Gains from trade

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CHAPTER OUTLINE

- Introduction
- Utility and valuation
- One buyer, one seller: the sale of one item
- One buyer, one seller: the sale of many identical items
- Gains from trade
- Efficiency

- Discussions
- Conclusion
- Appendix: from utility to valuation
- Exercises

INTRODUCTION

DEFINITION

Trade is a voluntary act between two parties, each giving something to the other in exchange for something else in return.

DEFINITION

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Utility is an abstract concept reflecting the satisfaction an individual derives from an activity. For instance, a consumer will choose alternative A over alternative B if "A brings her more utility than B". Before we start discussing the notion of gains from trade, we should first define what we mean by trade.

The key word in the above definition is "voluntary". Taking something from someone and giving them less than they expect in return is not trade, it is theft. Therefore, speaking of gains from trade is almost tautological. Yet, we choose to devote an entire chapter to the topic because trade between two individuals is a useful starting point to become familiar with the economic way of thinking and with the way markets work.

UTILITY AND VALUATION

The concept of utility

Because both parties involved in a trade have agreed to it, we know that they will both be better off after the trade than before. While this is informative, not all trades are created equal. In particular, some trades may be "better" than others: some transactions may make both parties substantially better off whereas others may make both parties only slightly happier than before.

To gain a better understanding of which trades are better, it is useful to have some notion of "how much happier" both traders have been made by the transaction. Economists have developed a conceptual tool to do so. It is the concept of *utility*.

There are many appealing reasons why one would want to use utility as a decision tool. One such reason is flexibility. Indeed, the notion of utility takes aspects other than mere monetary gains or losses into account. For instance, it allows for the fact that receiving a gift of \$100 makes a person happier when they are a poor student than when they are a rich CEO. Even though the actual gift is the same in both cases, it will likely make a bigger difference in a poor person's life than in a rich person's, for whom it will simply change a number in a bank account. (This aspect is discussed in more depth in Chapter 8.) Similarly, the concept of utility allows for the consideration of dimensions other than monetary. For example, working in a job that pays little but is more pleasant and more fulfilling may bring you more satisfaction – i.e., more utility – than working a monotonous high-paying job.

Despite these important features, the concept of utility suffers from an important drawback: it is impractical. Indeed, utility is so subjective and abstract that it cannot be used directly to compare the situations of two individuals. Would it mean anything to say that Person X is twice as happy as Person Y? Not really. For the same reason, we cannot compare the well-being of two individuals based on their utility.

IMPOSSIBLE INTERPERSONAL COMPARISONS OF UTILITY: THE PROBLEM OF SCALE

As another example, think of how you would answer a customer satisfaction survey asking you to rate your overall satisfaction with a product on a scale of 0 to 100. You might answer 95 because you consider yourself "almost fully satisfied", while your friend might answer 85. Does that mean that your friend did not like the product as much as you did, or does it instead mean that your friend is more conservative in his numerical assessment? To him, 85 may be an excellent score. In fact, he may even have enjoyed the product more than you did, if such comparisons were possible. Even in this very specific case, where you were both given a scale "from 0 to 100", it is still not entirely clear how to interpret your scores in relation to one another.

Valuation

For the reason of impracticality mentioned above, we choose to not rely on utility to assess gains from trade but on a different measure: *valuation*.

By definition, a valuation possesses the remarkable advantage of being expressed in a given monetary currency, which we will take to be dollars throughout this book, unless otherwise specified.

Working with valuations allows for some of the flexibility afforded by utility. For example, the previous situation where an individual preferred a fulfilling but low-paying job over a boring high-paying job can be illustrated using valuations:



You are given the choice between Job A, a stimulating and fulfilling job that pays \$30,000 per year, and Job B, a monotonous and depressing occupation that pays \$70,000 annually. If you only cared about the money, you would choose Job B. However, if you attach value to having a stimulating occupation rather than a dreadful one, you might choose Job A instead. More precisely, if your valuation of a stimulating job versus a dreadful one exceeds \$40,000 per year, you would take Job A.

It is important to keep in mind that, despite the fact that a valuation is expressed in dollars, it does not mean that it is an objective measure. For instance, not everyone attaches the same value to having an exciting job rather than a boring one. You may value this excitement at \$45,000 per year, making you choose Job A in Example 1.1 above, but someone else might attach less value to it, say

DEFINITION

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Valuation is the monetary value that an individual attaches to a given activity.

\$10,000 per year, and would rather take job B. This subjectivity of using valuations is a good thing. It is precisely the kind of information we need in order to assess how much better off a buyer and a seller are as a result of trade.

However, valuation is not a perfect measure. For instance, it is unable to capture how people's well-being is affected by changes in income. Consider once more the example where \$100 was given to a poor person and to a rich person. We argued that the gift made a bigger difference in the poor person's life than it did for the rich person. However, if you asked each of them the monetary equivalent of this gift to them – i.e., their valuation of the gift – they would both answer "\$100". Precisely because a valuation is expressed in monetary terms it cannot capture what economists call "income effects", which the utility concept can. More on how utility and valuation are related can be found in the appendix to this chapter.

ONE BUYER, ONE SELLER: THE SALE OF ONE ITEM

The buyer's point of view

Consider a person who is contemplating purchasing an item. Given the information this person has about the item, about his budget, and about his own desire for the item, he will form his valuation for this item. Suppose that his valuation for owning the item is V =\$30. Recall that this means that he views acquiring the item (for free) to be equivalent to acquiring \$30.

It follows that this valuation, V = \$30, immediately tells us how much the person is willing to pay for that item. Specifically, he will not agree to pay more than \$30, because that would be a losing bargain (i.e., paying more than what something is worth to him). However, if the price of the item is less than \$30, he will agree to purchase it. In fact, \$30 is the highest price he would be willing to pay for the item. (If the price were exactly \$30, he would be indifferent between buying the item and not buying it.) To sum up, **a buyer's valuation is the maximum amount of money he is willing to pay.** In fact, when talking about a potential buyer, we will interchangeably use the phrases "willingness to pay" and "valuation".

The seller's point of view

Consider now a person who is contemplating selling an item. She has an opinion of how much owning the item is worth to her, say, \$20. It is her valuation, which we shall denote by C = \$20. If this potential seller currently has some use for the item – an old bicycle, for instance – the amount C may reflect the value of alternative goods or services she may use instead – like alternative modes of



transportation. If the potential seller has no use for the item but is simply someone whose activity is to produce and sell such items, the amount C may reflect the value of the inputs and money that go into the production of such an item.

Regardless of the potential seller's situation, C can be interpreted as a cost to the seller of providing the item to the buyer. She will not agree to give up the item for anything less than C = \$20. If someone were to offer her more, however, she would gladly accept the trade. In other words, a seller's valuation is the lowest amount of money she is willing to accept in order to give up an item. We sometimes use the phrase "willingness to accept" or "reservation price" when referring to a seller's valuation.

The trade of a single item

Having described under what conditions a potential buyer and a potential seller are willing to trade, let us now consider them together. Suppose, as above, that the buyer's valuation is V and that the seller's valuation is C. We have established that the buyer will not pay any more than V for the item and that the seller will not relinquish the item for anything less than C. Therefore, **trade will only take place if the buyer's willingness to pay exceeds the seller's willingness to accept; that is, if** $V \ge C$.

In order for trade to actually take place, both parties must agree to a price, which we shall denote P. It follows from the previous reasoning that they will only agree to trade if:



Clearly, if P > V, the buyer will leave with his money, and if P < C, the seller will leave with her item. The above expression, " $C \le P \le V$ ", is what we call a *free trade condition*, reflecting the fact that no party was forced into the trade. In fact, this condition guarantees that both parties will enjoy *gains from trade*.

For the buyer, gains from trade take the form of a bargain: the difference between what he was willing to pay and the price paid. Formally, the buyer's gain from trade is V - P. If V = \$30 and P = \$26, the buyer's gain from trade amount to \$4. In other words, to the buyer, this trade amounts to having made a profit of sorts, equivalent to \$4. In Figure 1.1, this is illustrated by the distance labeled (1).

For the seller, the analysis is similar. She was willing to sell the good for C and obtained P > C for it. Hence, her gains from trade take the form of a profit on the sale of the item, equal to P - C. If C = \$20 and P = \$26, the seller's gain from trade is \$6. In Figure 1.1, this is illustrated by the distance labeled (2).



Taken together, the sum of the gains from trade is (V - P) + (P - C) = V - C, which is exactly the gap between the buyer's and the seller's valuations. If the agreedupon price had been a different value than \$26, the division of the gains from trade between both parties would have changed, but the total gains from trade would have been unaffected. In Figure 1.1, this is illustrated by the distance labeled (3). To sum up, **as long as trade takes place, prices have no effect on total gains from trade**.

ONE BUYER, ONE SELLER: THE SALE OF MANY IDENTICAL ITEMS

Many trade situations involve buying more than one item. When doing your groceries, you may have found yourself buying more than one loaf of bread in a single trip, more than one carton of orange juice or more than one grapefruit. In fact, some goods such as bulk cereal, gasoline and electricity are not even sold by the unit but using continuous measures: ounces, liters, and kilowatt-hours, respectively. Therefore, we need to take a closer look at the sale of several identical items in order to take into account most trade situations. To show this, we shall suppose the items considered come in discrete quantities (like grapefruits), but the analysis applies to goods that are sold according to a continuous measure (like gasoline).

The buyer's point of view

To account for the fact that a buyer will potentially purchase more than a single item, we must consider how much he values various amounts of the good. In the previous section, we had denoted by V a buyer's valuation for a single item.

Because the buyer may now buy a quantity q > 0 of the good under consideration, we must find a way to describe his valuation for different values of q.

We shall denote by V(q) the buyer's *total valuation* of acquiring q units of the good. By definition, and building upon the previous section, V(q) is the maximum amount of money the buyer is willing to pay in exchange for a total of q units of the good. As a special case, V(1) = V, the buyer's valuation for a single unit of the good as per our notation in the previous section. Also, V(0) = 0, obviously.

For example, suppose the buyer's total valuation is s follows: V(1) = \$11, V(2) = \$19, V(3) = \$26, V(4) = \$32, and V(5) = \$36. This data tells us that he will not be willing to pay more than \$19 for two units and will not pay more than \$36 for 5 units. This reasoning works well if the good is sold in bundles of, say, 2 units or 5 units. While this is sometimes the case, most goods are sold with a per-unit price, say \$9/unit. When faced with per-unit prices the above reasoning may be misleading, as the following exercise illustrates.

EXERCISE 1.1

Consider the buyer above – with total valuations V(1) = \$11, V(2) = \$19, V(3) = \$26, V(4) = \$32, and V(5) = \$36 – and suppose the per-unit price of the item is \$9. Will he buy two units?

- // A common incorrect answer: Yes, because 2 units cost \$18 and this is less than his valuation for two units, V(2) = \$19.
- // Correct answer: No. He will buy exactly one unit, definitely not two. Acquiring one unit is worth \$11 to him, which is more than the price of \$9. Hence, he will gain \$2 (= \$11 - \$9) from that trade. <u>However</u>, buying a second unit is not worth it to him, because he values acquiring a second unit *given* that he already has acquired one at \$8 (= \$19 - \$11), which is less than the price of \$9.

Marginal valuation

Exercise 1.1 highlights the fact that, although useful, the *total valuation function V(.)* is not the most relevant piece of information in a buyer's purchasing decision. One cannot simply compare V(q) with $P \times q$ and assume the buyer will buy q units if V(q) > $P \times q$ and buy zero units if V(q) < $P \times q$. What matters to a purchasing decision (and to any economic decision, in fact) is, "Given my past decisions, what can I do to improve my situation?".

It follows that a buyer's decision is determined iteratively: If I have already decided to buy q units, will my situation improve if I choose to buy one more unit? The answer will be in the affirmative if and only if the valuation from