1 Introduction

In this lecture, we analyze the aggregation of diverse preferences. This enterprise proves a sobering experience and will make us question the efficacy of democracy. We uncover mostly troubling phenomena as a result of aggregating diverse preferences. We might first ask why we might want to aggregate preferences. The simple reason is that there are many decisions and actions whose implications we experience collectively, and therefore, we want to make those decisions and take those actions in such a way that agrees with everyone's preferences. However, as we shall see this proves to be an overly optimistic goal. When people have diverse preferences, we may not be able to define what is a good collective outcome. There may be no consistent formulation of a collective preference. Therefore, it may not be possible to even say "here is what American's prefer." For if our preferences all differ, there may be no collective American preference.

This is problematic. A motivation for democratic and republican forms of government is that they select policies that agree with the will of the people. A government cannot select policies that are reflective of the will of the people if the will of people does not exist. Even if the will does not exist in a formal mathematical sense. Perhaps, we can overcome this problem by applying a rule for preference aggregation. If we all agree that the rule is fair and balances the interests of all, then we might say that the choices that this rule produces represents the will of the people. This approach, as we shall see, fails as well. Any such rule that transforms diverse preference into a collective choice creates incentives for people to misrepresent themselves. And, if people misrepresent themselves, aggregation takes place over false revelations, leading us to question whether the outcomes produced are good ones.

1.1 Individual and Collective Outcomes

The problem that we examine in this lecture is how to transform diverse individual level preferences into a common collective set of preferences. And then how we can use those preferences to make collective choices. In most societies, people rely on political institutions to mediate the process of preference aggregation. This aggregation is
primarily over collectively experienced goods. Prevailing wisdom in advanced societies is that
decentralized institutions like markets can be used to allocate individually experienced commodities.
To make sense of all of this, we begin with a simple and crude dichotomy between
those outcomes that are experienced individually and those that are experienced collect-
ively. I enjoy a cup of tea, my car, my house, my chain saw individually, but
the clean air I breathe, the parks I wander, and the national security I rely upon are
or can be experienced by everyone else. In an introductory economics textbook the
individually experienced goods and services are called *private* and collectively expe-
rienced goods and services are called *public*. Actually, it’s slightly more complicated
than that. A pure public good can not only be consumed by everyone at the same
time, but it is also impossible to exclude people. This non rivalry and nonexclud-
ability obliges that we choose a common amount of public goods. The same is not
true of private goods. Not only do we not all have to drive the same maroon Ford
Taurus, wear the same Levi’s blue jeans, and eat the same hamburger, we cannot. In
an obvious way, excludability and rivalry in consumption enable diversity in choice.
Without them, we would all have to do the same things.

The private public good distinction like most clean and elegant constructions
obscures the interesting in between. First, Most of what we do is neither purely
public or private. The consumption of a purely private good must not have any
meaningful effect on anyone else. If I sit home and work on a puzzle quietly (and it is
hard to work on a puzzle loudly) then this is private consumption. But if I decide to
go for a drive in my car, I’m polluting the air, creating congestion on the roads, and
using up gasoline, a finite resource. All of these things materially effect other people.
Similarly, when someone smokes a cigarette, plants a garden, paints a house, or even
gets new shoes, they impact other people around them.
Second, many of the activities we enjoy involve groups of people. And though it
is trite to say it, the whole in these cases is more than the sum of its parts. A family
dinner is more than the just the food on the plates. The decomposition of thousand
voices or a string quartet into its parts leaves much less than the whole.

2 A Preferences Primer

We begin with an overview of some of the main ideas about preferences and by pinning
down a few formal definitions.

Let’s suppose that we have settled on a set of dimensions or attributes that define
the outcomes. For a given dimension, we can distinguish between three types of
preferences. In defining each type, we take the other dimensions as fixed and ask
what happens to preferences as we vary the level on this dimension. The first type of
preferences include those things for which more is better.

Preferences are increasing along a dimension if more is always preferred to less.
Money and time are examples of things for which most people have increasing preferences. And, we might think that there are many such things, but in fact there are not. Consider time spent at a favorite hobby. While our busy lives might not leave us enough time to pursue that hobby, the fact is that if we could spend all day, every day at our hobby we’d get bored. All play and no work, makes Jack a dull boy. Along most dimension our preferences increase up to a point and then decrease as we get satiated. Even the most dedicated Springsteen fans will ask for a reprieve after the fiftieth consecutive playing of Thunder road. We often think that we have increasing preferences, but this is only because we cannot get enough. Take sleep. Most of us, especially those of us with children, do not get as much sleep as we would like. We would prefer to get eight or even nine hours a night as opposed to the five or six that we shoehorn into our schedules. However, we would not want to sleep twelve hours. This type of preferences is called single peaked because graphical representations show a single peak at the ideal point.

**Def’n:** Preferences are **single peaked** along a dimension if there is an ideal value $A$, such that for values less than $A$, more is preferred to less, but for values greater than $A$, less is preferred to more.

Single peaked preferences are nothing more than a formal representation of the idea that there can be too much of a good thing. Interestingly, while we often here that phrase, we never here its contrapositive: too little of a bad thing. That is because there are many things for which the less we have the better. All else equal the less death, traffic, and pain, the better.

**Def’n:** Preferences are **decreasing** along a dimension if less is always preferred to more.

Goods for which preferences are decreasing are often called bads. And accordingly, public goods for which everyone has decreasing preferences, such as air pollution, are referred to as public bads.

### 3 One Dimensional Diversity: Ice Cream on the Beach

Our analysis relies on a series of simple models and illustrative examples. In our first model, we assume that policies can be placed along a one dimensional ideological spectrum. This spectrum varies from left, which we denote by $L$, to right, which we denote by $R$. In 1938, Harold Hotelling first described this model in the context of firm location decisions, even though firm location decisions take place in two dimensional space. Hotelling considered a single dimensional model because two dimensions was too difficult to handle and his thinking was that insights from the simpler model would likely translate to the more complicated one. In addition, there were cases,
such as ice cream vendors choosing locations along a beach that fit the model exactly.

In his much admired *An Economic Theory of Democracy*, Anthony Downs applied the Hotelling model to position taking among parties. The one dimensional beach becomes the aforementioned single dimensional ideological spectrum from left to right. This model provides the logical foundations for much of how we think about political ideologies. Senators and congresspeople are often placed upon this continuum. And in the national election studies, people are asked to place themselves on this continuum. That we differ and politicians differ in levels of liberalism and conservatism and by how much we differ can now be analyzed within and across populations.

Figure 1

$L \quad \quad \quad R$

We want to think of this as an outcome space and not as a policy space. A liberal outcome might be one in which everyone receives the same absolute tax reduction. A conservative outcome might be one in which everyone gets the same proportional tax reduction. In the latter case, the rich get a larger reduction in absolute terms while in the former the poor get a larger relative reduction. This distinction between policies and outcomes will be play a crucial role later when we discuss potential benefits of diverse preferences.

The next assumption that Hotelling and Downs make is that each voter has an ideal point somewhere in this interval. For example, we might place a voter’s ideal point at $X$. The terminology ideal point implies that this is the voter’s preferred point and it is. Moreover, Downs and Hotelling assume that the closer the outcome is to the voter’s ideal point, the more the voter likes it. This means that a voter has single peaked preferences over this outcome. If moving to the right means providing more of the conservative outcome, then the voter prefers more of conservatism up to a point, $X$, and thereafter finds any increases less appealing. In Hotelling’s version, the consumer’s ideal point was his or her position on the beach and the closer the ice cream truck to the person, the happier the person.

Figure 2

$L \quad \quad \quad X \quad \quad \quad R$

All that remains is to place candidates for office. In the Downs’ model, he assumes that there are two candidates running for office and that each candidate chooses an outcome along this spectrum. Denote the incumbent by $I$ and the challenger by $C$. To see how this model creates political preferences, consider our voter at $X$. The voter prefers the challenger to the incumbent because $X$ is closer to $C$ than to $I$. 
For the moment, let’s suppose that we can place every single voter on this ideological spectrum and that that placement fully reflects their preferences. This is a strong assumption. It implies that all of the preference diversity within the population of voters can be captured by this single dimension. If this is the case, then preference aggregation can work. Imagine that the number of voters is odd and that these voters are spread along this spectrum. The key person in this model is the median voter. There is a voter whose ideal point is denoted by $M$ such that fifty voters have ideal points to the left of $M$ and fifty voters have ideal points to the right of $M$.

Let’s assume that preferences of society are exactly those of the median voter and then check our desiderata. The median voter’s preferences satisfy completeness. Given any two outcomes, either one is closer to $M$ than the other or they are an equal distance away. Thus, we can compare any two outcomes. These preferences are also transitive. If outcome $A$ is closer to $M$ than outcome $B$ is. And if outcome $B$ is closer to $M$ than outcome $C$ is, then it follows that outcome $A$ is closer to $M$ than outcome $C$ is, so transitivity holds. Preferences trivially satisfy unanimity. If one outcome is closer to all voters ideal points than another, than that first outcome is by definition closer to $M$. Preferences also satisfy independence of irrelevant alternatives. If outcome $A$ is preferred to outcome $B$, then $A$ is closer to $M$ than $B$ is. This relationship between $A$, $B$, and $M$ is unaffected by the the existence of some other outcome $C$.

The only desideratum that appears not to hold is that the preferences be nondictatorial. The median voter appears to be a dictator. However, this is not formally true. The median voter is a reflector, much like the people in Magic Town. If we consider a vote between two extremist candidates in which 80% of the electorate prefers one over the other, the median voter has no ability to change the outcome. It follows that the using the the median voter’s ideal point as the collective ideal point is not dictatorial.

As important as the fact that the median voter satisfies the desiderata is the fact that the median’s preferred outcome is the likely outcome from political competition. To see why, suppose that the challenger chooses an outcome to the left of $M$. If the incumbent locates at $M$, then the median voter (at $M$) and all voters with ideal points to the left of $M$ will vote for the incumbent and the incumbent wins. The same argument goes for locating to the right of $M$. Thus, any candidate located at
a position other than $M$ will be defeated by a candidate at $M$. If both candidates locate at $M$, then they will split the vote and tie. Ties rarely occur in real elections, though many elections including some very important ones have been close. Further, empirical evidence gathered by Ben Page and others has shown that in real elections candidates tend to gravitate toward the median voter.

This linking of political outcomes with the median voter shows that an institution, namely winner take all two party democracy, can perform preference aggregation. The reason that this is as important as the fact that the preferences can be aggregated is that knowing that they can be aggregated is not enough. Just as knowing theoretically that nuclear fusion can be a renewable a source of energy is not enough to give us cheap, clean power. We need a process for choosing outcomes that agree with those aggregate preferences, just as we need a process for creating fusion.

The Hotelling Downs model suggests that democracy allows us to aggregate preference diversity by choosing outcomes from the middle. By now we should know that that sort of statement is loaded with implicit assumptions. Not the least of which is that the notion of a middle presumes an interpretation of outcomes that places them along a one dimensional line segment. If instead outcomes lie on a clock face, where twelve is bordered by both eleven and one, and there would be no middle. Though the clock face may seem like a silly interpretation of outcomes, it fits in those cases where the extreme left and the extreme right prefer the same outcome, such as on some issues of privacy. Even maintaining a distinction between the far left and and far right, we might question the unidimensional assumption. Politics may play out on more than just one dimension. Preferences are more diverse than this model allows. Few people define themselves ideologically by a single measure of how liberal, moderate, or conservative. For example, many people, and as a result, many politicians claim to be liberal on social issues and conservative on fiscal issues. We can extend the Hotelling/Downs model to allow for multi-dimensional preferences, i.e. greater diversity. The results are disastrous.