

Hidden Value: How Consumer Learning Boosts Output

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Iphones. I pads. Wikipedia. Google Maps. Yelp. TripAdvisor. New digital devices, applications, and services offer advice and information at every turn. The technology around us changes fast, so we are continually learning how best to use it. This increased pace of learning enhances the satisfaction we gain from what we buy and increases its value to us over time, even though it may cost the same — or less. However, this effect of consumer learning on value makes inflation and output growth more difficult to measure. As a result, current statistics may be undervaluing household purchasing power as well as how much our economy produces, leading us to believe that our living standards are declining when they are not.

This disconnect has implications for policy. Economists are more familiar with how learning makes us better workers by increasing our productivity, typically reflected economywide in higher inflation-adjusted wages and output per capita. However, how learning makes us better consumers is less likely to be captured by official measures of consumption and output. To the extent that these statistics might be imprecise, economists are liable to be led astray in assessing the economy's successes and failures, and policymakers may be misled in deciding which actions to adopt.

But how can one measure the impact of consumer learning on the well-being of households? First, we need to explore just how learning affects value.

Then we will turn to theories of consumer preferences and behavior that take learning into account. They may point us toward more accurate ways to estimate inflation and output growth than measuring prices directly.

MORE BENEFIT PER DOLLAR SPENT

In this era of rapid innovation and creativity, consuming so many new products typically involves learning both before and after we purchase them for the first time. Acquiring information about a product we haven't bought before is so automatic that we may hardly notice it as an economic phenomenon. Indeed, if the product is novel, we *must* acquire at least some information: First we find out that the

product exists and then what its characteristics and performance are like. This information acquisition in turn lowers the risk associated with any given purchase and, on average, will raise the amount of pleasure or use we get from it.

Consider all the information available to help us decide to see a movie. We can look at trailers in the theater or online; we can read reviews and compare the number of stars the movie gets from critics or fellow moviegoers; and we can ask our friends. Similarly, when deciding on a restaurant, we can consult online sources like Yelp, Zagat, or Chowhound; we can examine the menu and prices; we can read a review in the local paper; and we can listen to our friends' suggestions. All this information-gathering raises the probability that we will enjoy the movie or restaurant more than if we had chosen blindly. When we take the time to find out more information, we are able to select products most suited to our tastes and will generally experience higher satisfaction per dollar spent, given a fixed menu of choices, than we otherwise would. Raising our satisfaction per dollar may also make us more willing to buy more products within that category.

A second layer of benefits occurs through use: Using the features on my e-mail or word processing program becomes second nature as, one by one, I try out new tasks. This form of learning-by-doing raises the product's value in later uses; once I know that a feature exists and how to use it, I can more quickly find it and use it. As I learn to use my smartphone by



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making a call or finding a destination or taking a picture or watching a video clip, using it becomes faster and more successful.¹ Moreover, with cheap memory and computing power, we can customize the devices and applications to our needs. Using an application can also result in a valuable history to tap later: The letters I have written and the PowerPoint slides I have produced in the past may have pieces that I can insert into new e-mails and presentations. In many cases, the application has the ability to learn our habits and guide us to better choices, sometimes using the preferences of other users who make choices similar to ours. For example, Netflix looks at our past movie choices to suggest new ones.

What is economically significant about this form of learning is that the product is the same, but we value it more. Yet, standard measures of economic output miss this increase in value because the product appears unchanged. As a result, statistics measuring overall consumption may be too low.²

For example, let's consider how we value an Internet connection. Entrepreneurs keep developing search engines, aggregators, instructional sites, and various applications that make our use of the Internet more efficient. Plus, smartphones and tablets make it easier to connect whenever we want and wherever we are. All of this infor-

¹ Although this article does not explore the notion, it must be admitted that there is a countervailing truth: Our existing knowledge may become outmoded at a faster rate as new technologies race at us. This depreciation of our knowledge is a cost of rapid technological progress but is also something we have difficulty measuring.

² Another interesting implication of consumer learning is that it may be one reason that so-called early adopters are willing to pay a higher initial price for the latest technology. Even though they realize the price will drop later, they know they will become better off as they learn more about the product.

mation allows the smart consumer to choose movies, TV shows, restaurants, and a myriad of consumer products and services that are more to our liking. The cost of the better information that helps us make these better choices has fallen, allowing us to derive greater satisfaction from what we buy. Thus, our knowledge of the Internet enhances the value of — and spurs the development of — new ways to reach it.

Yet, so much of the content on the

has gone up, then this is not the right measure of our inflation rate, since the quality of the service has risen and we get more for the price.

Similarly, our cable TV bills (as measured in the U.S. CPI index of “cable and satellite TV and radio”) have risen at an average annual rate of just over 2 percent over the past five years. Does this rate fully reflect the greater value we derive from cable service? When we first use cable TV, we may

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Internet — videos, TV shows, music, and social media — is available at no extra cost. So, as we learn about the Internet, we use our connection to it more intensively, but we don't pay more. The Internet connection itself is unchanged; what is changed is the content and interactions it gives us access to. Because if the satisfaction we gain from the Internet connection is greater, we would be willing to pay more for it. But if the market for Internet connections is competitive, we don't have to: Competition prevents providers from charging more as Internet offerings expand, so we get more value for the same amount of money.

But does this improvement in our welfare show up in measures of real consumption and growth? Typically not. The monthly fee we pay to the Internet service provider this year is buying more for us than the monthly fee we paid five years ago. If the fee has gone up, we measure this as pure inflation: The price of “Internet services and electronic information providers” in the U.S. Bureau of Labor Statistics' consumer price index (U.S. CPI) has gone up at an annual rate of 1 percent. But if the satisfaction we have gained as we use the Internet more intensively

know only a few channels. Over time, as we channel-surf and learn more about the content shown on different channels, we may become attached to three or four channels we didn't know about before. As a result, access to cable TV becomes more valuable to us. But how can we measure that value?

MEASURING THE VALUE OF INFORMATION

Consider a traveler planning to go to a foreign city for the first time. Initially, the traveler sees that hotels A and B are equally priced and have similar luxury levels as measured by that country's rating scheme. But the Internet allows the traveler to see reviews from other travelers, detailed maps of the hotels' locations, and lists of the hotels' amenities. Let's say that the more knowledgeable concierge at hotel B is worth \$10 a day to the traveler. Learning about the concierge over the Internet makes the traveler better off by \$5: In the absence of this information, the traveler would have chosen randomly between the two hotels and would have gotten the good concierge half the time, for an expected value of \$5. But with the information obtained from the Internet, the traveler gets

the good concierge all the time, for an expected value of \$10. With better knowledge, the traveler gets more satisfaction from the same set of choices at the same price. Here we can quantify the improvement as \$5. The traveler knows how much to value the concierge and would have been willing to pay \$10 more to stay at that hotel than at the other.

But measuring this value may require new methods. Statistical agencies charged with measuring prices usually simply ask the hotels what prices they charge. Instead, an agency might have to survey consumers to elicit these evaluations. Alternatively, Internet-savvy hotel operators or tourist organizations could do experiments to elicit the extent to which customers are willing to pay more for superior information.

The effect of learning on value isn't limited to technology. For instance, learning to play an instrument often deepens our understanding and enjoyment of music. The information we gain isn't only steering us to the music we prefer; it also deepens our appreciation of the music. We make a human capital investment that improves our ability to consume, similar to a long-term investment in a home or an education that makes us better able to earn a living. Here we might wish to quantify the investment in information that consumers make in order to quantify the value of the information, in the same way that we might measure a consumer's investment in a home or a car.

To analyze consumption when learning is occurring, let's first explore some underlying theory regarding estimating changes in prices and output. This theory will allow us to construct a stable "utility function," a method of representing consumer preferences that permits us to assume that there are bundles of products and services across which a consumer is indifferent: He

or she would be just as happy with one bundle as another. It is this assumption — that we can find bundles of products across which consumers are indifferent — that economists rely on to estimate inflation and economic growth. We will then discuss how behavior is different in situations in which learning is occurring and how these changes in behavior influence pricing and welfare.

GENERALIZED UTILITY FUNCTION THEORY

In a classic 1977 article, "De Gustibus Non Est Disputandum,"³ George Stigler and Gary Becker argue that human tastes are fundamentally the same; they "neither change capriciously nor differ importantly between people." Where it appears that tastes vary, Stigler and Becker widen the notion of consumer preferences from specific goods and services to broad, unchanging categories that they call commodity objects of choice. These stable preferences have goods and services as inputs, but also the consumer's time and human capital such as education and the acquisition of information. Thus, individuals can actively shape the satisfaction they derive from specific goods and services by obtaining knowledge. But Stigler and Becker point out that this broader way of looking at preferences changes the nature of income and prices.

Stable preferences are key to measuring inflation. Ordinarily, if we can identify bundles of consumer goods and services about which a consumer is indifferent in two successive years, this starts us on the way to estimating inflation and output growth between the two years. We first look at what the consumer actually bought in the first year and then ask how much that exact set of goods and ser-

³ Translatable as "There's No Arguing About Taste."

vices would cost in the second year. This provides us with a measure of the rate of inflation the consumer faces. Alternatively, we can measure the set of goods and services the consumer actually bought in the second year and ask how much that set would have cost in the first year. This second measure of inflation is typically lower than the first one.⁴ We can use either measure, or we can average the two.

If we believe that consumers have stable preferences over these products — that is, more or less unchanging utility functions — then we can say that if consumers' incomes in the first year rise at the rate of inflation, consumers could afford to buy approximately the same goods and services they had bought the year before and are just as well off. We then can say that their real incomes haven't changed. If their incomes are 2 percent higher than the rate of inflation, we say that their real incomes have risen by 2 percent, because they can buy 2 percent more than they could the year before. But if consumers' utility functions change over time, this claim might become dubious: If last year I liked fish and bought a lot of it, and this year I don't like it as much but still buy a lot because it is cheap, then I may be worse off, though I am buying the same amount. To be sure, our preferences may fluctuate; I may prefer fish one year, meat another. But these back-and-forth changes may not matter to our overall measures if these fluctuations cancel out — for every individual who likes fish less, another likes it more. What Stigler and Becker were concerned with were systematic changes in taste.

⁴ The bundle bought in the second year is typically cheaper because goods and services increase in price at different rates, and consumers tend to buy less of the more expensive goods. So the second year's purchases will typically have fewer of the goods whose prices rose more rapidly.

The generalized utility function is stable. To demonstrate how underlying preferences may be seen to be stable, Stigler and Becker cite what appears to be an example of a changing utility function: addiction — the phenomenon that “smoking of cigarettes ... or close contact with some person over an appreciable period of time often increases the desire (craving) for these goods or persons.” But if we reformulate the specific product *cigarettes* into the broader commodity *smoking*, or *close contact* into the commodity *loving*, perhaps we can understand them as stable human behaviors.⁵

Citing Alfred Marshall’s example of music — “The more good music a man hears, the stronger is his taste for it likely to become.” — Stigler and Becker argue that an individual can accumulate “consumption capital” in music, so that, for instance, buying tickets to a concert at one point in time increases the satisfaction derived from further consumption of music later. Thus, just as workers can invest in education to enhance their productivity at making objects or providing services, so can consumers invest in education to enhance their enjoyment of certain goods and services. This increasing satisfaction can be understood as “rational addiction,” in that consumers can understand and predict rationally how their consumption in one period may affect their consumption in future periods. Thus, I can decide not to consume a drug that I know I will enjoy this period but that will induce a craving in future periods, when I will

⁵ In another example they explore, Stigler and Becker view advertising as a means of providing information to consumers that improves their perceived benefit from the product being advertised. In this case, the maker of the product provides information that changes the value of the commodity consumed. They also discuss fads and fashions and the role of culture and traditions in the formation of tastes. See my *Business Review* article on advertising for further discussion.

enjoy it less. Another implication of this perspective is that when we are young, we may not like a certain type of music very much initially, but we may realize that we will gain human capital that will make the early investment worthwhile in retrospect.

Note that a given act of consumption — for example, listening to or playing music — may have both an aspect of direct consumption (our current enjoyment) and an aspect of investment (how our current consumption affects our future enjoyment). Both aspects increase our current willingness to pay for the item. This makes for interesting dynamics over time. As we age, the period over which our investment will pay off shortens, but our enjoyment rises because of past learning. Eventually, though, our rate of learning and the rate of increase in enjoyment slow

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down, so we are less willing to pay because the investment value is falling, even though our direct enjoyment is still increasing.

As we become more willing to pay for something, do we have to pay a higher price? A drug dealer may offer the first dose of a drug for free, in hopes the customer becomes addicted. This depends on there being some likelihood that the person offered the free drug will remain a customer of the dealer, so that the addiction can be exploited. If the producer has a monopoly on the good whose value to us has increased, then the price may rise over time. This may be why

pharmaceuticals under patent typically rise in price faster than inflation. Even absent monopoly, learning is one of the main reasons why customers may find it difficult to switch from one supplier to another.⁶

MEASURING INFLATION AND OUTPUT

There are two ways in which we can be better off economically: We can have more products and services, or we can make better use of what we already have. It is easier, however, to measure quantity than quality. To think this through, consider how we currently measure output and inflation.

Suppose I spent \$20,000 on consumer goods and services in 2013 and \$21,000 in 2014. Is my well-being higher in 2014 than it was in 2013? The test that economists normally use is to ask whether I could have bought

the same goods and services in 2014 as I bought in 2013. If so, I must be at least as well off, because I could have bought the same goods but didn’t. Therefore, I must have preferred the goods I did buy to the goods I didn’t, since I can freely choose what I buy. So I strictly prefer what I consumed this year to what I consumed last year.

However, as we have seen, when consumers learn about a product, it

⁶ As we use products and services, our learning may result in what are known as increased switching costs. See Paul Klemperer (1995), Carl Shapiro and Hal Varian (1999), and Luis Cabral (2014), among others.

can provide more satisfaction than it did initially. In this case, we may want to consider my consumption as having increased, even though what I consumed did not change physically. But if the good or service in question is unchanged, how do we measure the increased satisfaction it offers, that is, its increased utility? There are at least two routes that we might take.

Consumer investment in consumption. One view is that in learning about, say, music, consumers are investing by directly raising the satisfaction they receive from music. In principle, an investment in consumption is no different from an investment in durable consumer goods, such as cars and refrigerators, or in real estate, such as a single-family home. Any investment is expected to return value to the investor — either in cash or well-being — over an extended period.

If we are learning about a technology that we expect will be around for a long time, then our learning may be valuable for a long time. Just as an investment in understanding music is likely to bear fruit over an entire lifetime, so may an investment in touch-typing, which enhances the speed and accuracy with which we can write e-mails and Internet posts. Even though the specific items we purchase — PCs, tablets, smartphones — may last only a few years, touch-typing is valuable in using all of those products and may enhance our ability to communicate over many years.

So to measure the increased satisfaction gained from such a consumption investment, we want to measure both the money and the time invested. Then we want to estimate the rate of return on those investments. Because we need to know over what period of time the investment will create returns and how much consumers value those returns, we have to survey consumers.


Willingness to pay. Alternatively, we can attempt to directly measure how the consumer's willingness to pay has changed. For example, if the price of a good rises and the consumer consumes as much of that good as she did previously, or if the price remains the same and the consumer consumes more of the good, then we may be able to measure an increase in the consumer's willingness to pay.

Consider pharmaceuticals. Suppose the efficacy of a drug improves over time as doctors and patients share information about its effects and as treatment regimens are fine-tuned accordingly. We may be able to directly measure the drug's increased value to both doctor and patient as a result of this social learning. A similar case can be made for medical procedures. An interesting possibility is that a given intervention — for example, use of a checklist in anesthesiology or surgery — may result in a widespread improvement in the quality of medical care.⁷ Again, as the intervention becomes widely adopted, we may be able to measure the joint value of this social learning as the quality of a variety of treatments (different surgeries, say) improves.

CONCLUSION

Does measuring the benefits — and the costs — of consumer learning matter, particularly if they are difficult to measure accurately? Even if economists cannot put numbers on them, it is important to understand the limits of what can be measured. If we cannot measure the improvement in our well-being from learning about products, then we underestimate our progress as consumers, and we overestimate both

the rate of inflation and the increase in income necessary to keep our welfare constant. We may think that living standards are falling when they are, in fact, rising. After all, when we discuss how we might raise productivity or consumer welfare, we typically rely on our existing measures of output and inflation. But to the extent that we think we might be getting this measure wrong, we might decide to temper or slant our objectives. For example, how we think of price stability is tempered by beliefs that our inflation measures are likely subject to a measurement bias, and we have a rough idea of the size of that measurement bias. As a consequence, a small but positive inflation rate may be viewed as achieving price stability.

But it would clearly be desirable if economic statistics measured output and inflation more accurately. The report of the Commission on the Measurement of Economic Performance and Social Progress seeks to move national statistical measures closer to an ideal measure of progress in national well-being. The commission's report points out that policymakers and others use these statistics to measure economic success. To the extent that current statistics are biased, policymakers are liable to be led astray. Thus, it would be valuable to consider how best to measure the impact of education, learning, and information on the well-being of households and to incorporate these measurements into our statistics. As new technology and learning make measuring inflation and output growth more difficult, we may not be able to rely on direct price measures; rather we may have to use surveys or econometric methods to estimate inflation and growth. 

⁷ Atul Gawande, a surgeon and journalist, has written about this in his book *The Checklist Manifesto*.

⁸ See Stiglitz, Sen, and Fitoussi.

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