

DMUU Week 3 self-study – Putting a price on value: WTP, WTA and the BDM mechanism

Overview (about 45 minutes)

In Week 2 we saw that value is an internal state that cannot be observed directly. Economists therefore measure a proxy: the amount of money a person would exchange for a good. This self-study introduces the two standard money measures of value, willingness to pay (WTP) and willingness to accept (WTA), and the Becker–DeGroot–Marschak (BDM) mechanism used to elicit them in experiments. You need all three for Assignment 1.

Step	Material	Time
1	Read the sections "WTP and WTA" and "The BDM mechanism" below	20 min
2	Resources: one short reading and one explainer (see "Resources")	20 min
3	Check yourself: questions at the end	5 min

By the end you should be able to:

1. **Define** WTP and WTA and explain why each is a proxy for value, not value itself.
2. **Explain** the rules of the BDM mechanism and why bidding your true value is the best strategy.
3. **Work through** a numerical BDM example, for buying and for selling.
4. **Describe** the WTP–WTA gap and one explanation for it.

WTP and WTA: two ways to put a price on value

Willingness to pay (WTP) is the highest amount of money you would give up to get a good. **Willingness to accept (WTA)** is the lowest amount of money you would accept to give up a good you already own.

Both translate an unobservable internal value into a number in a common currency. This is exactly the move from Week 2: value itself cannot be measured, so we measure a proxy for it. Money is a convenient proxy because it lets us compare very different goods (a snack, a mug, clean air) on one scale.

	WTP	WTA
Starting point	You do not own the good	You own the good
Question	"What is the most you would pay for it?"	"What is the least you would sell it for?"
Role	Buyer	Seller
Typical use	Pricing, demand estimation, neuroeconomic studies of choice	Compensation for losses (e.g. environmental damage), selling decisions

Surplus. If you buy a good at a price below your WTP, the difference is your *consumer surplus*, your gain from the trade. Example: your WTP for a sandwich is CHF 6 and it costs CHF 4, so your surplus is CHF 2. You will meet this term in the Plassmann et al. paper.

The WTP–WTA gap

Standard economic theory predicts that WTP and WTA for the same good should be almost identical, at least for inexpensive goods. Experiments show otherwise: people typically ask much more to give a good up than they would pay to get it.

- In a classic experiment, students were randomly given a university coffee mug or not. The median owner would not sell for less than USD 5.25, while the median non-owner would not pay more than USD 2.25–2.75 (Kahneman, Knetsch & Thaler, 1990; summarised in their 1991 paper below).
- A meta-analysis of 45 studies found that WTA exceeds WTP on average by a factor of about 7. The gap is smallest for ordinary private goods and largest for goods without a market, such as public or environmental goods (Horowitz & McConnell, 2002).

Two explanations are debated, and both matter for how we interpret any measured value:

1. **Loss aversion / endowment effect:** giving something up is experienced as a loss, and losses weigh more than equivalent gains. Owning the mug changes its value to you. (Loss aversion returns in Weeks 7–8 with prospect theory.)

2. **Elicitation procedures:** part of the gap may come from how the question is asked. When participants were trained on the mechanism, practised it, and answered anonymously, the gap for mugs disappeared (Plott & Zeiler, 2005). For lotteries, however, the gap remained under the same procedures (Isoni, Loomes & Sugden, 2011).

Take-away: a measured WTP or WTA is not a direct readout of value. It depends on who owns the good, how the question is framed and how the answer is elicited. This is why the elicitation *mechanism* matters, which is the topic of the next section.

The BDM mechanism: making honesty the best strategy

If you simply ask people "What would you pay for this?", nothing stops them from answering strategically or carelessly. Becker, DeGroot and Marschak (1964) designed a procedure in which stating your true value is in your own interest. It is now the standard way to elicit WTP and WTA in experiments, including the Plassmann et al. study in Assignment 1.

The rules (buying version)

[embedded content: The BDM mechanism, buying version · 4 steps]

The key design feature: **the price you pay does not depend on your bid**. Your bid only decides *whether* you buy. The price is always the randomly drawn number.

Worked example

A snack is worth CHF 3 to you (your true WTP). The random price is drawn with equal probability from CHF 0, 1, 2, 3, 4 or 5. Compare three possible bids:

Drawn price	Bid CHF 3 (truthful)	Bid CHF 1 (too low)	Bid CHF 5 (too high)
CHF 0	buy, gain 3	buy, gain 3	buy, gain 3
CHF 1	buy, gain 2	buy, gain 2	buy, gain 2
CHF 2	buy, gain 1	no purchase, miss a gain of 1	buy, gain 1

Drawn price	Bid CHF 3 (truthful)	Bid CHF 1 (too low)	Bid CHF 5 (too high)
CHF 3	buy, gain 0	no purchase, 0	buy, gain 0
CHF 4	no purchase, 0	no purchase, 0	buy, lose 1
CHF 5	no purchase, 0	no purchase, 0	buy, lose 2
Average gain	1.00	0.83	0.50

"Gain" = your value (CHF 3) minus the price you pay. Bidding too low only ever makes you miss good deals. Bidding too high only ever makes you buy at prices above your value. Bidding exactly your value is never worse, and sometimes better, than any other bid, whatever the price turns out to be.

The selling version (for WTA)

The same logic works in reverse. You own the good and state the lowest price you would accept (your *ask*). A price is drawn at random. If it is at least your ask, you sell and receive the drawn price; otherwise you keep the good. Asking more than your true WTA only makes you miss good sales; asking less makes you sell too cheaply.

Two practical details you will meet in experiments

- **One trial counts.** Studies often run many BDM rounds but pay out only one, chosen at random at the end. Each decision can then be treated as if it were the only one that matters.
- **Understanding matters.** The incentive only works if participants understand the rules. Many people wrongly believe that bidding low saves money, which is why good experiments train participants and check comprehension before the real task.

Resources (about 20 minutes)

	Resource	What to do	Time
Required	Kahneman, Knetsch & Thaler (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. <i>Journal of Economic Perspectives</i>, 5(1), 193–206 (free PDF)	Read pp. 193–197: the introduction and "The Endowment Effect", including the mug experiments	15 min
Required	Becker–DeGroot–Marschak method (Wikipedia)	Skim: a second description of the mechanism, and a 1797 anecdote about Goethe that shows why the mechanism only works if the hidden price stays hidden	5 min
Optional	KKT (1991), pp. 199–203, "Loss Aversion"	A preview of prospect theory, which we cover in Weeks 7–8	15 min
Optional	The Decision Lab: Endowment effect	A long, accessible overview with everyday examples. It does not discuss the procedural critique (Plott & Zeiler, 2005)	20 min

Check yourself (about 5 minutes)

You should be able to answer these without looking back. Answers are below.

1. Your WTP for a concert ticket is CHF 40. In a BDM procedure, the price is drawn at random between CHF 0 and 100. You bid CHF 40. What happens if the drawn price is CHF 25? And if it is CHF 55?

2. A friend says: "In a BDM auction I always bid a bit below my real value, to save money." Explain why this cannot save money and can only cost your friend.
3. You own a mug; your WTA is CHF 8. In the selling version you ask CHF 12, and the drawn price is CHF 10. What happens, and why was your ask a mistake?
4. Why might the same person state a WTA for a mug that is twice their WTP for it? Give two explanations.

Answers

1. At CHF 25: $25 \leq 40$, so you buy and pay CHF 25, not your bid, a surplus of CHF 15. At CHF 55: $55 > 40$, so there is no purchase and you pay nothing.
2. The price paid is the drawn price, which a lower bid does not change. A lower bid only adds cases in which the drawn price lies between the bid and the true value, and in exactly those cases you miss a purchase you would have liked.
3. $10 < 12$, so you keep the mug. But you value it at only CHF 8, so selling at CHF 10 would have made you CHF 2 better off. Asking more than your WTA only loses sales you would have wanted.
4. (a) Loss aversion / endowment effect: once you own the mug, giving it up feels like a loss, which weighs more than an equal gain. (b) Elicitation: misunderstanding of the procedure, or the way the question is asked, can inflate stated WTA; with training and practice the gap for mugs shrank (Plott & Zeiler, 2005).

References

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