

# A Start on nonmarket valuation:

---

Nonmarket-introduction.doc Edward Morey September , 27, 2018

Note that while these notes are primarily for Econ 2010, I also use them as introductory and refresher notes in Econ 4545

## Valuation and Consumer's Surplus, put simply

I use the term *individual*, to mean an individual member of some species, as in George Bush is an individual, and George the Gorilla is an individual.

(Most economists are typically only interested in individuals that belong to the species homo-sapiens, but there is nothing in economics per se that keeps an economist from including non-human individuals in society.)<sup>1</sup>

## For economists, value is anchored at the level of the individual: an individual associates different values with different things.

It is a measure of the “worth” that an **individual attaches** to a commodity, activity, or state of the world.<sup>2</sup>

Put simply, if commodity A is valued by an individual more highly than commodity B, having A would increase that individual's well-being more than having B would increase his or her well-being. (Often, we use the word *utility* as a substitute for well-being.)

---

<sup>1</sup> Whether to include non-humans has probably not crossed the minds of most living economists. Some famous dead economists thought they should be included.

<sup>2</sup> Note the word “attach.” For economists, a red ball only has value because one or more individuals have attached value to it. Otherwise it would be without value, at least for an economist.

Values, from the individual's perspective, are **relative**.

As in, "I value my friendship with Marc more than I value my friendship with Don." because "I would give up three apples to remain friends with Marc but only two apples to remain friends with Don."<sup>3</sup>

For economists, the values an individual associates with different commodities are expressions of that individual's preferences.<sup>4</sup>

For economists, the value society places on a commodity is the sum of the values (positive and negative) placed on it by the individuals in that society.

(For economists, if the individual members of society do not value a commodity, the commodity has no social value. Saying it another way, values that are not individual based, are not counted by economists.<sup>5</sup>)

An important question then is which individuals count? Whose values count?

Economists typically limit counting to human individuals, but not typically all human individuals. That said, there is nothing in economics that requires this. Note that many environmentalists, and some ecological economists, believe that the preferences/values of

---

<sup>3</sup> Assuming I like apples.

<sup>4</sup> A person is an individual, my dog Giacomo is an individual, a worm is an individual, and my house plant, Wilbur, is an individual, a distinct member of its species. An economist would probably say that an individual who has no preferences cannot value things: for such an individual, there are no values, nothing to count. Some people say that the ability to experience pain is necessary for having preferences. Others would say it is both necessary and sufficient. I am not sure that the ability to experience pain is necessary, but I would say one has to be able to "experience" something; that one has to be able to experience external stimuli at some level, so a rock cannot have preferences. A tree?

<sup>5</sup> Soon I will briefly discuss other notions of value.

non-human individuals (or at least some of them) should count towards social value. (Who should and should not count is an equity question.)<sup>6</sup>

**Value is of critical importance to economists because economists think the best thing to do is the thing that has the greatest value.**

---

<sup>6</sup> Note the distinction between (A) Edward, the individual, is a member of society whose values count directly in the social adding-up. Edward has a dog, Giacomo, whose happiness he cares about greatly. But, Giacomo is not a member of society, so his values **do not count directly** in the social adding-up. And (B), Both Edward and Giacomo are members of society, so both their preferences count directly in the social adding- up. Giacomo's welfare gets weight in both worlds, but in A) his preferences do not directly count; they count only because a member of society (Edward) cares about him.

**Note that many people define value differently from how economists define value.**

For example, many environmentalists would argue that the earth has value independent of how individual humans value it, and that earth's intrinsic value should count when decisions are made about how to use the earth and its resources.

(An economist would either say that there are no such values, or, if there are, they should not be considered.)

Religious people might say that the only values that should count are God's values; that what should be done, or not done, should be determined by the God's values (preferences), not the preferences of men.<sup>7</sup>

Many philosophers, but not economists, talk about whether things can have *intrinsic value*: value not assessed by some *valuer*—built in value.<sup>8</sup>

---

<sup>7</sup> This is not to say that economists believe that people should not believe in God, and, in fact, many economists believe in a God. Rather, in this context, they would describe belief in God as something that affects one's preferences. For example, a believer might not want to sin because sinning increases the probability that he will suffer in hell. That is, sinning, for believers, decreases long-run well-being. If God sends sinners to hell and non-believers don't believe this, then non-believers misjudge the consequences of their sins.

<sup>8</sup> Its value "for its own sake," or "in its own right". As in, a tree has value even if it experiences nothing and has no effect on the welfare of society's members. Tanya, a student, asked me "Can intrinsic values be factored into economic analysis?" Good question. The more general question is whether intrinsic value can be incorporated into decision making—letting things have intrinsic value would, it seems, set economics on its head. How might it work? There would be two kinds of values: economic values, based on the preferences of individuals, and intrinsic values. The decision maker would want to add them together. This would require that they are all in the same units, probably dollars. I am comfortable with measuring people values in dollars because people have use for dollars, but less comfortable saying that a tree has an intrinsic value of \$10? The tree has value, but no one values it? who would assign the intrinsic value? I guess an economist would say that to justify, on efficiency grounds, cutting down a tree, the net benefits, to humans, of cutting down the tree must be greater than its intrinsic value standing.

Economists typically value things in money.

- Could choose some other unit of value (ducks? in “Ducks we Trust”)
- Important thing is to value everything in the same units, so one can compare

The concept of value that economists typically use is called *consumer’s surplus*.<sup>9</sup> I will define it in a moment.

Before I do,

### **I need to make a distinction between market and nonmarket commodities.**

*Market commodities* are commodities that are bought and sold in the market place. Every individual takes the price of the commodity as given and, based on that price, chooses the quantity to purchase.

Price is exogenous, quantity is endogenous.

All the stuff available for purchase in the market place (e.g. Diet Coke)

Most market commodities are congestible – what does that mean?

Write down the names of five things that are market commodities, and explain why they are market commodities.

---

<sup>9</sup> The correct term is “consumer’s surplus” not “consumers surplus.”

In contrast, *nonmarket commodities* are commodities that are provided in some fixed quantity at a zero marginal-cost to the individual(s) consuming it.

Examples include public goods, historical monuments, snow in the mountains, the weather, air quality, how fat or skinny is George, that Trump is President, that Jared Polis is Boulder's representative in the House of Representatives, etc.

What is a public good?

Nonmarket commodities might, or might not be, congestible. For example, national defense is a nonmarket commodity and a public good, so not congestible. But a public park is also a non-market commodity, and it is congestible, so not a "public good."

What does congestible mean? A good is congestible if one person's consumption of the good impinges (congests) on the ability of another to consume that same quantity of that good.<sup>10</sup> So, what is a noncongestible commodity?

Write down the names of five things that are non-market commodities.

True false question: is Rocky Mt. National Park a market commodity or a non-market commodity?

Some aspects of RMNP are market commodities, some are non-market commodities.

---

<sup>10</sup> For example, an ice cream cone is congestible because if I eat it you cannot eat that same cone. My consumption of a specific cone precludes your consumption of that same cone. Santa Claus on Christmas Eve is noncongestible: Santa coming to your house does not diminish his ability to come to my house.



**Let's start with market commodities and ask how one can identify an individual's value for a market commodity.**

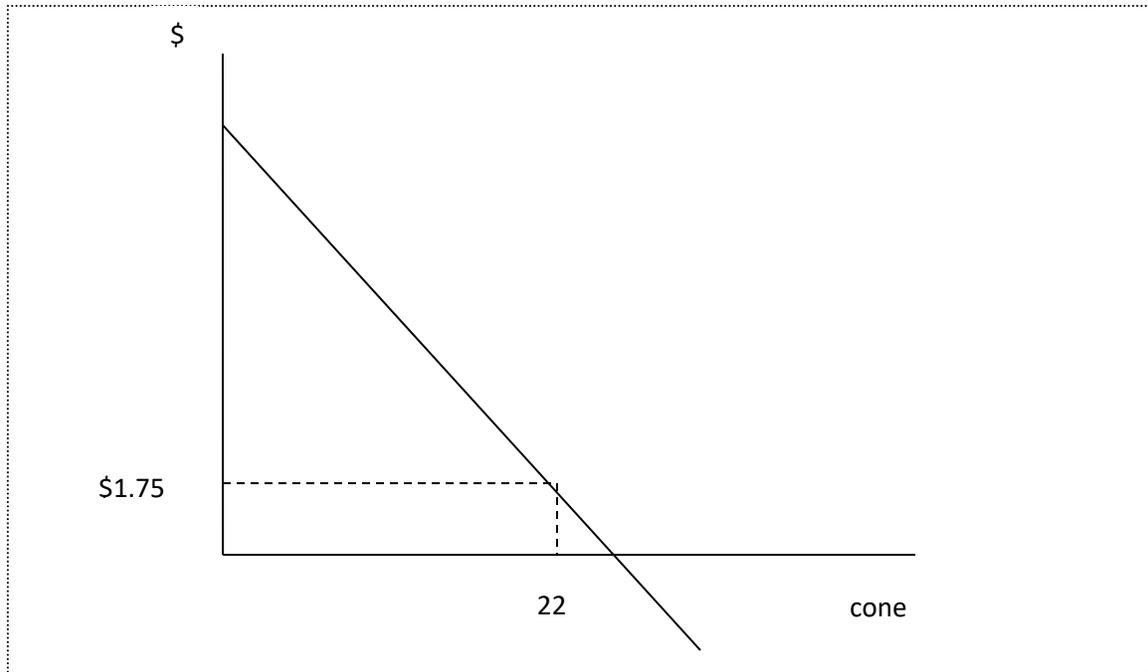
Need to distinguish between:

- Price
- Marginal value
- Total value
- Net value

Assume Ralph's inverse-demand curve (note I put \$ on the vertical axis) for ice cream cones is the simple linear function below.<sup>11</sup> Assume the market price is \$1.75 a cone. From the graph, we see that at this price he chooses to consume 22 cones a year.

---

<sup>11</sup> The terminology with respect to "demand functions" and "inverse demand functions" is often muddled. If the two variables of interest are price and the quantity demanded at each price, both contain the same information. If price is put on the vertical axis (quantity demanded on the horizontal axis) it is most properly called in "inverse demand function" (\$ as a function of quantity). If quantity is on the vertical axis and price on the horizontal axis, it is most properly called a demand function (demand as a function of price). But, many people refer to the relationship as a "demand function" independent of whether \$ are on the horizontal or vertical axis.



Ralph's inverse demand function for ice-cream cones per year ("inverse" because money is on the vertical axis).

- Ralph's inverse demand curve is his marginal value curve for additional cones. That is, it traces out his WTP (willingness-to-pay) for each additional cone. **Estimating demand curves (inverse demand curves) is an exercise in valuation and preference estimation.**
- Note that at around 25 cones, Ralph's WTP for an additional cone is negative: the additional cone makes him worse off, so he would have to be paid to consume it.<sup>12</sup>
- If the price of cones is exogenous to Ralph, and the quantity endogenous, he will consume cones up to the point where price equals the value of the last cone to Ralph (his marginal value)

---

<sup>12</sup> Note that if "WTP" is negative, its absolute value is willingness-to-accept, WTA, as in, what Ralph would have to be paid to eat a cone that is going to make him worse off.

This will be true for not just Ralph; it is true for everyone.

If price is less than his current marginal value, Ralph, or anyone for that matter, will buy, and consume, more.

If price is greater than marginal value, Ralph bought too many (made a mistake)

How much does our Ralph value the 22<sup>nd</sup> cone? He values it at \$1.75.

How much does Ralph value 22 cones a year? That is, what is the maximum he would pay to consume 22 cones?

- Area under the inverse demand curve up to 22.

How much would he pay above and beyond what he currently pays? That is, what is the net benefit he receives from having ice cream cones available for sale at \$1.75 each?

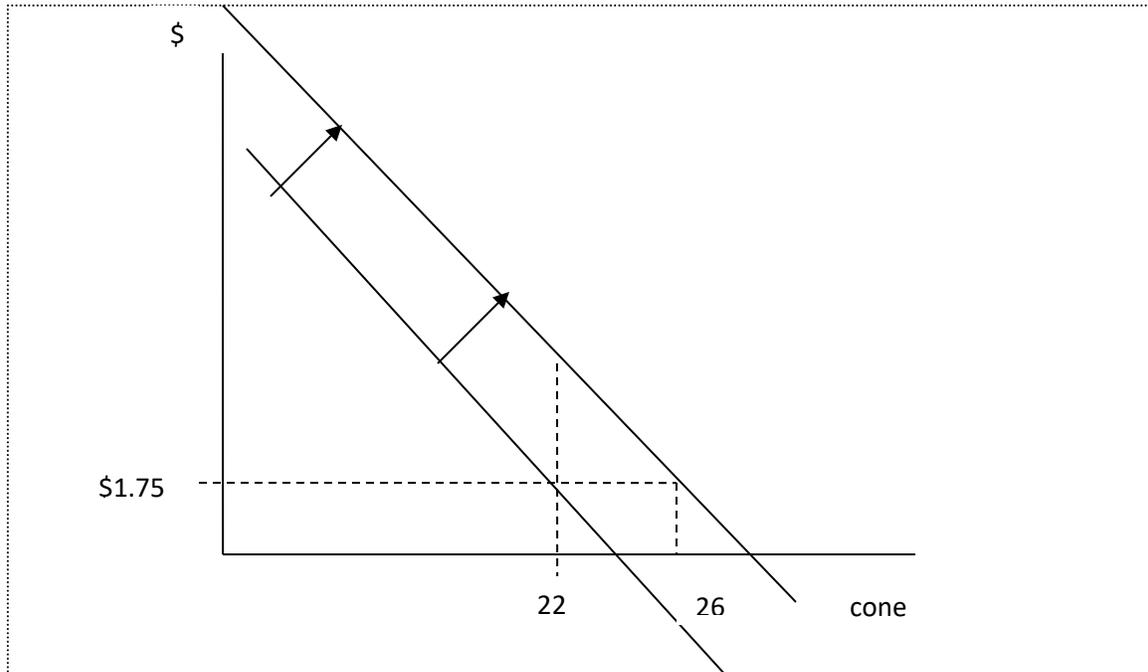
- What do we call this amount? The *consumer's surplus* he attaches to having cones for sale at \$1.75 each, as compared to no cones at any price. It is the area below his inverse demand curve for cones and above the current price.
- This is his willingness-to-pay (wtp) above and beyond what he currently pays to have cones for sale at \$1.75 each.

Can you figure out the dollar amount of the area?

A start on non-market valuation: Edward Morey Sept. 27, 2018



Now consider an increase in the quality of ice-cream cones



What happens to consumer's surplus from cones if quality increases and the price remains at \$1.75?

What would happen to CS if the price remains at \$1.75 a cone, but all flavors but “dog poop” are eliminated.

How about if the temperature rises into the high 90's, the price remaining at \$1.75?

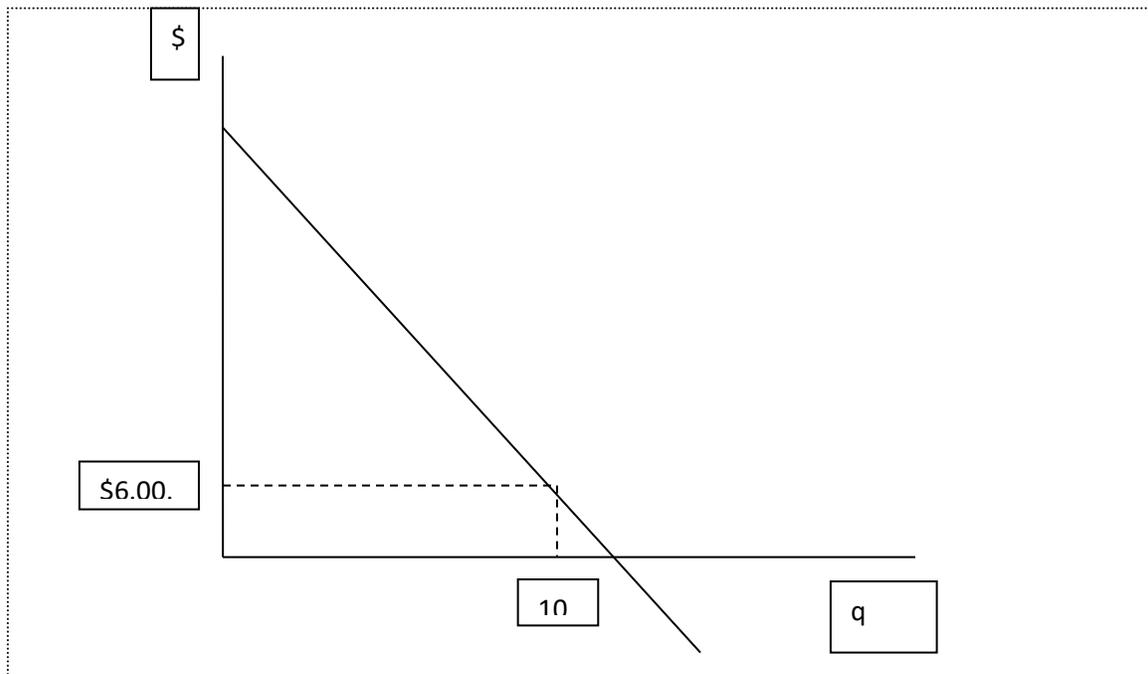
What would likely happen to Ralph's consumer's surplus from cones if the price of a cone remains at \$1.75, but he loses his job, so has less money. Not that poor people have less ability to pay than rich people; so, if we are going to use consumer's surplus as our measure of value, the preferences of a rich person will count more than the preferences of a poor person. If this bothers you, note that the market does the same things (a rich person can buy more stuff than can a poor person).

**Now consider the value to an individual for a nonmarket commodity.**

Draw Ralph's inverse demand curve for nonmarket commodity  $q$ .

$q$ , for example, might be acres of Boulder official open space (measured in 100's of acres). (Do you know about Boulder open space?)

Assume 10 units (1000 acres of open space) currently exists (were produced/supplied/bought by the City)



Ralph's inverse demand function for some non-market commodity,  $q$

What is his WTP to have 1000 acres of open space (10 units) available at a zero price? It is the area under his inverse demand curve to the left of 10 (and above zero).

- In this case, how would you define marginal value? His WTP for another 100 acres (units increased from 10 to 11). It is \$6.

- Note that in this case total value equals net value
- Note that \$6 is **not** a price he can pay to buy additions to open space

What an individual is willing to pay for something beyond what he currently pays is his or her *consumer's surplus* associated with that something.

Would Ralph prefer Boulder with no open space or 1000 acres of open space at a cost to him of \$6 per 100 acres (total cost \$60)? He would prefer the 1000 acres of open space at a cost of \$60. Why?

If it cost him \$9 to have open spaced increased from 1000 to 1100 acres, would he want this increase take place? No

What happens to Ralph's consumer's surplus from open space if its quality is degraded by pollution? If all of it is opened to mountain bikers, and Ralph hates mountain bikers?

**Is consumer's surplus WTP or WTA? And, what is the difference between the WTP and WTA?**

WTP is willingness-to-pay

WTA is willingness-to-accept

Define in words your WTP to be cured of a deadly cancer. Define in words your WTA a deadly cancer.

Does anyone have a syringe or two?

Are they the same? NO.

Not for us to worry about, but the area under the demand curve above the price (what I have called consumer's surplus) is, loosely speaking, an average of WTP and WTA. (This is something to worry about if you are in Econ 4545. These notes are for Econ 2010).

Consider another example: global warming.

Consider the current rate of global warming. Let's assume it is 1% per year. Now consider a program that will reduce this rate of increase by 20% (so the new rate will be less than 1% a year).

Consider two amounts:

Your WTP to have this program implemented (what you would give up in terms of private goods and services to make it happen).

Now assume the program will be implemented at a zero cost to you, and ask how much money you must be paid to agree to **not** have the program implemented. Your WTA the elimination/absence of the program.

Much research suggests that what you would pay to buy something your value (your WTP to acquire it) is less than what you would have to be paid to accept its loss (WTA)

How people value things seems to depend, critically, on whether they “own” it. This empirical finding is problematic for economists.

There are lots of experiments along the following lines. The experimenter finds out how much you would pay for a candy bar (or whatever). They then try to buy the candy bar back from you. And find that what you would have to be paid to give it up is more than what you were willing to pay to acquire it.

WTP typically does not equal WTA

Note that WTP is bounded by your income (ability to pay) but WTA is unbounded. That is, you cannot pay more than you have, but your income does not put a limit on your WTA.

Under U.S. superfund law the polluter is responsible for the damages to the American people caused by the pollution. And damage is legally defined as WTP for elimination of the damages.

Consider the BP oil spill in the Gulf of Mexico.

Which is a better measure of damages from pollution injuries if the intent is to make society whole?<sup>13</sup> WTP or WTA? WTA. Why?

WTP is how much you would have paid to stop the injury (the physical and biological effects of the spill) from happening. But, note that the pollution has already happened.

WTA is how much you would have to be compensated to be *made whole*, after the loss.

We use WTP, not because it is more ethically defensible, but because it is easier to estimate.

---

<sup>13</sup> Here the word “injury” refers to the physical effects, the physical effects of the pollution (fish die, respiratory disease increases etc.). And the word “damages” refers to the negative effects of the physical injuries on people, which are measured in dollars (money). These are legal terms.

Summarizing and repeating, consider the role of WTP and WTA in market transactions.

If I go into a store and leave with a new red dress (I look good in red), the value of the store's inventory has been reduced (their assets are less)

However, they let me walk out with the dress. Why? Because I pay them more than their WTA the loss of the red dress, so, in total, the store is better off because I paid them more than their WTA the loss of the dress.

Why would I do this? I buy the red dress because my WTP for it greater than the price. So, paying the price (having less money) and getting the dress makes me better off (I got a positive consumer's surplus)

**So, a number of years ago I faced the following problem in a legal case.<sup>14</sup> An Indian tribe had been injured, years ago; specifically, it had been forced to leave the river basin where it had lived for hundreds of years and move to a reservation where there was no river. The cause was pollution from mining injuries.**

Put simply, the injury was the loss of the tribe's river-based culture

The Government and the Tribe were recently considering suing the current owner of the river basin for the damages the tribe suffered, and continue to suffer, because they lost their culture.<sup>15</sup>

The economic question was how much the tribe was damaged in \$ because of this injury? WTP would be how much the poor tribe, many years ago, would have paid in \$ to stop the loss of their river-based culture.

(Note that back then most of their exchanges and trades were not in \$, and they had few \$)

Their WTA would have been how much white-man money they would have had to have been given to voluntarily move—to voluntarily give up their culture. Again, keep in mind that most of what they consumed and valued was not bought with white-man money.

WTA would be humongous; WTP, in comparison, a trifle: they had few dollars to pay.

Legally WTP is the measure of damages, but WTA is what would make them whole.

---

<sup>14</sup> I am stylizing the facts a bit to make the point clearer.

<sup>15</sup> Under the law, the current landowner is legally responsible for the damages caused by injuries caused by previous owners. Don't buy a toxic waste dump unless you get it real cheap.

Note to Edward. See also the example about African tribe in book about place.