Market Equilibrium

A well-functioning market economy will settle, in each of its markets, at an equilibrium at which the quantity demanded equals the quantity supplied. Everybody who thinks it worth their while to produce at the market equilibrium price will produce. Everybody who thinks it worth their while to purchase and consume at the market equilibrium price will do so.

And there is no alternative arrangement that will leave both producers and purchasers better off in the aggregate—that is, with more surplus.

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Recapitulation

1. The social-psychological sources of the market economy in our propensity to be gift-exchange creatures.

2. The extension of gift-exchange into a global market economy that gives us a uniquely productive division of labor.

3. The ability of the market to--broadly--govern itself and, at least in competitive equilibrium, be productively and distributionally *efficient*.

4. How to draw supply and demand curves.

5. How, given the supply and demand curves, to calculate what the equilibrium prices and quantities will be.

Last time we noted the remarkable efficiency of private property plus market exchange as a societal calculating mechanism for organizing production and allocating distribution. It appears to be five or more times as efficient as the leading alternative—the non-market bureaucratic-command economies that existed behind the Iron Curtain and that still exist today in North Korea and Cuba, those constructed on the pattern of the Rathenau-Ludendorff World War I-era German command war economy. Why?

We argued that the principal advantage of market economies is that they economize on information. To make a market economy work, all you have to do is:

• Set up private property as an institution.

• Set up market exchange as an institution.

• Write down the prices of all N commodities on a whiteboard.

And let it roll.

We also came up with a list of questions to ask any societal calculating mechanism for organizing production and allocating distribution:

• Is it attainable?

• Will it be productively efficient—that is, will the right people be making the right things?

- Will it be distributionally efficient—that is, will anybody say "I don't want that, I want this that consumes fewer scarce resources instead"?

- Will it be *fair*?

If, somehow, we have a well-functioning market system in which prices are right—which they will be in a *competitive equilibrium*—then the market allocation will be productively efficient. People will have incentives to make the right things, and to have them made by the right people

And if prices are right—are determined in a way that sets them at values where they correspond to societal resource scarcities—the market allocation will be distributionally efficient. People will have every incentive to buy the right things—if we trust consumer sovereignty, that is.(Maybe we don't: people seem to have much more of a taste for sugar, salt, fat, internet poker, and other unhealthy things than we should, or than we want to.)

And if prices are right, the market allocation will be attainable

But will the market allocation be *fair*?

Let's drop that last question for now, and move on to actually drawing supply and demand curves and calculating the equilibrium.

Opportunity Cost, Supply, and Demand

KEY IDEAS

1. To understand what equilibrium a competitive market equilibrium will reach, it is very helpful to draw the supply and demand curves.

2. The supply curve summarizes the relevant information about producers' actions.

3. How producers will act depends on the *opportunity costs* they face when they decide to enter the market. If the price offered is high enough, it will be worth their while to turn away from what they would do otherwise, produce, and sell in the market.

4. Similarly the demand curve summarizes the relevant information about purchasers. It summarizes at what prices which potential purchasers decide that this market is the best

We are analyzing a market economy. But in this lecture it will be instructive to pretend, for a while, that we do not have a market economy. We will pretend, for a while, that we are the bureaucrats of Production Distribution Coordination—PDC—in charge of figuring out what people should do and telling them to do it.

Fundamentals of Supply and Demand

- Let's say that we have eight potential yoga teachers: Hermione, Ron, Harry, Letitia, Severus, Tom, Albus, and Hagrid.
- And let's say we have *unlimited* and *highly elastic* demand: the people of Berkeley won't pay more than $10/hour for a group yoga lesson (they think that would be unfair)—but as many people as we offer seats... mats... are willing to pay $10/hour.
- And let's say each of our eight can teach a class of at most the following number of students: Hagrid, 50; Hermione, 12; Harry, 10: Severus, 4; Ron, 3; Letitia, 2; Albus, 1; and Tom, -2—you then have to take the people in Tom's class, refund their money, and find them places in another class just to undo the damage and restore them to the *status quo ante*.

Preferences, Technologies, and Allocations

Let us keep on being very Berkeley: let us continue to work with a toy economy with two and only two commodities, lattes and yoga lessons. Last time we had two people, flexible Dharma and uptight high-strung Greg. Let us assume this tine

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that we have more people in our economy—not Dharma and Greg but, say: Hermione, Ron, Harry, Letitia, Severus, Tom, Albus, and Hagrid.

Let's say that each of our eight can teach a class of at most the following number of students: Hagrid, 50; Hermione, 12; Harry, 10: Severus, 4; Ron, 3; Letitia, 2; Albus, 1; and Tom, -2—you then have to take the people in Tom's class, refund their money, and find them places in another class just to undo the damage and restore them to the status quo ante.

Now We Are the PDC Committee...

- We have to decide:
  - Who we assign to teach yoga.
  - How much we pay them out of the $10/lesson that is the willingness to pay of the entire Berkeley population.
- MEMO: Productivities: Hagrid, 50; Hermione, 12; Harry, 10: Severus, 4; Ron, 3; Letitia, 2; Albus, 1; and Tom, -2.

And let's say we have unlimited and highly elastic demand: the people of Berkeley won't pay more than $10/hour for a group yoga lesson (they think that would be unfair)—but as many people as we offer seats... mats... are willing to pay $10/hour.

My Lords, Ladies, and Gentlemen: to Your iClickers...

- Start with Hagrid:
  - A. Yes
  - B. No
- And how much should we pay him?
  - A. 0
  - B. $40
  - C. $60
  - D. $500
  - E. Something else...
- MEMO: Productivities: Hagrid, 50; Hermione, 12; Harry, 10: Severus, 4; Ron, 3; Letitia, 2; Albus, 1; and Tom, -2.

Now suppose we have a bureaucratic-command economy. In this version of Berkeley we have abolished private property and market exchange, and the *government of people* has been replaced by the *administration of things*. The *administration of things* is a tremendously boring set of jobs that nobody much wants to do. It is called PDC—Production and Distribution Coordination. Now PDC has to choose (a) who is going to teach yoga classes, (b) how much PDC is going to pay them,

(c) how much PDC is going to charge students, and (d) who gets into the yoga classes (if there is an excess demand).

What will PDC decide to do?

What PDC Decides...

- Hagrid: Yes; not sure what to pay...
- Hermione: Yes; $60
- Harry: Yes; $40
- Severus: No
- Ron: No
- Letitia: No
- Albus: No
- Tom: No

Here is what PDC decided to do—in the form of Berkeley Econ 1 course on January 30, 2012.

How Did PDC Do?

- Hagrid: -$1000 + 50 x $10 = -$500
- Hermione: -$0 + 12 x $10 = $120
- Harry: -$50 + 10 x $10 = $50
- Severus:
- Ron:
- Letitia:
- Albus:
- Tom:
- Number of students: 72
- Value created: -$330

Now let us add some more information—information that no PDC committee can have: information about *opportunity costs*. For Hagrid, the opportunity cost of teaching a yoga lesson is $1000: he really, really does not want to teach yoga, for he really wants to raise dragons instead. For Harry and Severus, the opportunity cost of teaching a yoga lesson is $50; for Letitia, $25; for Ron, $20; and for Hermione, $0 (remember: she can go back in time and so live the class time twice, so teaching yoga doesn't keep her from doing something else). And let me tell you that Albus has nothing better to do with his time and would in fact pay $10 to teach yoga; and that Tom would pay $50 because he really, really likes teaching yoga.

6

Some More Information...

- Productivities: Hagrid, 50; Hermione, 12; Harry, 10: Severus, 4; Ron, 3; Letitia, 2; Albus, 1; and Tom, -2.
- Reservation wages:
  - Hagrid, $1000 (really wants to raise dragons instead); Harry, $50; Severus, $50; Letitia, $25; Ron, $20 Hermione, $0 (she can go back in time, remember, so it doesn't keep her from doing something else); Albus, -$10 (he likes teaching yoga); Tom, -$50 (he really likes teaching yoga)

Calculating Opportunity Costs...

- Opportunity costs:
  - Hagrid, $20; Harry, $5; Severus, $12.50; Letitia, $12.50; Ron, $6.67; Hermione, $0; Albus, -$10; Tom, $25.
- Productivities:
  - Hagrid, 50; Hermione, 12; Harry, 10: Severus, 4; Ron, 3; Letitia, 2; Albus, 1; and Tom, -2.
- Reservation wages:
  - Hagrid, $1000; Harry, $50; Severus, $50; Letitia, $25; Ron, $20 Hermione, $0; Albus, -$10; Tom, -$50.

This translates into *opportunity cost* per student: Hagrid's 50 potential students come at an *opportunity cost* of $20 per student. Letitia and Severus's 6 potential students come at an opportunity cost of $12.50 per student. Ron's 3 students come at $6.67 per student. Harry's 10 students come at $5. And Hermione's 12 students come for free.

Now it gets tricky. For Albus's 1 student there is an *opportunity benefit*: we don't have to pay him, he is willing to pay us—an opportunity cost per student of -$10. And Tom—he would pay us up to $50 to teach his two students, but then we have to refund their money and find them places in another class—an opportunity cost per student of $25.

How to Draw a Supply Curve

- A supply curve is a tool for telling us what will happen if we have a market
- Start out at a price of zero
- Raise the price until somebody is willing to sell
- Keep raising the price, and watch how other sellers enter the market

The Market for Yoga Lessons

To figure out what the market would do, we now need to draw the supply curve.

Back when I was a student, my teacher Charles P. Kindleberger told me of the early nineteenth century British economist J.R. McCulloch, who had said that it was easy to make a parrot into a tolerably-learned political economist simply by teaching it to say "supply and demand, supply and demand." Kindleberber said McCulloch, but the literature ascribes the quote to Thomas Carlyle. In any event, it is true. To be an economist, you have to be able to say the word "supply."

We say the word "supply" by drawing a supply curve. Set out a graph. Put the quantity that producers are willing to sell along the horizontal axis. Put the per-unit price at which they are willing to sell on the vertical axis. Put your pen at the (0,0) point of the graph. And now let us trace out the supply curve.

Is anybody willing to teach at a price of zero? Yes, Hermione, Albus, and Tom are. At a price of zero Hermione, Albus, and Tom want to teach—and they teach 11 students in total, counting the remedial work needed that takes up 2 slots just getting Tom's unfortunate victims back to the *status quo ante*. So (0,0), (11,0), and the line connecting them is the start of our supply curve. Now raise the price to $1/student. Anybody else willing to teach? No. $2? $3? $4? No.

At a price of $5/student, Harry would be willing to teach if he got to keep the money his students pay—which he does in a market economy, for your time and your work is yours and you can sell it whomever you please, in this case, your students. So at a price of $5/lesson we have 21 students. So the points (11,5), (21,5), and the line between them are also on the supply curve. And so on, and so forth.

We continue drawing our stair-step supply curve as we head up and to the right along the graph, raising the price we are hypothesizing that students are willing to pay. Ron shows up and the number of students grows to 24 at a price of $6.67. And at a price of $12.50 both Letitia and Severus are willing to teach, and there are places for 30 students. At a price of $20/ student, with a sigh Hagrid is willing to abandon dragon-

raising for yoga teaching, and we can satisfy 80 students. And at a price of $25 Tom can no longer pay the legal judgments against him for yoga malpractice and has to drop out, and so there are 2 extra seats in Hermione's class and enough capacity for 82 students.

That is our supply curve.

How about demand?

Normally we would draw our demand curve the same way. But right now, to keep things simple, we said that demand in Berkeley was completely elastic at a price of $10/lesson. Nobody thinks it worth their while to pay more than $10 for a yoga lesson, but at a price of $10/lesson there is a potentially unlimited supply of people who want to take yoga.

And we have enough to calculate the market equilibrium.

Market Equilibrium

So what happens in the market? Well, Hagrid passes... Hermione teaches 12 students and winds up +$120... Harry teaches 10 students and winds up +$50... Severus passes... Ron teaches 3 students and winds up +$10... Letitia passes... Albus teaches 1 student and winds up +$20 to the good... Tom teaches -2 students and winds up +$30 to the good...

Total surplus: +$230

Total students: 24

PROPERTIES OF MARKET EQUILIBRIUM

1. It is where the supply and demand curves cross.

2. It is easy to calculate once you know the supply and demand curves.

3. Nobody in the market, however, has to calculate these curves: the market finds its equilibrium by itself, simply by everybody looking at prices and reacting as they think best.

4. The competitive market equilibrium produces the most dollar-value surplus of any arrangement.

5. The competitive market equilibrium gives that surplus disproportionately to low-cost

What Would the Market Do?

- Elastic demand fixes the price at $10/hour/student...
- Property in your own person means you keep the money you charge...
  - Hagrid passes...
  - Hermione teaches 12 students and winds up +$120...
  - Harry teaches 10 students and winds up +$100...
  - Severus passes...
  - Ron teaches 3 students and winds up +$10...
  - Letitia passes...
  - Albus teaches 1 student and winds up +$20 to the good...
  - Tom teaches -2 students and winds up +$30 to the good...
- Total surplus: +$260
- Total students: 24

We don't have to run through this individual by individual in detail. We just have to look at the supply and demand curves on the diagram.
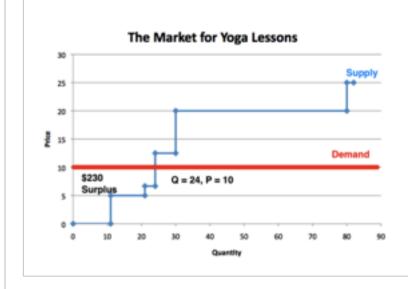
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Where the Lines Cross

We now have two lines on our graph. One, the blue upward-sloping stair-stepped line, we read as follows: Look at the y-axis value: that tells us the price. Then look for the x-axis value: that tells us how many items producers would offer for sale at that price. The other, the demand red line, we read in a similar way: Look at the y-axis value: that tells us the price. Then look for the x-axis value: that tells us how many items producers would buy at that price.

It is clear that if the market price is not where the lines cross—if the price is set at a level where there are more or fewer willing buyers than sellers at that price—then the market will not be working very well. If the price is above the level at which the lines cross—in this case $15/lesson—then there will be excess supply in the yoga industry: the instructors will offer more classes than there are students to fill. And if the price is below the level at which the lines cross, then there will be excess demand in the yoga industry: there will be a good many students willing and able and wishing to pay the price and take lessons who will find themselves unable to find spots in a class.

The Market for Yoga Lessons

How Does This Compare to PDC?

How does this compare with what PDC would do? Well, on January 30, 2012, the Berkely Econ 1 class meeting in Wheeler Hall as the PDC yoga committee...

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The Superior Efficiency of the Market

Now is my opportunity to drive home the point I made two lectures ago: About how much does use of markets rather than command amplify societal economic productivity? The macro-historical unnatural experiment across the Iron Curtain of the

twentieth century suggests that it quintuples it. And given what we have just seen comparing the market to PDC, you can begin to understand why.

My Lords, Ladies, and Gentlemen, to Your i>Clickers...

- About how much does use of markets rather than command amplify societal economic productivity?
  - A. None
  - B. Doubles it
  - C. Triples it
  - D. Quadruples it
  - E. Quintuples it

Notice that the market sorted out this superior arrangement by itself. Nobody drew a supply curve. Nobody drew a demand curve. People simply looked at the price, looked at their other opportunities, decided whether to offer yoga lessons or not, and decided whether to take yoga lessons are not.

Why and How We Draw Supply and Demand Curves

It is true that to understand what the market did, we find it useful to draw supply and demand curves. To draw a supply curve, we

- Start out at a price of zero.
- Raise the price until somebody is willing to sell.
- Keep raising the price, and watch how other sellers enter the market.

And we are done. Similarly, to draw a demand curve, we:

- Start out with a price so high that nobody wants to buy.
- Lower the price until the first buyers appear.
- Keep lowering it, and watch more buyers appear.

And once again we are done.

So far we have assumed a very simple demand curve. We can consider more complex situations.

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We Can Use This Supply Curve with Any Demand Curve

The Market for Yoga Lessons

$Q = 60 - 2P$

The Downward-Facing Dog

Suppose that nobody is willing to pay $30 a lesson, but that #yogastudent1 is willing to pay $29.50, #yogastudent2 is willing to pay $29, and so forth down to #yogastudent60 who is willing to go to a yoga class if it is free—and then there are more: #yogastudent80 would go to a yoga class if you paid him or her $10 to do so; #yogastudent100 would require a $20 cash payment to induce him or her to do the Downward-Facing Dog.

With this new demand curve and our old supply curve, we can immediately read off the yoga market equilibrium: a quantity of 30 yoga lessons taken; a price of $15 per lesson; Severus and Letitia are now glad to enter the yoga lesson business. Consumer surplus is $225—#yogastudent1 gets something he or she would have been willing to buy for $29.50 and gets it for $15, thus getting $14.50 of surplus, and so on down to #yogastudent30 who is the only person taking a yoga lesson who says "meh" and could just as easily take it or leave it alone. And with the new demand curve our producer surplus jumps from $230 to $365.

Who gets the bulk of this extra producer surplus?

13

We Can Use This Supply Curve with Any Demand Curve

The Market for Yoga Lessons

Q = 30, P = 15

Q = 60 - 2P

How the Market Adjusts

Note that in a market economy if the demand suddenly shifts from the old demand curve with its equilibrium price of $10/lesson and its equilibrium quantity of 24 lessons to the new curve, that there is no need for any PDC to do anything. The market will adjust all by itself. What will happen if the price is below 15? Excess demand—and the price will rise, and more producers will enter, and some purchasers will be discouraged. What will happen if the price is above 15? Excess supply—and the price will fall, and some producers will become discouraged and exit, and some purchasers will enter. If the price is above 15, the disappointed sellers will be willing to offer to take less and bid business away from the satisfied sellers. If the price is below 15, the disappointed buyers will be willing to offer more. The market should "grope" itself to the equilibrium price of 15, where there will be no disappointed would-be sellers who wish to cut their prices, and no disappointed would-be buyers who wish to raise their prices.

Distribution of Surplus

Note how the surplus from the availability of the option to take yoga lessons at a price of $15 is distributed to consumers. Some people get a lot—because they really like yoga, would pay through the nose for it, and so get a really good deal. Some people get only a little surplus—because they are "meh" about yoga, especially at $15 a lesson.

Is this fair?

Aristotle says fairness consists in treating equals equally, and unequals unequally. Is it fair for the people who really enjoy the class to only have to pay as much for it as the people for whom it is barely better than a poke in the eye from a sharp stick?

Note how the surplus from the availability of the option to offer yoga lessons at a price of $15 is distributed to producers. Some people get a lot—because they really like to give yoga lessons and would almost give them for free, and so get a really

good deal. Some people get only a little surplus—because they are "meh" about giving yoga lessons, especially at a measly $15 per student per lesson

Is this fair?

Aristotle says fairness consists in treating equals equally, and unequals unequally. Is it fair for the people who really love teaching the class to receive as much for teaching it as the people for whom teaching a yoga class is barely better than a poke in the eye from a sharp stick?

Defects of Other Arrangements

Other arrangements have, invariably:

- Some of the wrong people teaching the classes

- Some of the wrong people taking the classes

- Too few classes being offered

- Too many classes being offered

Other arrangements leave potential side deals open:

- Some of the wrong people teaching the classes

- If Letitia is assigned to teach a class and Ron is not, then —"Psst. Will you teach my class?" There's surplus for them to split

- Some of the wrong people taking the classes

- If yogastudent#10 is not assigned to take a class and yogastudent#50 is, then—"Psst. Will you take my place?" There is surplus for them to split

Too few classes being offered: If only Hermione, Albus, and Tom are teaching, then yogastudent#12 through yogastudent#30 meet Harry, Ron, Letitia, and Severus outside the PDC system, and there is surplus for them to split...

Too many classes being offered: If everyone is teaching, then when yogastudent#31 through yogastudent#80 meet with Hagrid, they look at each other and say: "Let's just pretend we did this"—and in so doing they split $30 x 50 x ½ = $750 of surplus...

A competitive market in equilibrium leaves no side deals open:

- No group of students can get together with a teacher and agree to just pretend that they did this.

- No group of non-students can get together with a non-teacher and gain surplus by engaging in a transaction.

- No student can swap places with any non-student in such a way that they can make a side-payment that makes both happy.

- No teacher can swap places with any non-teacher in such a way that they can make a side-payment that makes both happy.

Reaching and Staying at Equilibrium

Once the market reaches equilibrium, it will stay there—unless and until something happens to change the supply curve or the demand curve or both. If the market is out of equilibrium, it will head for the equilibrium price (and quantity). If the price is above equilibrium and there is excess supply, some supplier will have an incentive to cut his or her prices to try to get closer to capacity. If the price is below equilibrium and there is excess demand, some customer will have an incentive to raise the price he or she is willing to pay in order to get a spot in line before the supply runs out. The market should thus grope toward its stable equilibrium price: a process that French-Swiss economist Leon Walras called *tatonnement*, a French word for groping around, for tentatively feeling your way around, or for trial-and-error.

Now the process by which the market reaches its equilibrium can be a complicated and fraught one. Every buyer, after all, has an incentive to try to convince the sellers that the maximum price they will pay before they leave—their reservation price—is lower than it actually is. Every seller has an incentive to convince the buyers that they really do not want to sell at a low price. If there are lots of buyers and lots of sellers and if they are uncoordinated, however, these frictions will be small and unimportant. And the market will quickly settle on its equilibrium prices.

Thus we see another advantage of the market system as a societal calculating device for organizing production and allocating resources: the government does not even have to transmit information about what prices are by writing them down on a whiteboard. The market's participants will settle on an equilibrium price and write it down for everyone to see.

The Market Equilibrium is a Very Good Deal for Some

Note that the market equilibrium is a very good deal for some. Consider Hermione. Hermione would have been willing to teach her yoga class for free had PDC told her to do so. She would not have thought herself in any sense exploited or hard done by. Teaching yoga for free would have been, she would have thought, as good as any of the alternatives available to him out there in this wide green world. But now in the market economy Hermione finds that she is collecting $15/lesson/

student. All of that is "producer surplus" that makes her better off: she can now afford $180 more of nice things per lesson she teaches. If some government official came along and said "we are going to ban yoga lessons", Hermione all by herself would be willing to pay a bribe of up to $150/lesson to make that not happen.

Hermione is doing well.

But Severus? He gets only $10/lesson of surplus. And Hagrid does not benefit at all. Is this fair? They are all fully qualified to give yoga lessons. It's just that small differences between Hermione's and Hagrid's brain chemistry makes the breakeven wage for her much less than for him. Shouldn't all the potential yoga teachers share the surplus from the market and share it equally?

It's a question. It's not a question the market can answer, or a thing that the market does. The market rewards low-cost suppliers. It rewards them very richly.

Similarly, the market system rewards high value demanders. Let us look at yogastudent#10—the person who is just indifferent between taking and not taking a yoga class when the price hits $25/lesson. Yogastudent#10 would have been happy to pay as much as $25 a lesson, but is only paying $15. That is $10 of "consumer surplus" for yogastudent#10: he or she is $10 better off than if no yoga lessons were offered, and he or she had to wander off and find something else to spend his or her money on, something else to do.

Yogastudent#28, by contrast, is gaining only $1 of surplus per lesson. And yogastudent#30 is, like, totally "meh." Taking yoga passes the time. It is better than poke in the eye with a sharp stick. But he or she would really just almost barely have the money and the time to go do something else. Is this fair?

Total Consumer and Producer Surplus

We can take all of these surpluses from all of the different producers and consumers, and we can add them up. Add up all the surpluses from all the consumers—the total differences between the market price that each of them does pay and their respective reservation prices—and you get the total consumer surplus from the market. That is the maximum amount that the consumers, if you could get them together in a group and figure out how to allocate the charges, would be willing to pay in order to keep the market open rather than to see it shut down completely.

On our supply and demand graph, we can visualize the total market consumer surplus. Look at the y-axis and draw a horizontal line at the value of the market price. The gap between where the demand curve hits the y-axis and the horizontal market price line is the base of a triangle. The point of the triangle is the market's supply-and-demand equilibrium. The sides of the triangle are on the y-axis, are on the demand curve, and are on the horizontal price line.

The area of the triangle is the total consumer surplus. That is how much the market is worth to the consumers as a societal coordination mechanism.

Similarly, add up all the surpluses from all the producers—the total differences between the market price that each of them receives and their respective reservation prices—and you get the total producer surplus from the market. That is the maximum amount that the producers, if you could get them together in a group and figure out how to allocate the charges, would be willing to pay in order to keep the market open rather than to see it shut down completely.

On our supply and demand graph, we can visualize the total market producer surplus. Look at the y-axis and draw a horizontal line at the value of the market price. Look at the area between (a) the y-axis, (b) the supply curve, and (c) the horizontal price line. That area is the total producer surplus. That is how much the market is worth to the producers as a societal coordination mechanism.

Although the consumer surplus does indeed flow to consumers, it is not the case that each consumer gets the average amount of consumer surplus. Some receive much more than average. Some receive almost nothing at all. Is this fair?

This is not a question that the market as a system can answer. But it is a question you should ask. We will say a little bit later on about what economists can say about "distributive justice"—but even when we say what economists have to say, it will only be a very little about the subject.

Properties of Market Equilibrium

- Let us review the properties of the market equilibrium:

- It is where the supply and demand curves cross.

- Nobody is rationed out of the market in the sense that they wish that they could make the trades that others are making at the prices they are making them at, but cannot.

- It is stable.

- It produces the maximum dollar-value social surplus.

- No other possible arrangement produces more social surplus.

- Other arrangements have something wrong with them—some of the wrong people teaching the classes, some of the wrong people taking the classes, too few classes being offered, or too many classes being offered.

Central Planning via PDC Once Again

Now let us step back, and suppose that we didn't have a market economy but that instead this was all arranged as part of the *administration of* things *by* PDC—Production and Distribution Coordination. Suppose PDC decided that we were going to offer four yoga classes—taught by Severus, Hermione,

Harry, and Hagrid—charge a price of $20/lesson for each student, and offer $200/lesson for each instructor. And it finds that, at a price of $20/lesson for each student, there are only 20 students. But our teachers have a capacity of 76 students.

What would PDC then do? I see five options:

1. Split up the students among the four teachers and announce that the teachers will only be paid $100/lesson

2. Split up the students among the four teachers and announce that the students will each have to pay $40/lesson

3. Pick one of the teachers by lot and send him or her home, and then go draft 10 passers-by and force them to take the class, charging each student $20/lesson and paying each teacher $200/lesson

4. Draft 20 passers-by and force them to take the class, charging each student $20/lesson and paying each teacher $200/lesson

5. Lower the price charged to $19/lesson and the price paid to $190/lesson, and see if any more students are willing to pay that price and if any of the teachers say they would rather go do something else. And if that doesn't work, keep lowering the price.

Now possibilities (1) through (4) seem to me to be simply bad ideas. They each create lots of unhappy people. Hagrid, for ex-

ample, is absolutely ape**** about the whole situation no matter what choice PDC makes. All of the students are angry if PDC chooses option (2). The 10 passers-by forced to take yoga are angry in (3)—as is Hagrid, if he is not the teacher sent home, and whichever of Severus, Harry, or Hermione is sent home is angry, as are Ron and Letitia. And Hagrid and the 20 drafted passers-by are all ape**** in (4). "What do you mean I'm only being paid $200, or $1--?" "What do you mean I'm being charged $40?" "I have a perfect right to teach my class!" "What do you mean I have to take a yoga lesson? I don't want to take a yoga lesson!!"

By contrast, possibility (5) seems like a good idea. There are fewer students at a price of $20/lesson than there are spaces in the classes, and more instructors than there are slots for. That is a sign that the price of $20/lesson is in some sense too high. We should lower it, and see if there is a price at which everybody will be happy—at which everyone who wants to pay the price gets a slot in the course, everyone who wants to teach at that price gets a slot as well, and there are no people involuntarily drafted either as students or teachers who don't think that they are getting a good deal.

It is that option (5) that the market system is supposed to do as it settles on a price.

It is a fact that any other allocation mechanism leaves potential side deals unless it mimics the competitive market allocation. Consider an alternative arrangement might leave Hagrid assigned to teach and Hermione not. Then there is a potential

side deal to be made. Or an alternative arrangement might leave some of the wrong people taking the classes If yogastudent#10 is not assigned to take a class and yogastudent#30 is, then yogastudent#30 has an incentive to find yogastudent#10 and say: "Psst. I'll let you take my place if you pay me $5." There is $10 of surplus for them to split. Or an alternative arrangement might have too-few classes being offered. If only two classes are being offered (unless one of them is taught by Hagrid), even if the right people are teaching and taking them, then there is still a side deal to be made. Yogastudent#21 through yogastudent#30 can meet Ron, Letitia, and Severus outside. If they then set up their own class outside the umbrella of PDC, there is surplus for them to split if they can settle on a price. Or an alternative arrangement might have too many classes being offered. If Hagrid is teaching yogastudent#31 through yogastudent#80, they ought to all look at each other and say: "Let's just pretend we did this."

A competitive market equilibrium allocation leaves no mutually-beneficial side deals open. No group of students can get together with a teacher, agree to just pretend that they did this, and leave all of them better off. No group of non-students can get together with a non-teacher and all benefit by choosing a price and holding a class. No student can offer a side-payment to swap places with any non-student in such a way that makes both happier. No teacher can charge a fee to swap places with any non-teacher in such a way that both are happier.

These are powerful arguments. They suggest that even if you are not going to use the market as a societal calculating mechanism, whatever societal calculating mechanism you choose to use should closely mimic what a competitive market would do.

What You Have Learned

By the Time You Finish This Lecture You Should Be Able to:

1. Explain what a supply curve is, and successfully derive one from information about the tastes of and technologies available to producers.

2. Explain what a demand curve is, and successfully derive one from information about the tastes of consumers.

3. Explain what a competitive market equilibrium is, and successfully derive the market equilibrium price and quantity given the supply and demand curves.

4. Explain the importance of and calculate consumer and producer surplus at the

The unnatural experiment conducted in the twentieth century by the abolition of private property and the market system behind the Iron Curtain revealed the extraordinary and remarkable efficiency of them as a societal calculating mechanism for organizing production and allocating distribution. Together they appear to be five or more times as efficient as the leading alternative— non-market bureaucratic-command economies. A principal advantage of market economies is that they economize on information. Other mechanisms require that the center discover and process enormous amounts of information in order to form production and allocation plans and to be sure that those plans are being fulfilled. The market requires only a little information. In fact, the market does not even require that the center set the prices: the prices can set themselves. That is what a competitive market equilibrium does.

There will, in any market, be a supply curve and a demand curve: a group of people who wish to produce and have reservation prices for doing so, and a group of people who wish to buy and have reservation prices for doing so. A competitive market will settle on an equilibrium price at which the quantity demanded and the quantity supplied are equal. That equilibrium price will be stable. That equilibrium price will also produce the maximum social surplus—the maximum sum of consumer and producer surplus—relative to any alternative mechanism. And that equilibrium price and quantity will leave no mutually-beneficial side-deals possible.

These are powerful advantages of a market system. They suggest that even if you are not going to use the market as a socie-

tal calculating mechanism, whatever societal calculating mechanism you choose to use should closely mimic what a competitive market would do.

Problem Set 1: Choice, Production Possibilities, Oportunity Cost, Supply and Demand

For this problem set, we will consider a toy economy with eight workers--Lucy, Ricky, Ethel, Fred, Chingachgook, Galla Placidia, Ibn Sina, and An Lushan--that produces two commodities: lattes (large, vanilla-caramel, half-caff, sweetened, made half with skim milk and half with half-and-half--all lattes are equivalent, and take the same time and skill to make), and yoga lessons.

In a shift the eight workers could each teach at most the following number of yoga lessons: An Lushan 8; Chingachgook 8; Ibn Sina 4; Galla Placidia 3; Lucy 1; Ethel 1; Ricky 1; Fred 0.

In a shift the eight workers could prepare at most the following number of lattes: Lucy 20; Chingachgook 20; Ibn Sina 12; Ethel 10, Ricky 10, Fred 5; An Lushan 3; Galla Placidia 2.

Workers can split shifts: spend half their time teaching yoga and teaching half their maximum number of lessons and the other half pulling lattes and making half their maximum number, etc.

All 8 workers want to work full shifts.

1. What is the largest number of yoga lessons that this economy could teach?

2. What is the largest number of lattes that this economy could make?

3. Suppose Joe Djugashvili comes along and--out of the goodness of his heart and his desire to serve the people--volunteers to take on the onerous labor of the head of Production Distribution Coordination and assign people to shifts and tasks. He grabs four workers at random and says "you are pulling lattes". He tells the rest "you are teaching yoga classes". What is the expected value of the number of yoga classes taught? What is the expected value of the number of lattes made?

4. Graph the Production-Possibility Frontier--the PPF--of this economy.

5. Louie von Mises comes along and says that Joe Djugashvili is a really lousy head of PDC. Is Louie right or wrong? Use the PPF you drew in (4) to motivate your answer.

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6. How many yoga lessons could the economy produce and still produce as many lattes as Joe Djugashvili expected the economy he ran to produce in (4)?

7. How many lattes could the economy produce and still produce as many yoga lessons as Joe Djugashvili expected the economy he ran to produce in (4)?

8. Suppose that lattes sell for $4 each. What is the *opportunity cost* for each of the eight workers of putting them to work teaching an extra yoga lesson?

9. Suppose that all the students in a yoga lesson collectively pay $15 per lesson. What is the *opportunity cost* for each of the eight workers of putting them to work pulling an extra latte?

10. Suppose Joe is still head of PDC. Oskar Lange comes along bearing the results of your calculations from (8) and says that he has a plan by which the economy can produce more than the random-assignment economy of (3). In what order does he tell Joe to pick the people who are going to teach the yoga lessons?

11. What is the relationship between your answer to (10) and your answer to (4). Is Louie now happy (or at least less unhappy)?

12. Suppose customers are willing to pay $4 each for lattes and $15 for yoga lessons. Who should Joe assign to teach yoga? To pull lattes? How many lattes will the economy make and how many yoga lessons will it teach?

13. Suppose customers are willing to pay $4 each for lattes but only $5 for yoga lessons. Who should Joe assign to teach yoga? To pull lattes? How many lattes will the economy make and how many yoga lessons will it teach?

14. Suppose customers are willing to pay $4 each for lattes and $45 for yoga lessons. Who should Joe assign to teach yoga? To pull lattes? How many lattes will the economy make and how many yoga lessons will it teach?

15. Which economy--(3), (12), (13), or (14)--is the worst economy? Why?

16. Which economy--(3), (12), (13), or (14)--is the best economy? Why?

17. Suppose that the price of lattes is $4 each. Let the price of yoga lessons vary from $0 to $100, and draw the supply curve for yoga lessons.

18. Suppose that the price of lattes is $2 each. Let the price of yoga lessons vary from $0 to $100, and draw the supply curve for yoga lessons.

19. Why is your supply curve in (17) different from your supply curve in (18)?

20. Suppose that the price of yoga lessons is $20 each. Let the price of lattes vary from $0 to $40, and draw the supply curve for lattes.

21. Suppose that the price of yoga lessons is $10 each. Let the price of lattes vary from $0 to $40, and draw the supply curve for lattes.

22. Why is your supply curve in (20) different from your supply curve in (21)?

23. For the supply curve you drew in (18), suppose consumers demand 22 yoga lessons. What is the equilibrium price of yoga lessons?

24. For the supply curve you drew in (18), suppose consumers demand 12 yoga lessons. What is the equilibrium price of yoga lessons?

25. For the supply curve you drew in (18), suppose consumers are willing to pay $22 for yoga lessons. What is the equilibrium quantity of yoga lessons?

26. For the supply curve you drew in (18), suppose consumers are willing to pay $4 for yoga lessons. What is the equilibrium quantity of yoga lessons?