Hi, Professor Navarro here again.
In this third lecture, we're going to
probe behind the curtain of the demand
curve.
We'll do that by learning more about
consumer
behavior and how consumers choose the
products they do.
In the process, I will introduce you to
important new concepts.
Such as cardinal versus ordinal utility,
diminishing marginal utility and demand
price elasticities.
These concepts will help us to better
understand why the demand curve slopes
downward
and why the demand curve sometimes shifts.
We will also come to solve at least
one puzzle I told you about earlier, why
increasing
the price of a product may not always
result in higher profits for a firm or
business.
[MUSIC]
>> Lecture three, demand and consumer
behavior.
>> In the early days of automobile
manufacturing, Henry Ford
was reported to have said of his model T
car
>> Give them any color they want, so
long as it's black.
Well, we've certainly come a long way
since Ford's
day, at least when it comes to consumer
choice.
Inded today's consumers can choose from a
dizzying assortment
of goods and services in the marketplace
in virtually every industry.
From autos and computers to sneakers and
bikinis.
The question of course is, how do
consumers go about making their choices?
And the concept of individual choice is
one of the most important in economics.
In fact, the great economist, Stanley
Jevons once said, the
theory of economics must begin with a
correct theory of consumption.
So why do people do what they do?
While psychologists and philosophers have
many complex answers to that question,
economists believe that for the most part
we do what we do
and we buy what we buy because it makes us
feel good.
And well some may argue that this selfish
mode lacks any
of the milk of human kindness That sets
humans apart from
the apes, it is nonetheless hard to
disagree with the idea
that a lot of our behavior is indeed
driven by self interest.
Using this simple method of self interest,
consumer choice boils down to three
things.
The pleasure people get from consuming a
good, the price they have to pay
for it and the income or budget available
to them to exercise their choices.
So how do you measure pleasure?
It's a good question.
And the English philosopher Jeremy Bentham
and his followers
thought they had an answer back in the
1800s.
Bentham proposed
that society should be organized on the
principle of
utility, which he defined as the property
in any object.
To produce pleasure, good or happiness or
to prevent pain, evil or unhappiness.
To Bentham all legislation should be
designed on utilitarian
principles to promote the greatest
happiness of the greatest number.
And Bentham's followers took him quite
literally.
They belived that scientists would
eventually invent a
machine that could measure pleasure by
measruing brain waves.
They even developed a measure of pleasure
they called the util.
For example, a big, juicy sirloin steak
for dinner might give a
person 1,000 util while a plate of spam
might yield only 100 utils.
And if economists were able to take such
measurements
with some utilometer, they'd have what is
called a cardinal measure of utility.
Meaning that utility could be measured in
actual numbers.

This would make it very easy to explain consumer behavior.
Of course, nobody yet has come up with a utilometer.
Instead, in their efforts to explain consumer choice,
economists have settled for an ordinal measure of utility.
An ordinal measure simply ranks goods relative to one another.
Thus, you can say you like peas better than broccoli
and you like ice cream better than both of those vegetables.
But you don't really need to say by how much to rank your preferences for these goods.
Now, having debunked the existence of a cardinal utility.
It will be nonetheless, very convenient for me now to assume
that we can, in fact, actually use numbers to measure utility.
This is a favorite trick of economists.
Make a simplifying assumption to explain a complex point.
In this case, I'm going to explain the difference between total utility and marginal utility.
And show how the utility-maximizing rule or equi-marginal principle allows us
to derive the downward sloping demand curve.
But just remember as I do this that our use of actual numbers is only for simplicity.
So, let's take a look at this table.
It shows the quantity of music concerts consumed Q.
And the total utility or pleasure U that Phil, our music connoisseur would gain from that consumption.
Note that as consumption increases from 0 to 5, utility increases from 0 to 10.
Now, let's use this table to derive the marginal utility.
It is simply the additional utility that Phil
would derive from a one unit increase in consumption.
So, if Phil moves from zero to one concert and total utility
increases from 0 to 4, what's Phil's marginal utility?
That's right, it's 4.
Now, how about if Phil increases him consumption by one more concert to 2?
What is the marginal utility now?
The answer is 3, which we get by subtracting 4 from 7.
Now take a minute to fill in the marginal utilities in the rest of the table.
Did you get it right?
Note that in this third column the marginal utility steadily falls as consumption rises.
This reflects the law of diminishing marginal utility.
And it is one of the most important concepts in economics.
Think of it this way.
Suppose you go to a restaurant and have duck orange with wild rice.
It might taste pretty good and you might even be hungry after eating it.
Even so, if the waiter brings a second serving of
the duck, it probably won't taste as good as the first.
And if you had to eat a third serving, it probably wouldn't taste very good at all.
Apparently sometimes you can get too much of a good thing.
Now here's another table.
This one for the utility associated with eating pizza slices.
Take a minute to graph on a piece of paper both the total
utility and marginal utility curves with the
quantity of pizza on a horizontal axis.
Do your figures look like these?
Note that the downward slope of the marginal utility curve in the right-hand figure
is reflected in the total utility curve being bowed downward in the left-hand figure.
This bowed shape in turn reflects the idea that total
utility increases with consumption but does so at a decreasing rate.
In other words, there is diminishing marginal utility.

[MUSIC].
Our next task is to formulate and
solve the consumer's optimization problem
using utility theory.
That sounds pretty technical and
complicated, but
all we're saying is that given the money
they have in their pockets, consumers are
going to find the best way to spend it.
That's optimizing behavior.
And all economic agents are assumed to
optimize
something as a way of explaining their
behavior.
For example,
firms typically are assumed to maximize
profits.
In the consumers case, we assume that
consumers
maximize utility subject to a budget or
income constraint.
In plain terms this means that consumers
have a certain amount of income to spend.
And subject to their budget constraint and
given a menu of prices, they will choose
a market basket of goods that will
provide them with the greatest utility or
satisfaction.
The question is how do consumers do this?
And the answer lies in something called
the utility maximizing rule or
equimarginal principle.
A consumer with a fixed income facing
market prices will
achieve maximum satisfaction when the
marginal utility of the last dollar
spent on each good, is exactly the same as
the
marginal utility of the last dollar spent
on any other good.
Let's take a few minutes now to prove
this.
By so doing, we can derive the downward
sloping demand curve and
gain further insight into market
equilibrium
on the consumer's side of the market.
Assume then that health food nut Greg
[INAUDIBLE]
is trying to decide how many Big Macs and
Dove
Bars he should buy with his fixed daily
income of $10.
This table summarizes the marginal utility
that Greg will get from the consumption
of the first, second, third and so on
units of each of these goods.
Note that for both products, marginal
utility is declining.
Now in order to make this table really
work for
us, we have to take into account the
different prices of each of the two
products.
We can do so by converting the marginal
utilities
in the table to a per dollar spent basis.
We do this simply by dividing each
marginal utility by the product price.
This allows us to compare apples and
oranges, as the
saying goes, or in this case Big Macs and
Dove Bars.
Adding these columns to the table, here's
what this looks like.
Take a minute now to try and fill in the
empty boxes and columns three and five.
Did you get it?
You can see that since the price of Dove
Bars is one,
the marginal utility per dollar is the
same as the marginal utility.
However, for Big Macs, a marginal utility
of, say, 18 converts
to a marginal utility per dollar of nine
because it's price is $2.
Now this next table illustrates the
sequence of
purchases that Greg will make to maximize
his utility.
With his first potential choice, he'll
start
by buying one Big Mac which will yield
him a marginal utility per dollar of 12
and leave him with a dollar's income.
This is clearly superior to buying the
first Dove
Bar, which only yields an MU of ten per
dollar.
Next,
Greg will buy his first Dove Bar for $1.00
and a second
Big Mac for $2.00, because both yield an
MU per dollar of ten.
So what will Greg do next with his
remaining $5.00?
Try filling in the remaining boxes.

That's right, in his third potential choice, Greg opts for a third Big Mac, and with his fourth potential choice, he spends his remaining income of $3 on a second Dove Bar and fourth Big Mac.
What's really interesting about this, besides the fact that Greg is a heart attack waiting to happen, is that Greg runs out of money exactly where the marginal utility per dollar of the two goods are equal.
In this case, equal to eight.
This proves more generally that utility maximized when the marginal utility of the last dollar spent on each good is exactly the same as the marginal utility of the last dollar spent on any other good.
This is the utility-maximizing rule or the equimarginal principle.
What's really neat about the equimarginal principle, is that it perfectly explains why demand curves slope downward.
Let me show you how.
Suppose that at the equilibrium point in our last example, we hold the marginal utility per dollar constant for the two goods.
In this case, it would be equal to eight.
Now further suppose that the price of Dove Bars increases.
What happens to the marginal utility per dollar of Dove Bars, and how do you think that our consumer Greg will respond?
Because price is in the denominator.
The marginal utility per dollar of Dove Bars falls below the same ratio for Big Macs.
Therefore, in order to maximize his utility, Greg will have to decrease his Dove Bar consumption and increase that of Big Macs.
This clearly implies a downward sloping demand curve.
As the price of Dove Bars rises, quantity demanded falls.
This example can also help us understand the income and substitution effects that we introduced in the previous lecture.
In this case, the substitution effect is obvious.
As we've shown when the price of Dove Bars rises Greg increases his consumption of Big Macs.
This is because the last dollars spent on Dove Bars yields less utility than the last dollars spent Big Macs.
But what about the income effect?
To understand this we have to understand the difference between nominal income and real income.
Nominal income is the face value of what we have in our pocket or bank account.
For Greg it's 10 bucks.
Note however that when inflation increases, in this case when the price of Dove Bars rises, it reduces Greg's actual purchasing power.
But simply, he can no longer afford to buy the same combination of Dove Bars and Big Macs that he once could, so real income is nominal income adjusted for inflation.
And here's the punchline
[SOUND]
; the portion of the increase in Greg's purchase of Big Macs due to his reduction in real income is the income effect.
Now to complete these thoughts, let's use a little algebra to generalize the utility-maximizing or equimarginal principle to the case of many goods.
It looks like this, study it carefully.
And here's the second part of the equimarginal principle rule.
Try to fill the empty boxes correctly with either an equals sign, a greater than sign, or a less than sign.
Did you get it right?

[MUSIC]
Let's turn now to one of the most practical concepts in microeconomics, the price elasticity of demand.
As we shall soon see, this concept has tremendous application in the pricing and marketing strategies of both businesses and government agencies.
It also helps us to better understand many aspects of public policy.
So let's start out by just thinking about the word elasticity.
If you pull back on a rubber band and then let it go, it snaps forward pretty smartly.
That's becasue it's pretty elastic.
But if you pull back on a piece of string, it only snaps back a little bit.
It's pretty inelastic.
Well, the price elasticity of demand simply measures how much consumers will increase or decrease their quantity demanded in response to a price change.
A big change means demand is elastic, like the rubber band, and a small change means demand is inelastic.
There is of course a formula to calculate elasticity.
But before we go down that road, let's really nail this down from an intuitive perspective.
Take a look at these two demand curves and study the slopes of the curves very carefully.
Note that in the first graph, the demand curve for crack cocaine is very steep.
Almost vertical.
In contrast, in the second graph, the demand curve for beef is almost flat or horizontal.
Given the shape of these curves, in which market do you think the quantity demand will respond least and the most to a change in price?
That is, in which market is demand least and most elastic?
Did you get it right?
The demand for crack cocaine is the least elastic and the demand for beef is most elastic.
To see this, imagine that the price of crack cocaine rises by a dollar.
In this case, the quantity demanded changes very little.
In contrast, a dollar increase in the price of beef results in a huge decrease in the quantity demanded.
Now here's the general price elasticity formula.
It is simply the percentage change in the quantity demanded divided by the percentage change in price.
Take a minute to study this.
Now there is a question probably forming in your head right now.
Why use percentages rather than absolute amounts in measuring consumer responsiveness?
There are at least two good answers.
First, the use of percentage changes for both price and quantity frees us from worrying about what the unit of measure is for different goods, pounds, bushels, tons, whatever, and what the measure is for price, say, pennies or dollars.
To see what I mean, suppose that the price of cement falls from three dollars to two dollars and consumers increase their purchases from 60 to 100 pounds.
It may appear that consumers are very sensitive to price changes, and therefore, the demand is elastic.
After all, a price change of 1 has caused a change in the amount demanded of 40.
But now, let's change the monetary unit from dollars to pennies.
In this case, we could just as easily say, that a price change of 100 pennies caused a quantity change of 40 pounds, giving the impression that demand is inelastic.
Using percentages resolves this choice of units problem.
Second, the use of percentages allows us to solve the comparing products problem.
For example, it makes little sense to compare the effects on the quantity demanded of a $1 increase in

the price of a $10,000 car versus a $1 increase in the price of a $1 carton of milk.
Here, the price of both products has risen by the same amount, but the price of milk has risen by 100%.
While the price of the car has risen by a miniscule tenth of one percent.
Better that we compare the price change of both products on the same percentage basis, say, 1%, to determine how consumers will respond to the price change.
That's what the elasticity formula allows us to do.
Now, here's the formula for calculating price elasticities.
Looks pretty formidable, doesn't it?
But let's break this formula down into smaller logical pieces.
Let's start with the change in Q, call it delta Q.
We can rewrite this as simply the quantity demanded before the price change, minus the quantity demanded after the price change, or, Q1 minus Q2.
And, we can do the same for the change in P.
Call it delta P.
It is simply P1 minus P2.
As for each of the two terms in the denominators, these are simply the averages of quantity and price.
So, although this formula looks pretty forbidding.
All you are doing is dividing a change by an average.
Now, one more thing.
If you're a math wizard, you might figure out pretty quickly that since price and quantity demanded are inversely related, the price elasticity coefficient will always be a negative number.
For example, if price declines, then the quantity demanded will increase.
This means that the numerator in our formula will be positive and the denominator negative yielding a negative price elasticity.
Note, however that for simplicity, economists usually ignore the minus sign and present price elasticities as absolute values.
We'll do that too.
So just remember to ignore the minus sign.
Now let's get back to our formula and use it to calculate the price elasticities along two different segments of this demand curve.
By doing so, we'll not only do some sample calculations, we'll also prove that the price elasticity actually changes as we move along the demand curve.
So take a minute now to calculate the elasticity for a move from point A to B as well as from C to D, and put your answers in the boxes.
Did you get it right?
If not, study the math here carefully and try it again.
Let's identify now the three major categories of elasticity, as seen in this figure.
First, demand is elastic if a given percentage change in price results in a larger percentage change in quantity demanded.
For example, if a two percent fall in price results in a four percent change in quantity demanded.
In this case, the elasticity is greater than one.
Note that the curve is flat, as in our beef example.
If the curve were horizontal, demand would be said to be perfectly elastic.
Second, demand is inelastic if the price elasticity is less than 1.
For example, if a 3% decline in price leads to just a 1% increase in quantity demanded.
In this case, the percentage change in price is accompanied by a relatively smaller change in the quantity demanded.
Note that the curve is steep, as in our crack cocaine example.
If the curve were perfectly vertical, demand would be perfectly inelastic.
Finally, demand is said to be unit elastic

if the price elasticity
equals 1.
For example, if a 1% drop in price causes
a 1% increase in quantity demanded,
elasticity is exactly 1, or unity.
This table lists the price elasticities
for a variety of products.
Note that necessities, like housing,
electricity and bread, are very
price-inelastic.
On the other hand, goods that tend more
towards
being luxuries, like restaurant meals and
glassware, are very price-elastic.
These observations lead us to a discussion
of what determines the elasticity of
demand.
Besides luxuries versus necessities, other
important factors
include substitutability, proportion of
income, and time.
The greater the number of substitutes for
a
good, the more elastic its demand will be.
For example, beef has a lot of
substitutes.
Poultry, fish, and soy products.
In contrast, crack cocaine has little or
no substitutes.
That's why a drug addict's demand is much
more inelastic than a beef eater's.
In this regard, the elasticity of demand
also
depends on how narrowly the product is
defined.
For example, which do you think has a more
elastic demand, Chevron gas or gas?
That's right.
The demand for Chevron gas is much more
elastic than the demand for gas because
many brands,
such as Shell and Texaco, can be
substituted for
Chevron, but there is no good substitute
for gas.
A third factor determining elasticities is
the proportion of income.
Other things equal, the higher the price
of a good relative to
your budget, the greater will be your
elasticity of demand for it.
For example, a 10% increase in the price
of pencils will amount
to only a few pennies, with little
response in the amount you demand.
But a 10% increase in the price of housing
would have a significant impact
on the quantity of house you would
purchase.
The fourth factor is time.
In general, demand will tend to be more
elastic
in the longer run than in the short run.
For example during the energy crisis of
the 1970s the
demand for oil was very inelastic in the
short run.
However, over time, businesses invested in
energy-saving technologies while people
started driving more fuel-efficient cars,
and the demand elasticity increased.
This table lists a number of short and
long run elasticities.
What do you think of demand for medical
care remains
inelastic between the short and long run,
while for other
goods, such as bus trips and movies,
inelastic demand in
the short run becomes highly elastic
demand in the long run?

[MUSIC]
Now let's turn to our final task of this lesson, which is to demonstrate just how powerful the price elasticity concept can be in both business and government applications.
And let me start out by asking you this question.
If you raise the price of a product, will the total revenues from selling that product go up or down?
At an intuitive level this might seem like a really dumb question.
Why?
Because most people's intuition tell them that, of course total revenues will go up with a price increase.
But this is one of those rare cases in economics where intuition can be dead wrong.
As the case of Stuart Applegate in our introductory lecture indicated.
To see why, let's first look at how a firm's total revenues are calculated.
Here's the formula.
Total revenues simply equal the price times the quantity.
Now, knowing what you do about price elasticity, you might already be able to answer a question like this.
Suppose your business sells tapes, and I tell you that demand for your product is relatively price elastic.
Looking at this formula, what would you do to raise your total revenues?
Raise or lower your price?
That's right.
You'd lower your price.
This is because in the total revenue, formula P will go down by less than Q will go up.
So total revenues, or TR, must rise.
This figure lists the six pricing and total revenue possibilities.
See if you can fill in the six empty boxes.
Did you get it?
It should be readily apparent from this figure just how powerful this concept can be.
Just remember the case of Stuart Applegate from the first lecture.
He was the Chief Executive Officer who tried to bail out his software company by raising prices.
But demand was highly elastic, total revenues fell, and his company went out of business.
And then there was Jennifer Twilly, a financial analyst in the operations department for the transit authority in Paradise, California.
Facing a revenue shortfall, Jean ordered an analysis of the elasticity of demand for bus services.
When she found that bus demand was also highly elastic, she recommended to her supervisor that the Transit Authority lower bus fares.
This pricing strategy did indeed increase ridership, and boost total revenues.
It also earned Jean a nice promotion.
It's not just pricing strategies that the concept of elasticity of demand can help with.
It's also broader marketing strategies.
For example, why do you think that many airlines offer fare discounts to people who stay over on a Saturday night?
It's because airlines are trying to sort out two different kinds of customers, business people with more inelastic demands who want to fly home on the weekends and perhaps be with their families, versus pleasure travelers who don't mind staying over on a Saturday night.
By making this separation, the airlines can effectively charge two prices.
A higher one to business travelers, and a lower one to pleasure travelers.
This means more total passengers, and more total revenue.
Okay, here's another one.
Why don't most new cars sell at their sticker price?

Put another way, why do you have to go in and haggle when you buy a car whereas if you go in and buy a gallon of milk, you pay the sticker price?
It's because our car salespersons are trained to sort out comparison shoppers with more elastic demands from impulse buyers who have inelastic demands.
By not listing the selling price of cars, the salespersons can charge the impulse buyers more.
[MUSIC]
Finally, the concept of price elasticities can also help us think through a wide variety of public policy problems.
Take a look at this figure in the case of drug addiction.
In the figure, we see once again that the demand curve for a highly addictive drug like crack is almost perfectly inelastic.
We also see that the supply curve crosses the demand curve at point E where the price is $10 a dose.
Now what happens in the figure when the US government escalates its war on drugs by interdicting large quantities of illegal cocaine shipments from Colombia?
That's right, the supply curve shifts inward.
The practical effect is to significantly raise the price, but because demand is inelastic, this has little impact on reducing crack consumption.
But there is a further problem.
Because crack addicts have to now pay more for their fix, crime tends to increase, because it is through robberies and burglaries and prostitution that most addicts pay for their dope.
Given these observations, the logical thing to do, at least from an economic point of view, would seem to be to just legalize drugs.
But beyond the obvious moral questions raised by that proposal, some economists have argued that while drug addicts are highly insensitive to price, the casual drug user is high price sensitive.
This suggests that even if the war on drugs has little effect on curbing consumption by drug addicts, it nonetheless may have a big effect on reducing consumption among casual users, who presumably respond to price hikes by substituting cheaper drugs like alcohol for more expensive drugs, like cocaine.
Of course, the debate over the legalization of drugs remains unresolved.
But at least with the help of microeconomics, policy makers can better think through the problem.
A second policy issue involves agricultural price supports.
The problem here is that demand for farm products is highly inelastic.
Perhaps only 0.20 or 0.25.
This means, that during a year of bumper crops, the quantity demanded will change only a little bit, but food prices will plummet.
The paradoxical result is that many farmers go bankrupt when crops are plentiful.
One way to address this problem is to restrict farm output, and this has been regularly done with many farm products, from milk and oranges to corn and wheat.
Still a third application involves the levying of so-called excise or sales taxes.
If the government imposes a sales tax on a product that is highly elastic, what do you think will happen to total tax revenues?
That's right.
Total revenues fall.
So at least most legislatures are smart enough to seek out products with more inelastic demands to tax, products like alcohol and tobacco.
You can see then, from all of these applications, just how important and useful the theory of consumer behavior and consumer choice can be.
In the next lesson, we'll tackle the supply side of the supply and demand framework.

In the meantime, please remember that
economics is
not something to memorize but rather
something to conceptualize.
So as you study it, think about it too.
Your job
and your business
just might depend
on it.
[MUSIC]