voter theorem (Grofman, 2004, p. 43). The following paragraphs will illustrate Black (1948) version of the median voter theorem.

To grasp Black's (1948) theory, one must understand the voters order of preferences. According to Black (1948), when voters are asked to devise and rank policy motions put forward by competing politicians, one can reasonably assume that they would following their pre-set schedule of preferences-whatever that order may be (Black,1948, p.23). Assume Voter A votes for a_2 when put against a_1 , a_3 and a_4. The same voter A is indifferent between motions a_3 and a_4. Figure 2 below graphically illustrates this Voter A's order of preference.

Figure 2



Order of Preferences. Reprinted from "On the Rationale of Group Decision-making", by D. Black, 1948, Journal of Political Economy, Vol. 56, No.1, p.24.

Consider the vertical axis to the left of Figure 2. Motion a_2, the most preferred motion out of the four motions, is listed at the top of the vertical axis. Motion a_1, on the other hand, is the least preferred motion and hence marked at the lower end of the vertical axis. Motions a_3 and a_4 are listed right next to each other, pointing out Voter A's indifference between the two motions. Pairing this vertical preference indicator-axis with the horizontal axis, where the competing motions, a_1, a_2, a_3 and a_4 are denoted by the particular points along the line, completes Voter A preference graph.

The points on the graph are joined by a straight line to "merely assist the eye, since the curve would be imaginary except at the four points" (Black, 1948, p.24). Furthermore, the relative *heights* of the points matter rather than the absolute heights thereof (Black, 1948, p.24).

The graph illustrates, that while the "preference curves may be of any shape whatsoever, there is reason to expect that, in some important practical problems, the valuation actually carried out will tend to take the form of isolated points on a *single-peaked curve*" (Black, 1948, p. 24). Thus, a preference curve continuously slopes upwards to a peak and then continuously slopes downwards from that maximum; thereby making the preference curve an inverted U-shaped-curve (Black, 1948, p. 24). The motion that "corresponds to the peak of inverted U-shaped curve resembles the most preferred motion for the member concerned, or simply put, the voter's *optimum*" (Black, 1948, p. 24-25). Now that we have explained Black's notion of single-peaked preferences, how does this relate to the median voter theorem?

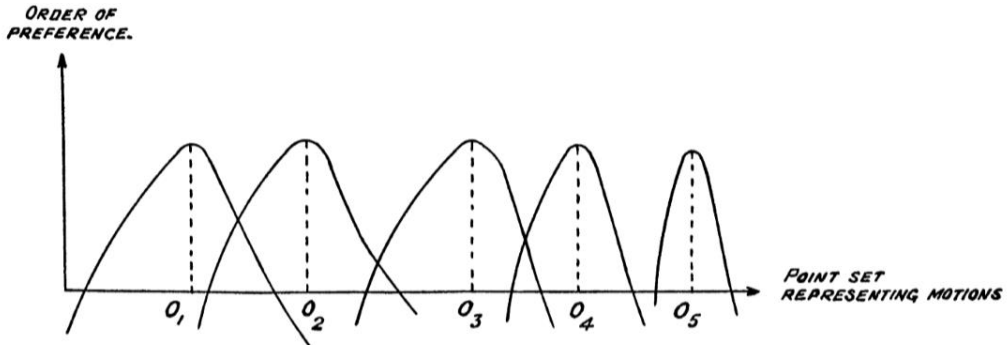
Single-peaked preference curves hint to the fact that only one motion will be able to achieve a simple majority over all other motion. Black (1948), thus, makes the following assumption to avoid the presence of cyclical majority rules:

> It can be shown that, at most, only one motion will be able to get a simple majority over every other. To prove this, let us assume that a_h is such a motion, i.e., that a_h can get a simple majority over every other. And let us assume that this is also true of some other motion, a_k. By our first assumption, however, a_h can get a simple majority over every

other motion, including a_k. Therefore a_k cannot get a simple majority over a_h. Hence, at most, only one motion can get a simple majority over every other (p.26).

However, what exact motion will most likely win when mapping out the preferences curves of say, five voters? To answer this, consider Figure 3 below.

Figure 3



Preferences Curves of Five Committee Members. Reprinted from "On the Rationale of Group Decision-making", by D. Black, 1948, Journal of Political Economy, Vol. 56, No.1, p.26.

Within a committee, only a finite number of motions can be put forward and voters will consider these finite options in relation to their personal optimum. Each voter's optimum is marked with O_x respectively. Based on the graphs, Black (1948, p.25) constructs two assumptions. According to Black, it is reasonable to expect that the farther away the proposal made falls below or above the voters optimum, the less she/he esteems the motion concerned. His second assumption states that "when m motions ($a_1, a_2, \ldots, a_m$) have been put forward, the committee places each of these motions against every other in a vote and picks out that motion, which will be able to get a *simple majority against every other motion"* (Black,1948, p. 25). In short, the members of the committee will select and enforce the Condorcet Winner.

Given the above assumptions and Figure 3, consider the following preposition: $a_h < a_k \leq O_1$. The preference curve (irrespective its precise shape) of each member is upward sloping from a_h to a_k. Motion a_k , "which stands at a higher level of preference on the curve of each voter, will get a 5:5 majority against a_h "(Black, 1948,p.26). With preposition: $a_h < a_k \leq O_2$ in place, those with optimums at or above O_2 (four member in the case of Figure 3) also have a upward sloping

preference curve from a_h to a_k. Here, however, a_k will only receive at least a 4:5 majority against a_h (Black, 1948, p.26). If $a_h < a_k \leq O_3$, "a_k will get at least a 3:5 majority against a_h. Similar relations hold for motions corresponding to values above O_3" (Black, 1948, p.26).

So, what motion can defeat every other by at least a simple majority? Interestingly, the preference curves of at least three members are downward sloping leftwards of O_3. On the other hand, the preference curves of at least three members are downward sloping rightward of O_3. In short, Voter 3's optimum has a 3:5 majority. Therefore, the motion corresponding to the ***median*** voter's optimum O_3, will defeat all other motions by at least a simple majority (Black, 1948, p.26). In short, the median voter's preferred motion will most likely win the simple majority, making it a so-called '*Condorcet Winner'*.

All in all, Black's single-peaked curve is "one that changes its direction at most once, from up to down" (Grofman, 2004, p. 43). This notion ensures that there are no cyclical majorities. This allows the median voter theorem to hold for committee decisions made by majority voting in a single-dimensional space, where there is an odd number of committee members (Rowley and Schneider, 2008, p. 80). In Black's single-peaked preference curves, the median voter's optimum receives the majority vote in the pairwise competition, making it a Condorcet Winner and thus a stable equilibrium. However, Black's version of the median voter theorem only holds when there are no cyclical majorities. Cyclical majorities are only avoided when two parties are considered and when two voters are **not** given the choice between three or more motions. Furthermore, voters' preference curves are required to be single-peaked. Furthermore, a simple majority win requires the number of committee members to be odd.

2.2) Duncan Black's rediscovery: Lewis Carroll's parliamentary representation principles

Duncan Black also borrowed concepts from other writers beyond Condorcet. Between 1951 and 1952, whilst trying to discover if he had any British precursors, Black stumbled across English logician, mathematician and author Lewis Carroll's (the pseudonym of Rev. Charles Lutwidge Dodgson) contributions to election theory (Coase, 1994, p. 195). Black refers to Lewis Carroll's work on voting theory "as the most remarkable contribution to political science since Thomas Hobbs" (Black 1970, p. 1). Due to Black's (1958) clear explication, "Carroll's pamphlets on the

properties of different election rules, vote cycling and 'disequity' are widely recognised" (Dimand, 1993, p. 34).

One of Carroll's pamphlets discussed by Black (1948) is the "*The Principles of Parliamentary Representation*" dated November 5th, 1884 (Black, 1958, p. 191). This pamphlet along with another two pamphlets were published in letter form to St James's Gazette (Black, 1958, p. 191). These pamphlets were Carroll's response to the discussion of electoral reform that had become nationwide in Britain[2] at the beginning of 1884 (Black, 1970, p. 5). Early in 1884, British Prime Minister William Ewart Gladstone tried to introduce the Third Reform Act. This Act was aimed at giving voting rights to agricultural labourers and miners in country districts. Gladstone also promised in the year 1885, to redistribute parliamentary seats more evenly (Black, 1970, p. 5). Interestingly, "the most glaring deficiency in representation was not in the franchise itself but in the maldistribution of parliamentary seats" (Black, 1970, p. 5).

It is useful to take a small break here to discuss what is meant by *proportional representation* and what the difference is to *majoritarian voting*. This should aid in understanding why there was a debate on the redistribution of parliamentary seats from 1850 to 1900. Majoritarian voting, which this paper has mostly been dealing with thus far, occurs when a set of individuals set out to choose the single 'best' candidate or course of action out of the set of candidates and/or motions (McLean, McMillan, & Monroe, 1996, p.xii). The theory of proportional representation, on the other hand, deals with choosing an assembly in such a way that it is representative of those who voted for them (McLean, McMillan, & Monroe, 1996, p.xii).

Under majoritarian voting, an elected official represents the constituents who elected her/him in much the same way a lawyer represents his client in front of a court of law (McLean, McMillan, & Monroe, 1996, p.xii). The agent (in this case the political representative chosen) only has one course of action: winning over the majority of her/his voters to win the election (McLean,

[2] The discussion was not limited to Britain, as "there was a surge of interest in proportional representation in Europe and Australia" (McLean, McMillan, & Monroe, 1996, p. xiii).

McMillan, & Monroe, 1996, p.xii). Proportional representation, on the other hand, "is expressly designed to represent all shades of opinion. This tends to multiply the number of parties represented in the House of Representatives" (McLean, McMillan, & Monroe, 1996, p.100).

The boroughs in 1880 Britain, which should be proportionately represented in parliament, were not represented equally in parliament seats.

> For instance, at one end of the scale a group of boroughs with an aggregate population of .25 million returned 42 members, and, at the other end, practically the same number, 43 members, were returned by boroughs with an aggregate population of 6.73 million (Black, 1970, p. 5).

The above affected a wide range of electoral procedures with resulting multimember constituencies[3], which can be viewed in Table 2 below:

Table 2

Distribution of Multi-member and Single-member Constituencies in the General Elections 1880, 1885 and 1886

General Election	Number of constituencies	Number of constituencies returning 1 member each	2 member each	3 member each	4 member each	Number of members (seats)
1880*	422	196	211	12	1	658
1885	643	616	27	-	-	670
1886		Identical with 1885				

Distribution of Multi-member and Single-member Constituencies in the General Election 1880, 1885 and 1886. Reprinted from "Lewis Carroll and the Cambridge Mathematical School of P.R.; Arthur Cohen and Edith Denman", by D. Black, 1970, Public Choice, Vol. 8 (Spring), p.6.

[3] The situation was similar in 1860 America. Abraham Lincoln "won an absolute majority of the Electoral College on less than 40 percent of the vote "(McLean, McMillan, & Monroe, 1995,p.114)

Table 2 shows that "of the total number of 658 seats in the parliament of 1880, no fewer than 422 were in multi-member constituencies which returned 2, 3, or 4 members" (Black, 1969, p. 207). Furthermore, "in the 3-member constituency, the elector was allowed 2 votes which he could give either to a single candidate or to 2 candidates (Black, 1970, p. 5).

Consequently, the Third Reform Act was passed in December of 1884 and the Redistribution Act in June 1885. The Third Reform Act of 1884 "extended the vote to agricultural workers, while the Redistribution Act of 1885 equalized representation on the basis of 50,000 voters per each single-member legislative constituency. Together these two acts tripled the electorate" (Richard & Foot, 2019). The tripling of the electorate implies a greater and more even proportional representation for 19th century Britain, although limited to male suffrage only.

Now that the historical background in which Carroll found himself at the time has been outlined, this research essay can turn to the context of his parliamentary representation pamphlet. As stated earlier, this pamphlet was a response to the historical debate outlined above. Carroll regards the "choice of an electoral system as being the problem to be dealt with in proportional representation" (Black, 1969, p. 206). The main "purpose in his theory of parliamentary representation is, therefore, to find the mathematical expectation of the percentage of the voters represented in various electoral systems" (Black, 1967, p. 2). The results thereof are summarised in Figure 4.
In Figure 4, the electors in the franchise belong to either the Liberal or the Conservative party. As the number of parliamentary seats was limited, the more seats one party got, the fewer went to the opposing party (Black, 1967, p.3). Carroll applied the technique of a two-person zero-sum game along with the maximin criterion to quantitatively explain the apportionment of parliamentary seats m (Black, 1969, p. 206).

The scenario of the results in Figure 4 evolved from the following assumptions that Carroll made:

i. "There are only two political parties, say A and B. Each party knows the number of its own supporters (as well as the support numbers of opposing parties) and can direct these votes (v) as it chooses" (Black, 1976, p.2).

ii. "The elector only prefers candidates of his own party. This implies that any candidate presented by the opposing party, cannot be voted for. Furthermore, the elector is equally well represented whichever in house-candidate is chosen" (Black, 1976, p.2).

iii. "The electoral system may be such that a constituency has 1, 2, 3, 4, 5, … , m seats. Thus, Carroll's theory will cover all the cases in which the constituency has m members and the elector is allowed v votes, such that $1 < v \leq m$ holds" (Black, 1976, p.2).

iv. "An election to fill say, three seats, will choose the candidates who have the highest, the second-highest and the third-highest numbers. In general, candidates who have the highest numbers of votes (v) are elected, until all the available seats have been filled" (Black, 1976, p.2).

Figure 4

Number of members assigned to each constituency	Number of votes each elector can give					
	1	2	3	4	5	6
1	51					
2	68	51				
3	76	66	51			
4	81	74	64	51		
5	84	79	71	61	51	
6	86	81	74	66	59	51

Mathematical expectation of the percentage of the electorate represented. Reprinted from "The Central Argument in Lewis Carroll's The Principles of Parliamentary Representation", by D. Black, 1967, Public Choice, Vol. 3, No.1, p.2.

Based on the results in Figure 4, Carrol found that the larger the number of seats in parliament and the lower the number of votes per voter, the lower the percentage of unrepresented electorate will be. Consulting any row in Figure 3, it is noticeable that "for a constituency with 2 or more seats,

the smaller the number of votes allowed to the elector, the greater is the percentage of the electorate represented" (Black, 1967, p. 16).

Another conclusion about the number of votes the elector should have can be drawn from Figure 4, by looking along Down's table columns . The "smaller the number of votes allowed to the elector, the greater is the percentage of the electorate represented", implying that "the percentage represented is at a maximum when the elector is allowed a single vote" (Black, 1967, p. 16).

In summary, according to Carroll, the soundest electoral system will be "that member of the family which gives rise to the greatest degree of representation" - or, in other words, "the best electoral system will be that member of the family which maximizes the number of electors represented, and which consequently minimizes the number of electors unrepresented" (Black, 1969, p. 206). According to Carroll, this is achieved in an "electoral system based on large constituencies, with four or five seats, in which the elector is allowed a single vote" (Black, 1969, p. 209).
Unfortunately, like Black's (1948) single-peaked preference curves, the results above are based on the assumption of only two political parties: "It gives a neat algebraic treatment of a few problems in voting, but the scheme of P.R. (proportional representation) which it suggests, is entirely dependent on the assumption that there are only two political parties (Black,1958, p. 191).

There was some justification for this extreme assumption. In Carroll's time of writing (the period 1868-1886), the electorate belonged to either the Liberal Party or the Conservative party, making the electoral system a two-party set-up (Black,1958, p. 191). Carroll's parliamentary representation interpreting the two-party system in politics is akin to Game Theory. However, since "Game Theory was not officially invented until the appearance of a paper by John von Neumann in 1928, the booklet's lack of success is not to be wondered at" (Black, 1970, p. 5). It was due to Black's rediscovery of Carroll's work, that these have now found its place in Public Choice.

2.3) Competition tactics: Hotelling's Spatial Competition Theory

Duncan Black's rediscovery of Lewis Carroll's parliamentary representation highlighted the importance of the percentage of representation within an electoral system, and with it the competition amongst political candidates. Harold Hotelling, another contributing author, discussed

the median voter theorem in terms of competition theory in his “Stability in Competition” paper published in 1929.

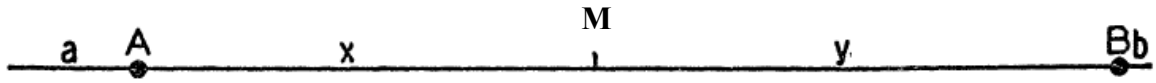
Harold Hotelling was a mathematical economist and statistician born on September 29th, 1895 in Fulda, Minnesota (Darnell, 2012, p. 2). “Hotelling belongs to a small group of scholars who came into economics from a formal training in mathematics” (Samuelson, 1960, p. 21). Hotelling’s contributions to economics “range over a wide area and are unified by their use of mathematical tools of analysis which enabled him to derive results which had, until then, been inaccessible to economists” (Darnell, 2012, p. 9). One such mathematical tool used by Hotelling is the “principle of minimum differentiation”, which is described in his "Stability in Competition” paper (Brown, 1989, p. 451). This principle is familiar with many generations as the problem of two ice-cream vendors that contrive to cluster together in the centre of a beach (Brown, 1989, p. 451). Interestingly, Hotelling was not directly concerned about the location of the firms, nor did he make any reference to ice cream vendors as many modern microeconomic textbooks infer (Brown, 1989, p. 451). Hotelling was “trying to show that price stability was possible in the case of a two-firm competition (duopoly), without resorting to collusion” (Brown, 1989, p. 451). However, it is the spatial location notion that is of most value to the median voter theorem.

In his paper “Stability in Competition”, Hotelling (1929) studied the equilibrium of spatial economic competition between two firms. He started his paper by observing that some consumers choose to buy a commodity from a seller, whose price is slightly higher than that of his competitor (Hotelling, 1929, p. 41). The observation suggests that there is more than just one price of a commodity in a market. This in contrast to the Cournot (1837) and Bertrand (1883) models. In these two models, a minute increase in price will send all the customers to the competition. Hotelling, however, notes that a minute increase in price by one seller will divert only a few customers to the competition and not necessarily the masses of customers. “The gradualness in the shifting of customers from one merchant to another as their prices vary independently is ignored in the examples worked out by Cournot and Bertrand” (Hotelling, 1929, p. 44).

Hotelling (1929) thus suggested, that other than the price of the commodity, the *location,* and the *cost of transportation, i.e. transaction costs* of the business matter to the consumer (Hotelling,

1929, p. 44). To understand why this may be the case, consider Hotelling (1929, p.45) spatial illustration of two firms in Figure 5.

Figure 5



Spatial competition between two firms. Reprinted from "Stability in Competition", by H. Hotelling, 1929, The Economic Journal, Vol. 39, No.153, p.2.

All consumers are uniformly distributed along this linear market set-up (Hotelling, 1929, p. 45).[4] The two firms are spatially located at *A* and *B* respectively (making this a model duopoly). Firm *A* sells q_1 at price p_1, whilst Frim *B* sells q_2 at price p_2. Each consumer transports his or her purchase home at a transaction cost of c per unit (Hotelling, 1929, p. 45). Furthermore, no customer "has any preference for either seller except on the grounds of price plus transportation cost" (Hotelling, 1929, p. 45). Of course, there are several possible causes why buyers prefer one seller over the other, but all such possible transaction costs are collapsed in the transportation costs *c* (Hotelling, 1929, p. 45).

Now, it could be that $p_2 > p_1$. If Firm B wants to sell anything he cannot let p_2 exceed Firm *A*'s p_1 "by more than the cost of transportation from A's place of business to his own" (Hotelling, 1929, p. 45). Firm *B* captures the entire segment of length *b* and will thus sell to customers in a segment of length *y*. Length *y* depends on the "differences of prices and transportation costs between him and Firm *A*. Likewise A will sell to all the buyers in the strips of length *a* and of length *x*, where *x* diminishes as $p_2 - p_1$ increases" (Hotelling, 1929, p.46). Suppose now that firm *A*'s location is fixed and firm *B* is free to choose the location of his business (Hotelling, 1929, p. 51). Where would Firm *B* set up shop?

[4] The assumptions that Hotelling (1929) based his notion on proved to be fatal at a later stage.

Firm *B* will strive to set up shop as close to Firm *A* as he possibly can, so as to increase *his market share*[5] (Hotelling, 1929, p. 51). If *A* "is not exactly in the centre of the line, B will choose the side of A towards the more extensive section of the market, making *b* greater than *a*" (Hotelling, 1929, p. 51). Indeed, due to transaction c, consumers will now allocate some of their purchases away from *A* to *B*, thereby increasing B's profit at the expense of A (Hotelling, 1929, p. 52).

Hotelling (1949, p. 53) thus maintains that "as more and more sellers of the same commodity arise, the tendency is not to become distributed in the socially optimum manner, but to cluster unduly". However, according to Hotelling (1929, p. 53), this is a suboptimum solution, a so-called "wasteful private profit-seeking management". Instead of clustering unduly, the firms should occupy symmetrical positions. To make the positions an optimal solution, the two firms should be located at either end of the two quartile points (*A* and *B*).

The unduly clustering or suboptimal equilibrium of the two firms is typically found at the centre of the market (M), which is, in this case, the median consumer. The agglomeration of firms around the median consumer gives rise to the incentive of producing goods that are very much like the previous goods (Hotelling, 1929, p. 54). There is now a tendency to merely make a "slight deviation in order to have as many buyers as possible for the new commodity as there had been for the old" (Hotelling, 1929).

The above-mentioned incentive to mirror one's competition is strikingly exemplified in politics (Hotelling, 1929, p. 54). The undue agglomeration of firms around the median consumer serves as a metaphor for the clustering of political parties around the median voter. The reference of sellers "strung like beads along a road is not only of economic import but is interestingly used by Hotelling to show why two major political parties tend to be so much alike" (Samuelson, 1960, p. 22). Hotelling (1929, stated:

[5] Given that firm A is not located in the exact centre of the line (M).

> The competition for votes between the Republican and Democratic parties does not lead to a clear drawing of issues, an adoption of two strongly contrasted positions between which the voter may choose. Instead, each party strives to make its platform as much like the other's as possible. Any radical departure would lose many votes, even though it might lead to stronger commendation of the party by some who would vote for it anyhow (p. 54).

Indeed, political parties are inclined to offer political agendas that resemble each other closely, just to be as close to the median voter as possible. Furthermore, each candidate tends to reply to questions ambiguously and refuse to take a definite stand concerning controversial topics, for fear of losing votes (Hotelling, 1929, p.54). Just like the standardisation of furniture, Hotelling (1929, p.54) argued, voters are faced with an excruciating and excessive sameness.

2.4) Anthony Downs's notion: A Merger of Hotelling's and Black's paths

Although aspects of the theorem were derived from Harold Hotelling's (1929) analysis of competition in spatial markets and Duncan Black's (1948, 1958) political science findings, the best known statement of the theorem is in Anthony Downs's 1957 paper titled "An Economic Theory of Political Action in a Democracy" (Whiteley, 2007, p. 222).

In his research essay, Downs's underlining hypothesis of the median voter theorem states that "political parties in a democracy formulate policy strictly as a means of gaining votes" (Downs, 1957, p.137). This contrasts with several economic theories, which consider the primary social function of government to maximise social welfare. According to Downs (1957, p.136), it is important to discuss the motives of those individuals who run a government, as their motives are not necessarily benevolent.

The sub-section to follow will connect Downs's (1957) contribution with those of Black (1948) and Hotelling (1927) to further explain the underlying hypothesis. One possible reason as to why Downs's (1957) statement of the median voter theorem is the most prominent, is that he, in a manner of speaking stood on the academic shoulders of his predecessors.

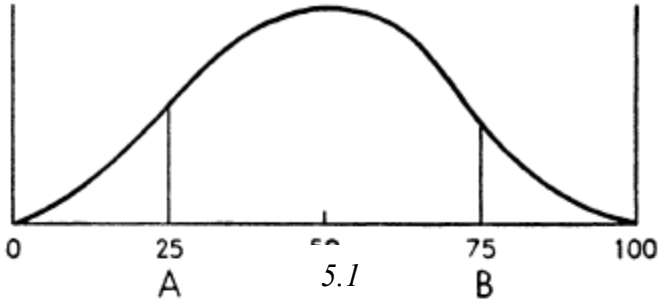
Downs's hypothesis has some resonance with that of Hotelling's spatial analogy for political action which was discussed earlier. Downs's (1957, p.137-142) version of Hotelling's spatial market, however, consists of a linear scale of *ideologies*, running from zero to one hundred in the usual left-to-right fashion with following assumptions:

i) There are two parties (A and B) competing in periodic elections.
ii) The party or coalition who wins majority of votes, gains control of the 'all-powerful' governing apparatus until the next election. No vote of confidence is allowed.
iii) Every citizen has one and only one vote in each election.
iv) Every agent in the model - whether an individual, a party or a private coalition- always behaves rationally.
v) Voters vote according to (a) changes in their utility incomes from government activity and (b) the alternatives offered by the opposition.
vi) Political party ideologies can be ordered from left-to-right (linear) in a manner agreed upon by all voters.
vii) Each voter's preferences are single peaked at some point and slope monotonically downwards on either side of that peak.
viii) The frequency distribution of voters is variable from society to society but fixed in any one society.
ix) The primary factor influencing the voters' estimation of each party's future performances is not its campaign promises about the future but its performance during the period just ending.

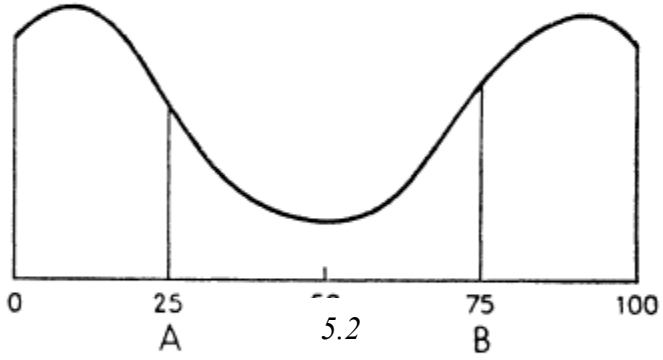
Downs (1957, p.143) then illustrates three different types of voter distributions along assumption (vi). The relevant figures to this essay can be viewed in Figure 6 below. According to Downs (1957, p.141-142), if voters roughly approximate a normal distribution curve, as seen in Figure 5.1, then Hotelling (1929) is correct in stating that the political clustering of the two parties will occur at the centre. At the centre, both parties A (whose starting position is at 25) and B (whose starting position is at 75), could gain more votes than it loses at either ends of the extremes (Downs, 1957, p. 143). However, when the distribution of voters does not resemble that of a normal distribution curve, but instead somewhat like that of Figure 6.2; then the two parties diverge toward either extreme

rather than converge to the centre. Each party "gains more votes by moving toward a radical position than it loses in the center" (Downs, 1957, p. 143).

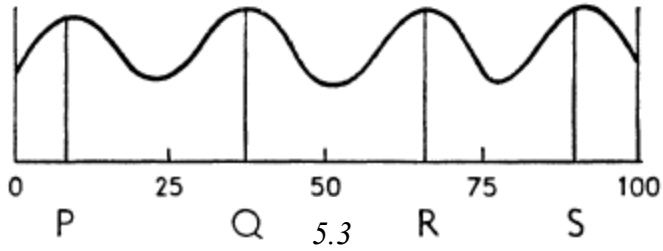
Figure 6



6.1) Stable Democracy



*6.2) P*olarised Electorate



6.3) Multimodal distribution curve

Distribution Curves of Voters along linear scale of ideologies. Reprinted from "An Economic Theory of Political Action in a Democracy", by A. Downs, 1957, Journal of Political Economy, Vol. 56, No.2, p.26.

The clustering of the two parties in the centre of the normal distribution curves suggest that no radical policy should occur in the next election, as the two parties' ideologies resemble each other

closely. Most voters are located relatively close to the "incumbent's position no matter which party is in power" (Downs, 1957, p. 143). According to Downs (1957, p.143), this is a stable democracy.

In contrast, if the electorate is polarised as in Figure 6.2, then a radical alteration in policies may occur, because half of the electorate will always feel that the other half is imposing its policies upon them (Downs, 1957, p. 143). The constant alternation of extreme policies in elections, will diverge the electorate into social chaos (Downs, 1957, p. 143).

Downs's (1957) requirement for a stable government entails a distribution curve that resembles a normal curve. For this requirement to hold, Downs (1957) draws up assumption (vii): "Each voter's preferences are single peaked at some point and slope monotonically downward on either side of the peak" (Downs, 1957, p. 142). This assumption exactly resonates with Black's (1948) formulated inverted U-shaped (single-peaked) preference curve. Assumption (vi) and (v) are akin to Black's (1948) order of preferences illustration in Figure 2 above. In Figure 2, Black (1948) assumes that when voters are asked to devise and rank motions put forward by competing politicians, the voters vote in accordance with their pre-set schedule of preferences, whatever that order may be. In Downs's case, the electorate's primary influence is not each party's future campaign promises, but its performance during the just-ended elections (Downs, 1957, p. 138).

Downs's argument against a voter distribution like that in Figure 6.2, implies that either "the distribution must change or the democracy will be replaced by tyranny in which one extreme imposes its will upon the other" (Downs, 1957, p. 143). Downs's normal voter distribution assumption supports Black's (1948) requirement, which states that only a single party policy motion can achieve a simple majority over every other policy when voter preferences are single-peaked. Recall from section 2.1, that the only time a single motion is guaranteed to achieve a simple majority is in the absence of cyclical majorities. Cyclical majorities (or intransitivities), on the other hand, are most definitely avoided in a two-party system.

The above brings us to the motivation behind assumption (i). This assumption rules out the occurrence of cyclical majorities (or intransitivities). Cyclical majorities, as can be recalled from section 2.1 on Black (1948), is most likely to occur in a multi-party system. A voter distribution

curve like Figure 6.2 will entail majority cycles, which is not viable for a stable equilibrium within an electorate.

Assumption (i) can also be found in the work of Hotelling (1929). Downs (1958, p. 143) maintains that, unlike Hotelling's model, his model can be applied to a multi-party system without a disequilibrium. Downs (1958, p.143-145) indirectly recognised the drawback of assuming a two-party system only by discussing his hypothesis in a multimodal distribution curve of voters seen in Figure 6.3.

Figure 6.3 depicts the distribution of voters as multimodal, where a separate party is formed at each mode. In a multimodal distribution curve, each party is motivated to stay put and differentiate itself as much as possible from the neighbouring parties. If a party decides to move to the left to gain votes, it will lose just as many votes on the right and vice versa. Thus, the best course of action for any party is to stay its course and steer away from any neighbouring parties.

The multimodal strategy is in direct contrast to that of the two-party system, where political parties tend to cluster around the political centre. This, however, gives the voter a wider range of choices, as each party takes a definite political-ideological position. The voters are not confronted with the excessive sameness, which was a drawback flanked by Hotelling in sub-section 2.3.

Interestingly, Downs manoeuvred his way back to his two-party conclusion by maintaining that a multiparty system, which would most likely form a coalition, has a "less definite and coherent program than that of a two-party system (Downs,1958, p.144). This contrasts with Carroll's (1885) parliamentary presentation. Parliamentary representation represents many shades of options, which makes it difficult to form cabinets (i.e. coalitions) to command a parliamentary majority (McLean, McMillan, & Monroe, 1998, p.100). The formation of a coalition thus entails the merger of political ideologies which may create instability. Instability, in turn, makes for a weak government according to subscribers against parliamentary representation. Downs further maintains that even in a coalition government, the government must receive the indirect majority, which is only maintained by appealing to the masses of voters within a "relatively narrow band on the left-right scale"(Downs 1958, p.144). All in all, Downs (1958, p.145) persists that the

distribution of voters determines whether a democracy leads to an effective government, which according to him, should resemble a normal curve (Figure 6.2) relevant to a two-party system.

The distribution of voters begs the question if a two-party or a multi-party set-up represents voters most accurately. Proportional representation has been touched on by Carroll's (1885) pamphlets in sub-section 2.2. Just like in the case of Carroll, the assumption made by Downs is plausible in his time of writing, as the United States is a classic example of a nation with a two-party (Republicans and Democrats) system. Furthermore, another reminiscence of Lewis Carroll's parliamentary representation can be found in assumption (iii): "All sane, law-abiding adults who are governed are citizens, and every citizen has one and only one vote in each election" (Downs, 1957, p. 137). This assumption is borrowed one to one from Lewis Carroll's parliamentary representation theory, that each voter has one vote and one vote only. The borrowing of one vote per citizen brings this research essay to Downs's significant contribution to the median voter theorem, which will be discussed in the sub-section below.

2.5) Anthony Downs's unique contribution to the median voter theorem

Downs (1957), as shown in the preceding sub-section, stood on the academic shoulders of Hotelling (1929), Black (1948) and Carroll's 1885 parliamentary representation treatise. However, Downs's significant additions to the median voter theorem are the considerations of government decision making in the context of imperfect information as well as perfect information (Downs, 1957, p. 138).

According to Downs (1958, p.139) the only relevant point to make in a perfectly informed world is the view that the government places the same weighing on every voter's preferences. Since each citizen has one vote only, the government "cannot gain by trading A's vote for B's (Downs, 1957, p. 138)". In short "the equality of franchise is successful as a device for distributing political power equally among citizens" (Downs, 1957, p. 138).

In a perfectly informed world, no citizen can be influenced by another citizen's vote, as information is freely available to all citizens (Downs, 1957, p. 139). The lack of complete information implies that the gathering of all relevant information on political parties' manifestos, track-record, and so

on is costly. Hence, transaction costs are present. It is reasonable to assume at this point, that political parties do not exactly know what the expectations of voters are. Citizens, on the other hand, have a somewhat rational ignorance as to what the government and its opposition have accomplished in the past election year (Downs, 1958, p.139). This set-up provides a fertile ground for persuasion and bribery, as some voters are now in the position to persuade other voters.

Persuaders provide certain well-chosen facts to overcome the uncertainties of other voters, who may not know what party they prefer, given that information is now costly. However, the motives behind persuaders are not pure as they provide a selection of biased facts to voters that are favourable only to their own agenda (Downs, 1958, p.140). This means that some voters now become politically more important than others, as they can influence more votes than they themselves can cast. This fact cannot be ignored by the government. As a result, "equality of franchise no longer assures net equality of influence over government action. In fact, it is irrational for a democratic government to treat its citizens with equal deference in a world in which knowledge is imperfect" (Downs, 1958, p.140).

The lack of perfect information also makes the governing party susceptible to bribery (Downs, 1958, p.141). It has now become a rational response to persuade the persuaders. The exchange of the persuaders' political help (such as campaign contributions) for policy favours is a transaction deemed eminently rational for both themselves and the government. In a democracy, political lobbying, and the information cost with it is one example of the response to the lack of perfect information. Consequently, imperfect knowledge makes the governing party susceptible to many forms of bribery. "Essentially, inequality of political influence is a necessary result of imperfect information, given an unequal distribution of wealth and income in society (Downs, 1958, p.141)".

On the other side of the coin, the government is itself rather ignorant to what its citizens' desires and needs for government policies are. The government, therefore, must send out trained representatives to discover, transmit and analyse the specific desires of their constituents. Scarce government resources are now deployed to persuade the electorate to vote for the ruling party once again in the next election run.

All in all, Downs (1958, p.149-150) attempted to model government decision-making. The foremost punchline coined by Downs is that politicians do not try to capture the majority of votes to maximise social welfare, because "what reason is there to believe that the men who run the government would be motivated to maximize it? To state that they should do so does not mean that they will" (Downs, 1957, p. 136). A politician's goal is to attain income, influence, prestige, and any other form of glory that is accompanied by gaining office. Their social function of formulating policies and serving their constituents is a mere by-product thereof. Political parties, in response to the normal distribution curve, will thus cluster around the median voter to achieve the majority of votes. However, according to Downs (1958, p.149), this is a rational and efficient response to imperfect information within a democracy.

3. The median voter theorem hypothesis and empirical evidence

Now that the median voter theorem and its accompanying assumptions have been discussed through the exploration of the contributing authors, the research essay can turn to the empirical prowess of the median voter theorem. Empirical evidence is often a robust method of testing economic theorems and their accompanying models. The empirical evidence of the median voter hypothesis in the literature, however, seems to be divisive. There is support for and against the median voter theorem in past decades. The median voter theorem enjoyed a decade of increasing acceptance from the late 1950s to the early 1970s. It has featured "strongly in economic modelling of the local government sector" and became "the dominant approach to the analysis of local resource allocation in the US" (Sørensen, 1995, p. 120). The median voter theorem was so widely accepted, that Holcombe (1989, p.116) noted that articles on the median voter theorem published in journals such as the "*American Economic Review*" and the "*Journal of Political Economy*" accepted the model's outcome without any more evidence than simply citing the mere existence thereof. Seeing as the median voter theorem was honed and popularised by Downs in 1958, this might not be all too surprising.

The median voter theorem became the "most widely used assumption whenever the political process is used to explain an economic issue" (Scervini, 2012, p. 530). So much so, that the "assumptions leading to the median voter dominance have been employed in a wide range of economic contexts. These include pollution control; income redistribution; minimum wage legislation and union behaviour; and, especially, local government provision of goods and services" (Romer & Rosenthal, 1979, p. 144).

Local expenditure does indeed provide fertile ground for the empirical testing of the median voter model. Expenditures are said to be first, "directly quantifiable so that 'objective' measurements of alternatives and policy outcomes are possible" and secondly "local populations tend to be more homogenous than the population of the country as a whole" (Romer & Rosenthal, 1979, p. 146). This particular version of the median voter model "concludes that the median voter's most preferred tax and service package will be chosen under a majority rule" (Bailey & Connolly, 1998, p. 349). In other words, the local government expenditures reflect the desires of the median voter.

Therefore, “the crudest version of the hypothesis assumes that the median voter has the median income of the local community so that local government expenditure should correlate with median income” (Bailey & Connolly, 1998, p. 351). Black’s (1948) median voter theorem is mostly being empirically tested here. Tax and service packages can easily be ordered according to their numeric value, making the preferences single-peaked.

Another fertile ground for the empirical test of the median voter can be found in majoritarian electoral voting. Here, the hypothesis of the empirical test can broadly be collapsed to the conclusion of Downs (1958) and Hotelling (1929) that “political market equilibrium is one in which both candidates adopt the policy position favoured by the median voter” (Rowley, p. 105). This implies that the “median voter within a distribution is the decisive agent in the democratic process” (Scervini, 2012, p. 530). As the median voter is the decisive agent, both the “political decision-makers adopt the preferences of the median voter” and therefore “move towards the point of the median preference” (Comanor, 1976, pp. 169-170).

Comanor (1976, p.169-170) maintains that the wide convention of political decision-makers to adopt median preferences rests on the foundations stated in a paper by Barr and Davis (1966). These two authors proposed a ‘voting rule’, suggesting that an “individual will vote for the candidate whose platform is closest to his own preferred level of expenditures”. Comanor’s (1976, p.176) analysis concluded that under certain assumptions, the entire distribution of preferred expenditures, and not just simply the median value, affects the decision of political officials. However, in cases where preferences are skewed to the right, the degree of “overstatement of actual levels of government expenditures may be relatively small, so that the median voter rule remains a useful means of approximation the results obtained from the actual process of political choice” (Comanor, 1976, p. 176). This is in unison with Downs’s (1958) statement regarding the importance of a voter distribution curve shape.

Studies by Inman (1978) and Deno as well as Mehay (1987) find that variables *not* associated with the median income voter have insignificant explanatory power when running a regression model of local government spending for school districts and municipalities. Similarly, Holcombe (1980) determines “that school district spending in Michigan follows the equilibrium predicted by the

median voter hypothesis" (Turnbull & Chang, 1998, p. 1002). Furthermore, Pommerehne and Frey (1967), as well as Turnbull and Djoundourin (1994), show that median voter specifications tend to dominate the ad hoc alternatives for both Swiss and US local governments. Turnbull and Chang find that "medium-size municipal governments behave 'as if' they maximise median voter utility once controlled for state-specific effects, management structure and populations density" (Turnbull & Chang, 1998, p. 1002).

Nonetheless, during the "last fifty years, many theorists have questioned the result, developing a wide literature on the voting process and its effects on political mechanism" (Scervini, 2012, p. 530). In the 1970s, the model has been questioned so much so, "that by the end of that decade it has been assaulted on so many fronts that it was virtually abandoned" (Holcombe,1989).

The greatest 'assault' came from Romer and Rosenthal paper "*The elusive median voter*" (1979). Romer and Rosenthal (1979) reviewed the empirical work of many economists, like the ones mentioned above, who "have used the median voter paradigm extensively, both in theoretical work and in empirical analysis" (Romer & Rosenthal, 1979, p. 160). Empirical papers such as Barr and Davis (1966), Bergstrom and Goodman (1973), Pommerehne and Frey (1976), Rubinfeld (1977), Inman (1978), and others, were considered in their article. The author concluded that "these studies have not provided strong, broad-based support for the median voter hypothesis, as there is no empirical basis for the median voter assumptions" (Romer & Rosenthal, 1979, p. 161). Romer and Rosenthal (1976) furthermore list three main criticisms of the model:

Firstly, economic studies fail to identify whether local government expenditures correspond to the desired level expressed by the median voter or if they are at some multiple (i.e. twice or one-third) thereof. Secondly, the studies do not confirm that the median voter (or any other voter fractal) is in fact the pivotal voter. Thirdly, basic median voter model is rarely tested against competing models. The superiority of the median voter model can, therefore, not be demonstrated.

The empirical evidence for the median voter model remained divisive during the 1990s up until recently. Sørensen suggested that the "median voter model implies that party affiliation and other characteristics of the representatives are unimportant to public policies" (Sørensen 1995, p.120).

Sørensen has, however, empirically shown that "party affiliation has an impact on demand patterns, while government occupation and committee appointments are major determinants of politicians desired allocation of public services" (Sørensen, 1995, p. 119).

Furthermore, Sørensen argues that the assumptions about to the median voter model are "inappropriate for representative and multi-service local governments" (Sørensen 1995, p.120). He further argues that the "Swiss system is useful to test the model under systems of direct democracy, representative democracy and combined systems" (Sørensen, 1995, p. 121). This was done 17 years later by Stadelmann, Portmann and Eichenberger (2012). The authors confronted the Swiss referenda results with the respective senators' roll call votes from mid-2007 to 2010. The authors find that the median voter model explains "approximately 17.6% points more than a random voting model of politicians flipping a coin when senators decide whether to vote with or against the majority of their constituents"; thereby implying that the "level of congruence between senators and their constituents under majority voting is low and district median voter's preference has a limited influence on overall senators legislative decisions" (Stadelmann, Portmann, & Eichenberger, 2012, p. 314). This mainly tested the median voter theorem as discussed by Downs. Here, the distribution of voters may not be normally distributed, making the median voter theorem prediction not much different from the outcome of a random coin toss.

On the redistribution front of the median voter model, Meltzer and Richard (1981) emphasised voter demands for redistribution: "Using a parsimonious, general equilibrium model in which the only government activities are retribution and taxation, the real budget is balanced, and voters are fully informed, we show that the size of the government is determined by the welfare-maximizing choice of a decisive individual" (Meltzer & Scott, 1981, p. 924). The authors found that the voter with the median income among the enfranchised citizens is the decisive one. Voters with "income below the income of the decisive voter, choose candidates who favour higher taxes and more redistribution; whereas voters with income above the decisive voter desire lower taxes and less redistribution" (Meltzer & Scott, 1981, p. 924). According to Scervini (2012), this stems from the straightforward logic:

> A more unequal income distribution is associated to a poorer median voter, who is able to set a higher amount of redistribution that, in turn, lowers incentives to investments and, ultimately, reduces economic growth This notion was so highly accepted, that a decade later, a group of insightful papers by Bertola (1993), Perotti (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994) focusing on the effect of income inequality to economic growth, keeping the assumption that higher inequality is associated to more redistribution through a median voter political mechanisms (p. 531).

However, Scervini (2012) opposed the above notion, "as the empirical evidence is restricted to a small number of papers that are very far from finding a commonly agreed result" (Scervini, 2012, p. 531). Scervini (2012, p.529) used the so-called "Luxembourg Income Study", which is a higher quality dataset than previously used, to "investigate the size of redistribution relative to different classes of the population and which economic and political aspects can influence the redistributive mechanism" (Scervini, 2012, pp. 529-530).

Scervini (2012, p. 540) concluded that "if one is ready to assume that a negative relation between inequality and redistribution is sufficient evidence in support of the median voter theorem, then it is confirmed". However, "if one analyzes in more detail the characteristics of the middle class and its difference with respect to the rest of the population, the role of the median voter is much more questionable" (Scervini, 2012, p. 540). Interestingly, however, is the fact that "some results could give evidence of an influential role of the middle class, many others go in the opposite direction, suggesting that mechanisms different from those envisaged by the median voter theorem are effective in explaining the amount of redistribution and its recipients" (Scervini, 2012, p. 54).

Scervini (2012, p.531) insinuated that one reason for limited investigation into the model is the "lack of suitable data on individual preferences, income inequality, and redistribution" (Scervini, 2012, p. 531)". Relatedly, de Neve (2011, p.865) argued that the median voter theorem "often lacked adequate data to support theoretical arguments. Attempts at distilling quantitative data on ideology have typically relied on surveys. Unfortunately, survey data are not readily available before 1970 and would be difficult to construct (De Neve, 2011, p. 865). An indicator of voter preference that has gained widespread usage is that of Kim and Fording (1998, 2003). Kim and

Fording (1998) developed measures that allow meaningful comparisons of party and voter ideology across 25 different countries starting in 1945 up to 1998. They did so by developing a measure of “party positions using party manifesto data compiled by Budge, Robertson, Hearl, Klingemann, and Volkens (Budge et al. 1992) and updated by Volkens (1995) later" (Neve, 2011). Essentially, “the position of the median voter is computed from vote shares for the ideologically ranked parties” (De Neve, 2011, p. 865). This data set sheds light on the median voter in over 50 democracies and thus an insight into the evolution of voter preferences. “This data set for the median voter lends itself to a wide range of empirical research in political economy and political science, and is of use to both cross-national and within-country analyses” (De Neve, 2011).

Holcombe (1989) notes that “one of the reasons for the rapid decline in the prominence of the median voter theorem is that it has suffered from excess in the application of its theoretical results to the real world” (Holcombe, 1985,p.117). Bassetto and Benhabib (2006, p.222) studied a simple model of production, where agents are heterogeneous in their initial wealth and where a sequence of redistributive tax rates are chosen through voting. Here the authors relax the single-peaked assumption, since “agents vote over an infinite sequence of tax rates and transfers (Bassetto & Benhabib, 2006)”. Cho and Duggan (2009, p. 851-852) apply a game-theory foundation to the median voter theorem. “Without a game-theoretic underpinning, we cannot confirm that the predictions of the median voter theorem are consistent with the incentives of strategically sophisticated agents (Cho & Duggan, 2009, p. 852)”. The authors show that “as the agents become arbitrarily patient, the set of proposals that can be passed in any pure strategy, subgame perfect equilibrium collapse to the median voter’s ideal point”, thereby “providing a firm bargaining foundation for the median voter theorem (Cho & Duggan, 2009, p. 863)”.

In summary, the above signifies that the assumptions formulated in section 2 by the contributing authors may potentially have no empirical basis to stand on. Preferences are often not single-peaked, as voting cyclical majorities exist. This stems from the view that voters’ opinions may be structured in two dimensions at once. Voters may have to take a position not only on free trade vs. protection but also, at the same time, on high welfare spending vs. low taxation. Furthermore, voters' positions on one issue may not be related to their positions on the other, and the median

voter in a particular issue may not be the same in another issue (McLean, McMillan, & Monroe, 1996, p.34).

Another assumption contributing to the downfall of the median voter is the assumption of two political parties. All three contributing authors' formulation of the median voter theorem is based on a two-party system. The empirical literature has shown no convincing evidence of the robustness of the median voter theorem when it comes to multi-service government, i.e. multiple political parties. Downs (1948) and Carroll (1885), however, have sidestepped this downfall to some extent, as there were only two main political parties in their time of writing.

However, one should not fully discard the median voter theorem. The sourcing of richer data, the relaxation of assumptions and the use of a game theory alludes to the impression that the median voter model can provide a "foundation for a theory of political structure that parallels the theory of market structure, with the median voter model fulfilling a role analogous to perfect competition in the market" (Holcombe, 1989, p. 115). The median voter theorem can be viewed as a simplistic model of aggregate voter preferences. The "same way that individual demand curves are summed in a private market to find the market demand, the median voter model depicts the market demand when aggregating by majority rule to be the demand of the median voter" (Holcombe, 1989, p. 119). The public sector demand can be understood by using the median voter model as a foundation. This should then assist with the basic understanding of the median voter theorem, which is vital for innovative work to occur.

4. Conclusion

Assisted by the growing public recognition of economics as a positive science and a rising public scepticism of politicians' motives, the median voter theorem seized an influential role in the analysis of political representation. This essay showed how the median voter theorem was pieced together by the works of various authors across multiple disciplines. Authors such as Condorcet (a 17th century mathematician); Harold Hotelling (a statistical mathematician); Duncan Black (a macroeconomist); Lewis Carroll (a novelist) and Anthony Downs (an economist and political theorist) all rendered significant contributions to the median voter theorem.

The median voter theorem implies that political parties are perceived to be vote maximising agents, who neglect their social function of formulating policies and serving their constituents. The implicit implication of the median voter theorem is the unduly convergence of political agents' platforms around the median voter ideological preference. Simply put, the demand for public sector outputs reflects that of the median voter preference. These conclusions of the model, however, rest on the three underlying core assumptions developed by the contributing authors. These three assumptions are: *two-party* electoral system with no cyclical majorities, single-peaked preference curve and rational voters who have one single vote to cast.

The empirical literature has, however, produced no convincing evidence of the robustness of the median voter theorem when adhering to all three core assumptions. Several electoral systems have more than two political parties, bringing about cyclical majorities. It follows that the theory performs exceptionally poor when a multi-service government is considered.

The model should, however, not be fully discarded. The model fulfils a role analogue to that of perfect competition in the market. Various empirical studies listed in this essay found informative conclusions by relaxing either of the three core assumptions or by applying game theory principles to the model. By doing so, they have revealed that there may be other representative determinants, such as party affiliation, agenda control, etc. present. These may not have been discovered if the median voter model had not existed. Furthermore, increasing distilled quantitative data on voter preferences can be used to further test the empirical prowess of the theorem. The Kim and Fording

indicator (1998, 2003), lends itself to a wide range of empirical research in political economy and political science. As far as this research paper can tell, there is no empirical paper that has made use of this specific data set to test the validity of the median voter theorem.

Moreover, voters often operate in a world where transaction costs exist. Citizens do not always vote rationally, partially due to the information costs involved in gathering political party manifestos, the accomplishment of the current government in the past election year, the state of the economy, etc. Imperfect information thus sets the scene for voter persuasion and government bribery. Voter persuasion and government bribery signals to the economic body that agents in a polity may be *non*-benevolent. In essence, the relevance of this paper is the recognition to treat political agents as behavioural entities who may not always behave rationally, especially in a world of imperfect information. Also, to see the median voter theorem as a foundation of further research into political decision-making, rather than a set political outcome thereof.

References

Alesina, A. (1988). "Credibility and Policy Convergence in a Two-Party System with Rational Voters". *The American Economic Review, Vol. 78, No. 4, September*, 796-805.

Bailey, S. J., & Connolly, S. (1998). "The Flypaper Effect: Identifying Areas for further Research". *Public Choice, Vol. 95*, 335-361.

Bassetto, M., & Benhabib, J. (2006). "Redistribution, Tax, and the Median Voter". *Review of Economic Dynamics, Vol. 9*, 211-223.

Black, D. (1948). "On the Rationale of Group Decision-making". *Journal of Political Economy, Vol. 56, No. 1, Feb*, 23-34.

Black, D. (1958). "*The Theory of Committees and Elections".* Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, Sao Paulo, Deli, Dunai, Tokyo: Cambridge University Press.

Black, D. (1967). "The Central Argument in Lewis Carroll's: The Principles of Parliamentary Representation". *Public Choice*, 1-17.

Black, D. (1969). "Lewis Carroll and the Theory of Games". *The American Economic Review, Vol. 59, No. 2*, 206-210.

Black, D. (1970). "Lewis Carroll and the Cambridge Mathematical School of P.R.". *Public Choice, Vol. 8 (Spring)*, 1-28.

Black, D. (1991). "Arrow's Work and the Normative Theory of Committees". *Journal of Theoretical Politics, Vol. 3*, 259-276.

Brown, S. (1989). "Retail Location: The Legacy of Harold Hotelling". *Journal of Retailing, Vol. 65,* 450-470.

Buchanan, J. M. (1988). "The Economic Theory of Politics Reborn". *Challenge, Vol. 31, Issue 2*, 4-10.

Cho, S.-j., & Duggan, J. (2009). "Bargaining Foundation of the Median Voter Theorem. *Journal of Economic Theory, Vol. 144*, 851-868.

Coase, R. H. (1994). "*Essays on Economics and Economists".* Chicago and London: The University of Chicago Press.

Comanor, W. (1976). "The Median Voter Rule and the Theory of Political Choice". *Journal of Public Economics, Vol. 5*, 196-177.

Condorcet, M. L. (1785). "*Essai sur l'Application de l'Analyse a la Probabilite des Decisions Rendues a la Pluralite des Voix".* Chelsea, New York: l'Imprimerie Royale.

Congleton, R. D. (2004). "The Median Voter Model". *The Encyclopedia of Public Choice*, 707-712.

Darnell, A. C. (2012). "*The Collected Economics Articles of Harold Hotelling".* New York, London, Berlin, Heidelberg, Lodon, Paris, Tokyo: Springer Verlag.

De Neve, J.-E. (2011). "The Median Voter Data Set: Voter Preferences across 50 Democracies". *Electoral Studoes, Vol. 30*, 865-871.

Dimand, M. A. (1993). "Lewis Carroll, Political Economist". *History of Economics Review,Vol. 19, Issue I*, 34-47.

Downs, A. (1957). "An Economic Theory of Political Action in a Democracy". *Journal of Political Economy, Vol. 65, No.2 (April)*, 135-150.

Edelman, P. (2014). "The Myth of the Condorcet Winner". *Supreme Court Economic Review, Vol. 22, No. 1*, 207-219.

Enelow, J. M., & Hinich, M. J. (1990). "*Advances in the Spatial Theory of Voting".* USA: Cambridge University Press.

Gerber, E. R., & Lewis, J. B. (2004). "Beyond the Median: Voter Preferences, District Heterogeneity, and Political Representation". *Journal of Political Economy, Vol. 112, No. 6*, 1364-1383.

Grofman, B. (2004). "Black's Single-Peakedness Condition". *The Encyclopedia of Public Choice*, 367-369.

Holcombe, R. G. (1980). "An Empirical Test of the Median Voter Model". *Economic Inquiry, Vol. XVIII, April*, 260-274.

Holcombe, R. G. (1989). "The Median Voter Model in Public Choice Theory". *Public Choice, Vol. 61*, 115-125.

Hotelling, H. (1929). "Stability in Competition" . *The Economic Journal, Vol. 39, No. 153 (March)*, 41-57.

Inman, R. P. (1978). "Testing Political Economy's 'as if' Proposition: Is the Median Income Voter Really Decisive?" *Public Choice, Vol. 33*, 45-65.

Inman, R. P., & Rubinfeld, D. L. (1997). "Rethinking Federalism". *Journal of Economic Perspectives, Vol. 11, No. 4, Fall*, 43-64.

Kim, H., & Fording, R. C. (2003). "Voter Ideology in Western Democracies: An Update". *European Journal of Political Research, Vol. 42*, 95-105.

Kurrild-Klitgaard, P. (2001). "An Empirical Example of the Condorcet Paradox of Voting in a Large Electorate". *Public Choice, Vol. 10*, 135-145.

McLean, I., McMillan, A., & Monroe, B. L. (1995). "Duncan Black and Lewis Carroll". *Journal of Theoretical Politica, Vol. 7, No. 2*, 107-123.

McLean, I., McMillan, A., & Monroe, B. L. (1996). "*A Mathematical Approach to Proportional Representation: Duncan Black on Lewis Carroll".* New York: Springer Science and Business Media.

McLean, I., McMillan, A., & Monroe, B. L. (1998). "*The Theory of Committees and Elections by Duncan Black and Committee Decision with Complementary Valuation by Duncan Black and R.A. Newing".* New York: Springer Science and Business Media.

Meltzer, A., & Scott, R. (1981). "A Rational Theory of the Size of Government". *Journal of Political Economy, Vol. 89, Nr. 5*, 914-927.

Neve, J.-E. D. (2011). "The Median Voter Data Set: Voter Preferences across 50 Democracies". *Electoral Studies, Vol. 30*, 865-871.

Qian, Y., & Weingast, B. R. (1997). "Federalism as a Commitment to Preserving Market Incentives". *Journal of Economic Perspectives, Vol. 11, No. 4, Fall*, 83-92.

Richard, M., & Foot, D. "*William Ewart Gladstone"*. Retrieved from Encyclopædia Britannica: https://0-www-britannica-com.innopac.wits.ac.za/biography/William-Ewart-Gladstone on 25th December 2019.

Romer, T., & Rosenthal, H. (1979). "The Elusive Median Voter". *Journal of Public Economics, Vol. 12*, 143-170.

Rowley, C. K. (1984). "The Relevance of the Median Voter Theorem". *Journal of Institutional and Theoretical Economics, Bd. 140, H.1., The New Institutional Economics: A Symposium*, 104-126.

Rowley, C. K., & Schneider, F. G. (2008). "*Duncan Black (1908–1991)".* New York: Springer Science and Business Media.

Samuelson, P. A. (1960). "Harold Hotelling as Mathematical Economist". *The American Statistician, Vol. 14, No. 3 (June)*, 21-25.

Scervini, F. (2012). "Empirics of the Median Voter: Democracy, Redistribution and the Role of the Middle Class. *Journal of Economic Inequality, Vol. 10*, 529-550.

Sørensen, R. J. (1995). "The Demand for Local Government Goods". *European Journal of Political Research, Vol. 27, Issue 1*, 119-141.

Stadelmann, D., Portmann, M., & Eichenberger, R. (2012). "Evaluating the Median Voter Model's Explanatory Power. *Economic Letters, Vol. 114*, 312-314.

Tullock, G. (1991)."Duncan Black: The Founding Father". *Public Choice, Vol. 71, No. 3, Twenty Five Years of Public Choice: A Retrospect and Prospect*, 125-128.

Turnbull, G., & Chang, C. (1998). "The Median Voter According to GARP". *Southern Economic Journal, Vol. 64, No. 4*, 1001-1010.

Whiteley, P. (2007). "Does the Median Voter Theorem wipe out Political Participation? In J. Bara, & P. Weale, *Democratic Politics and Party Competition* (pp. 222-244). London: Routledge.

Williams, D. (2004). "*Condorcet and Modernity".* United States of America: Cambridge University Press.

Young, H. (1988). "Condorcet's Theory of Voting". *The American Political Science Review, Vol. 82, No. 4, December*, 1231-1244.