Economics and Government Reader

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Chapter 3. Free Markets Do Work! Efficiency and the First Fundamental Theorem

Normative and Positive Statements, Again

Recall what we have learned about normative and positive statements in chapter 2 (find and re-read it if you do not remember).

A normative statement has no "True" or "False" status. It is not testable. There is no empirical way to contest your friend's statement that "Orange is better than red."

Notice, though, that one can usually change a normative statement into a positive one by defining the ambiguous terms in such a way that they mean something all people understand the same way. Let us change the above to "<u>For me</u>, orange is better than red." Now, we would understand that a person speaking likes orange colour more than she likes red. With another bit of defining the terms, "better means it has greater value to me," it becomes testable. If the speaker is willing to pay more for, say, an orange car than for a red car, *ceteris paribus*, we could even run an experiment (offer her a choice between an orange and a red car, and see which one she picks). "An orange car has greater value for me than a red car does" is not, of course, the same as "orange is better than red." It is also not necessarily the case that "orange is better than red" lacks meaning. But changing to something more defined, and so rather positive, we can think about the preferences from an outside observer point of view.

It is a similar situation when we are trying to evaluate various outcomes of market interactions around us. Different people would prefer different outcomes, in general. Yet, with some restrictions, we could build the measures that allows us to positively sort those outcomes from an outsider's point of view.

Efficiency

One of the most common measures of "goodness" of a situation is its *efficiency*. It is applied to allocations of the goods/services.

Allocations

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Definition:

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An allocation is a description of who gets what.

Mathematically, an allocation is a matrix. Formally, it is usually a table like the following:

Person	Grade
John	C
Peter	B
Sarah	C+
Mark	A-

Here's a different example, with more than one good:

Person	Grade	Apples, lbs	Money, $	Body Mass, kg
John	C	12	500	69
Peter	B	10	600	87
Sarah	C+	15	550	59
Mark	A-	12	400	120

Here, we see that John has C (in ECON 104?), 12 pounds of apples, $500 in his pocket, and weighs 69 kg. Sarah has C+ (in ECON 104?), 15 pounds of apples, $550 in his pocket, and weighs 59 kg.

If several allocations are possible, we would like to be able to sort them from the best to the worst. The four people in our example may all agree with some proposed ranking of the allocations, or some of them may disagree. Consider the two allocations below:

Allocation I:

Person	Grade	Apples, lbs	Money, $	Body Mass, kg
John	C	12	500	69
Peter	B	10	600	87
Sarah	C+	15	550	59
Mark	A-	12	400	120

Allocation II:

Person	Grade	Apples, lbs	Money, $	Weight, kg
John	A	12	500	69
Peter	A	10	600	87
Sarah	B+	15	750	59
Mark	A+	12	400	120

Everybody (among the 4 people involved) would agree that allocation II is better: Each of them has a higher grade and same amounts of everything else; also, Sarah's got extra $200. It is an easy choice. If we asked them to choose by voting, the consensus would be for allocation II.

We may not be so lucky. Consider the two allocations below:

Allocation III:

Person	Grade	Apples, lbs	Money, $	Weight, kg
John	C	12	500	69
Peter	B	10	600	87
Sarah	C+	15	550	59
Mark	A-	12	400	120

Allocation IV:

Person	Grade	Apples, lbs	Money, $	Weight, kg
John	F	12	500	69
Peter	B	10	600	87
Sarah	B+	15	750	59
Mark	A-	12	400	120

John would prefer allocation III (higher grade, same of everything else for him), Sarah would prefer allocation IV (higher grade and more money). How could they choose an allocation as a group? (Voting may not help in this case, either. Can you see why?)

What's Best

The general idea of efficiency is about what's best. Think about two cars, one consuming 12 litres of gas per 100 km, the other consuming 8 litres of gas per 100 km. We would say that the former is less fuel efficient, while the latter is more fuel efficient.

Notice that efficiency has to be qualified. It is "fuel" efficiency in the above example. Let us say the same first car costs $300 per month to operate (total of fuel purchases, tune ups, small repairs, oil changes, etc.), while the

second one costs $350 per month to operate. The first one is more cost efficient (and less fuel efficient) than the second one. Simply saying "efficient" is not enough; one must specify what kind of efficiency is discussed.

Common practice is to use word "efficient" in Economics to mean "the most efficient." This allows having a slightly different, and very helpful, definition of efficiency: something is efficient if it cannot be made better. If one says the car is fuel efficient that would mean there is no other car that consumes less fuel per 100 km. In this view, what kind of efficiency you mean will depend on what you mean by "better" (in "cannot be made better"). If "better" means "consumes less gas," we are talking about fuel efficiency; if "better" means "cost less to operate," we are talking about cost efficiency.

If we want to evaluate allocations, we are talking about allocative efficiency. There are many ways to qualify allocative efficiency; we will consider two – Pareto efficiency and Marshall efficiency.

Pareto Efficiency

Definition:

Allocation X is Pareto efficient if there is no other feasible allocation Y such that the change from allocation X to allocation Y makes at least one person better off without making any other person worse off.

Allocation II above is Pareto efficient (if the only available allocations are allocation I and allocation II). Allocation I is Pareto inefficient:

> Think about allocation I first. Changing from allocation I to allocation II makes everybody better off and nobody worse off. So there **is other feasible allocation** (allocation II) that is better than I. Conclusion: Allocation I is Pareto inefficient.

> Now think about allocation II. Changing from allocation II to allocation I makes nobody better off and at least one person (actually, all of them) worse off. So there **is NO OTHER feasible allocation** that is better than II. Conclusion: Allocation II is Pareto efficient.

Think about the following example: There is no production, and every good that is available belongs to somebody, and everybody places positive value on every good. What allocation of goods is Pareto efficient?

An explicit way to look at an allocation and decide whether it is Pareto efficient is to ask whether there is a possible change (re-allocation) that makes at least one person better off without making another worse off. Such change is called a Pareto improvement.

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D e f i n i t i o n :

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Allocation is Pareto efficient if there is no Pareto improvement possible.

If a Pareto improvement is possible, the allocation is Pareto inefficient. There would be no objections from anybody ever to make a Pareto improvement if it is possible to make it – nobody is hurt by a Pareto improvement, so nobody should be against it. This does have a less obvious implication: we should expect that any observable status quo is Pareto efficient. If somebody can be made better off, a maximizing individual would take actions to pursue a Pareto improvement and nobody would try and stop her. This also implies that Pareto efficiency is a poor guide for policies – we can easily imagine the policies that would benefit society as a whole but come at some cost to few members of that society. There is another notion of efficiency that could be used for such policies, and we will call it Marshall efficiency.

Marshall Efficiency

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D e f i n i t i o n :

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An allocation is Marshall efficient if it has the greatest aggregate value among all feasible allocations.

Consider the same allocations we looked at before

Allocation III:

Person	Grade	Apples, lbs	Money, $	Weight, kg
John	C	12	500	69
Peter	B	10	600	87
Sarah	C+	15	550	59
Mark	A-	12	400	120

Allocation IV:

Person	Grade	Apples, lbs	Money, $	Weight, kg
John	F	12	500	69
Peter	B	10	600	87
Sarah	B+	15	750	59
Mark	A-	12	400	120

These are both Pareto efficient (provided they are the only allocations available). Let us assume now that we can measure the value of the grades: value of F is $0 to everybody, value of C is $600 to everybody, value of C+ is $700 to everybody, and value of B+ is $900 to everybody. There are only some things that change in between these allocation, and that is what we are going to pay attention to.

In allocation III, John has C and $500 of money; in allocation IV, John has F and $500 of money. This translates in $1100 of total value of the grade and money to him in allocation III, and the total value of the allocation is ($1100 + value of everything else [apples and weight]). In allocation IV, John has F and $500 of money. This translates in $500 of total value of the grade and money to him in allocation IV, and the total value of the allocation is ($500 + value of everything else [apples and weight]) to him.

In allocation III, Sarah has C+ and $550 of money; in allocation IV, Sarah has B+ and $750 of money. This translates in $1250 of total value of the grade and money to her in allocation III, and the total value of the allocation is ($1250 + value of everything else [apples and weight]). In allocation IV, Sarah has B+ and $750 of money. This translates in $1650 of total value of the grade and money to her in allocation IV, and the total value of the allocation is ($1650 + value of everything else [apples and weight]).

Adding all the values for everybody yields:

Allocation III: $2350 + value of everything else to everybody;

Allocation III: $2150 + value of everything else to everybody.

Value of everything else to everybody is same in both allocations. Clearly, allocation III has greater overall value. It is Marshall efficient.

Another way to look at an allocation and decide whether it is Marshall efficient is to:

a. Recognize that there are possible changes that make some people better off (call them winners) but also make other people worse off (call them losers);

b. Evaluate the total gains by the winners and total losses by the losers;

c. Ask whether the total gains by the winners are greater than the total losses by the losers. If they are, a change is called a Marshall improvement.

Definition:

Allocation is Marshall efficient if there is no Marshall improvement possible.

If a Marshall improvement is possible, the allocation is Pareto inefficient. There would be objections from the losers if we want to pursue a Marshall improvement. It may be not possible in practice but we can run a thought

experiment: since the winners' gain is greater than the losers' loss, we could take enough of their gain away from them, transfer it to the losers to just fully compensate them for the loss, and the winners would still have some positive portion of those gains!

If you are interested in reading beyond this text, there is a common notion of Kaldor-Hicks efficiency in professional literature that is very close to the Marshall efficiency.

There are other notions of efficiency that people sometimes use in economics but they are beyond the scope of this class.

Even though the discussion of Pareto efficiency is more common in Economics literature, in practice most economists use the idea of Marshall efficiency (whether they admit to it or not). You may find it instructive to read a good discussion of this in **PARETIAN AND MARSHALLIAN EFFICIENCY; MARSHALL, MONEY, AND REVEALED PREFERENCE; MARSHALL DISGUISED AS PARETO** in a chapter by David Friedman (follow the link to the page).

Some Difficulties

Our examples (allocation tables above) involve 4 people and 4 goods, a simple and well defined situations. The real world is not that simple. For instance, the goods may not be well defined, the group may not be well defined, the values may be difficult to measure, or some values may be not readily acceptable. Consider some possibilities below.

The Group

In the wake of the terrorist attacks on the USA in 2001, regulating immigration and detaining the "enemy combatants" abroad as the measures of national security has come to the front of policy discussions in the United States. Let us say that detaining a suspicious fellow in Iraq and placing him in the Guantanamo Bay prison for several years, without open investigation, increases the security of the American citizens a little bit. Obviously, this also hurts the prisoner. This detention would be efficient if the benefits to the citizens are greater than the harm to the prisoner, **IF** you count the prisoner's value. The Americans routinely apply different standards in cases like this. If a suspect is an American citizen, he is included in harm/benefit considerations (and you will see open court procedures, due process, etc.). If a suspect is not American, he is excluded from harm/benefit

considerations (and you will just hear something about people held captive, no reason explained, no due process, etc.). Designations like "unlawful combatant" are applied to explicitly exclude some people from a group for which the efficient rules are designed. You could find all sorts of discussions about this, for instance:

- [Do Noncitizens Have Constitutional Rights?](#)
- [Does the Constitution Protect Foreigners?](#)
- [Graham, McCain: Don't Read Boston Suspect His Miranda Rights](#)

Or consider a trade deal that would make people in Vancouver $1,000,000 better off while making people in Burnaby $2,000,000 worse off. Most of us would not think about it as a good idea. Compare it to a deal that would make people in Vancouver $1,000,000 better off while making people in Lipetsk, Russia $2,000,000 worse off – some may feel bad about it but many of us would likely support it. If you think we wouldn't, consider the opposite – there is no shortage of people complaining about the corporations shipping our good jobs abroad ("outsourcing"), even calling it an evil practice by greedy businesses. It must (with some qualifications) be that the benefits to those foreigners getting new jobs are greater than the losses to the locals who lose the jobs (otherwise the locals would agree on some deal that stops a corporation from outsourcing), yet we do not celebrate this as the businesses making the world a better place. This is likely so because we place less value on good things happening to the foreigners than on good things happening to the compatriots.

- [Union wary of Bell Canada outsourcing](#)

  At the time I checked it out, there were just two comments for this article:

    - Dee
    August 31, 2015 - 20:16
      I notice once a company contracts out the quality of the calls goes to the sinker. I see layoffs, layoffs, layoffs.

    - Bell Worker

    August 29, 2015 - 10:23

      This is very shameful. Bell, Rogers and Telus were crying foul when it looked like Verizon was coming to Canada. They all cited job loss in Canada and unfair advantages to the foreigners. Now they are wholesale outsourcers eliminating positions in Canada. Bell Canada is making tons of money but greed trumps all.

These are quite common sentiments.

Or consider people who oppose meat eating because it hurts animals. For many, it is just unacceptable to kill that cute cow with big sad eyes in order to get a steak. For many others, it is perfectly acceptable. Those who think it is not acceptable apparently include the animals (or at least some animals) in the category of the individuals whose benefits/losses count (you can even see this in their rhetoric – talking about animals having same feelings as people, etc.).

- [Why It's Unethical to Eat Animals](#)

What is common in all this examples? Different people include different individuals in the group about whose efficient allocations we would think. Even though the definition of efficiency intends to make it a positive concept, people will disagree on what to recognize as an efficient allocation or inefficient allocation depending on who they recognize as the group members. In other word, these differences in opinions about group membership bring in a normative element for most practical applications of the efficiency criteria.

A Practical Suggestion

We will omit other difficulties from the discussion here. Except one – when you look at the tables above, it is rather easy to figure out efficiency status of an allocation. The real world allocations re much more complex, and the similar tables would be huge and messy, i.e., unlikely to really decipher. How could you then make an efficiency assessment for a real world situation? By using the second definition of efficiency: *an (Pareto/Marshall) allocation is efficient if there is no (Pareto/Marshall) improvement possible.* In other words, stating that you recognize something as inefficient implies that you can see an improvement.

"this is inefficient" = "I can describe an improvement"

Granted, there may be improvement that you cannot see – it is quite possible to miss some inefficiencies. But if you cannot describe a possible improvement, you have no basis to claim that an allocation is inefficient.

Free Market and Efficiency

When the firms and the consumers engage in exchange, we say that they are in the market for the good. A market is a mechanism that allows exchange. To model a market, one has to simply put the demand and supply curves, and recognize their intersection as market equilibrium. This market equilibrium is what we expect to actually observe in the real world.

Here's a way to think about trade: we are all in the market to gain something, and we can measure those gains. In every exchange there's something we obtain (value) and something we give up (cost). From a consumer's point of view, the value of any unit bought is the height of the demand curve (marginal value), and its cost is the price the consumer has to pay. The difference between the total value of all the good bought and the total expenditure is the consumer surplus. From a firm's point of view, the value of any unit sold is the price (revenue per unit), and its cost is the opportunity cost of producing/delivering the good to the market. The difference between the total revenue and the sum of the marginal costs of all the good sold is the producer surplus.

In market equilibrium, the sum of the consumer surplus and the producer surplus is maximized. This sum is called the total surplus from trade.

But this means that the market equilibrium is efficient! Try to think about any change imaginable that would make somebody in the market better off without making somebody else worse off, or any change imaginable that would increase the total value. I bet you can't.

Look over another explanation from Bryan's Blog[1] (here the total surplus from trade is called the community surplus):

> **#4) Using a diagram, explain the concept of community surplus.**
> In a competitive market, **community surplus** is the total achieved when consume surplus and producer surplus are added together. **Consumer surplus** is the benefit that consumers receive when they pay a price that is lower than the price they were willing to pay for the same good or service. On the other hand, the **producer surplus** is the benefit that producers receive when they receive a price higher than what they were willing to supply the same good or service.

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[1] Bryan's Blog, <http://14solvbr.wordpress.com/2012/09/20/chapter-3-market-equilibrium-and-efficiency/>, accessed in January 2015

Both consumer surplus and producer surplus are easy to understand as examples. Let's start with consumer surplus. Imagine that a new model of basketball shoes are unleashed into the market – these shoes supposedly allow people to jump higher. To certain basketball players who wish to increase their vertical leap, these shoes seem like an essential and thus they are willing to pay more than the set market price. Thus, when these kind of people eventually buy the shoe, they are purchasing it at a price lower than what they would have paid – this is the consumer surplus. For example, let us say that the market price of the shoe is 100 dollars. However, Joe really wants to increase his vertical leap and thus is willing to pay 125 dollars for the same shoe. Thus, Joe's consumer surplus will be the difference between the price he is willing to pay and the actual market price: 125 – 100 = 25 dollars.

Producer surplus is quite similar – it is when the producers benefit because they receive a price that is higher than the price they were willing to supply the good for. Continuing with the same example, let us assume that the producers have found efficient ways to produce the basketball shoe and thus is willing to sell it at a low price of 90 dollars. However, the actual market price of the shoe is 100 dollars. Thus, the producer surplus will be: 100 – 90 = 10 dollars. The producers of the shoe will receive 10 dollars in producer surplus.

The community surplus is essentially the overall surplus or benefit; it is the consumer surplus added to the producer surplus. In the diagram below, we see that the consumer surplus is the shaded triangle (light-yellow) that starts from the market price and reaches to the top of the demand curve (thus showing more consumer surplus as the price rises). The producer surplus is the shaded triangle (darker-yellow) that starts from the market price to the bottom of the supply curve (thus showing more producer surplus as price decreases). If we use the formula for calculating the area of a triangle, we can find the total amount of both consumer surplus and producer surplus. We then add this together to find the total: community surplus.
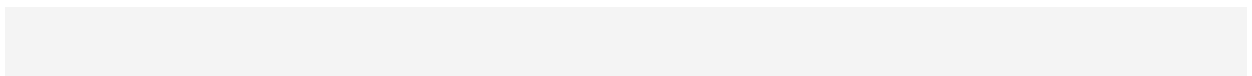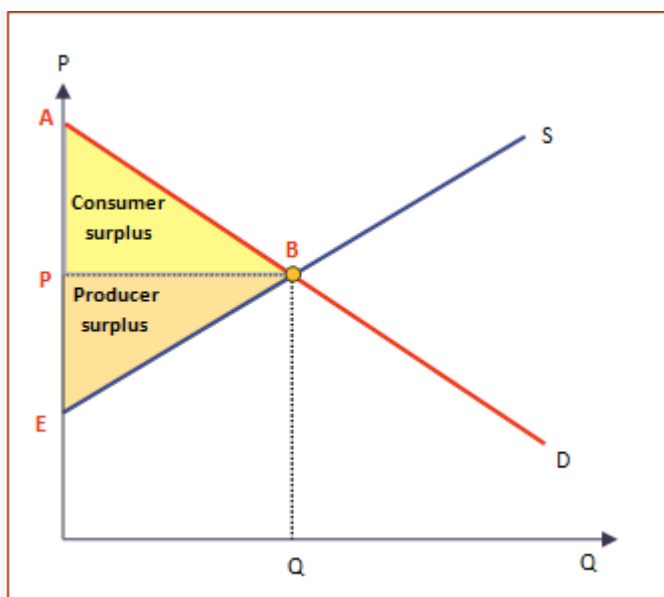
#5) Describe the concept of allocative efficiency and explain why it is achieved at the competitive market equilibrium.

Allocative Efficiency is achieved in terms of marginal cost and marginal benefit – thus it is important to first explain these two key concepts.

Marginal cost is the opportunity cost of one incremental unit. Thus, let us say there is a store that trades cats for small fish, and we currently possess a large number of small fish. Since the additional cost of producing more and more units tends to increase, the amount of small fish we are willing to give up for cats changes as we begin to possess more cats. Let's say that for the first cat I am willing to give up 20 of my 300 small fish. For the second cat, I am willing to give up 40 of my 280 (300-20) small fish. This continues so on and so forth, with the marginal cost increasing with each additional unit. The reason the marginal cost increases is because with each increase of something, the total output becomes smaller.

Marginal benefit is somewhat different. Marginal benefit is essentially the amount of extra utility derived from consuming one more quantity of a good or service. Typically, as we consume more and more of the same good or service, our benefit/satisfaction/utility becomes less and less. Thus, when I get my first cat I am willing to trade in large amounts of my small fish – for example, 100 out of a total of

300. However, when I get my second cat, I am not quite willing to give up as many small fish because I already have a cat and I have less small fish. This continues so on and so forth, with my marginal benefit decreasing with each extra quantity I consume.

Both marginal cost and benefit appear in competitive markets. Moreover, the marginal cost and marginal benefit will eventually meet at an equilibrium. This equilibrium is known as the competitive market equilibrium. For example, let's say that when purchasing my third cat, my marginal cost has increased to 60 small fish. At the same time, my marginal benefit has become 60 as well (first cat = 100 small fish, second cat = 80 small fish). Thus, the marginal benefit and cost have become the way – when these two concepts meet at a certain point, this indicates that allocative efficiency has been achieved. Allocative efficiency is essentially the optimal distribution and allocation of goods and services – it occurs at the competitive market equilibrium because the cost is the same as the benefit; there are no possible shortages or surpluses. When these two meet, the allocation of goods and services are as efficient as can be.

Another good way to look at it comes from writings of Gary Becker. Consider the following:

1. The supply curve reflects the cost of making a good. If the producer receives the price higher than the cost of making the good, there is a positive addition to her profit. We could call any such price "acceptable" to a producer. In the figure below, point A illustrates: the cost of making the 6th unit is $3, the price is $5, and the producer makes extra $2 in profit from selling the 6th unit. Any point in the shaded region is an acceptable deal for the producer.

Price

Supply
curve

A

5

3

6

Quantity
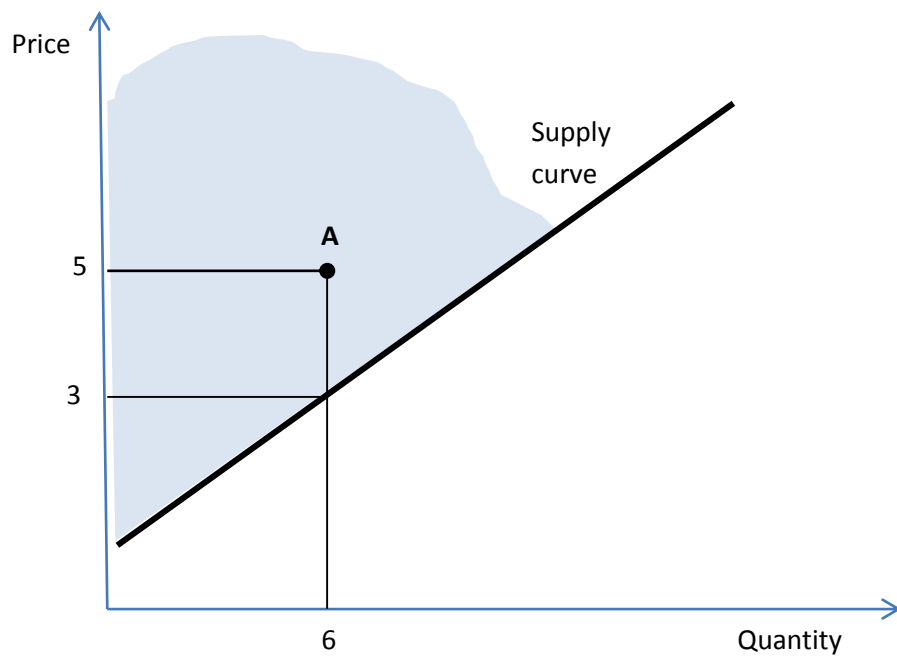
2. The demand curve reflects the value of a good. If the consumer pays the price lower than the value of the good, there is a positive addition to her consumer surplus. We could call any such price "acceptable" to a consumer. In the figure below, point B illustrates: the value the 6th unit is $8, the price is $5, and the consumer makes extra $3 in surplus from buying the 6th unit. Any point in the shaded region is an acceptable deal for the consumer.
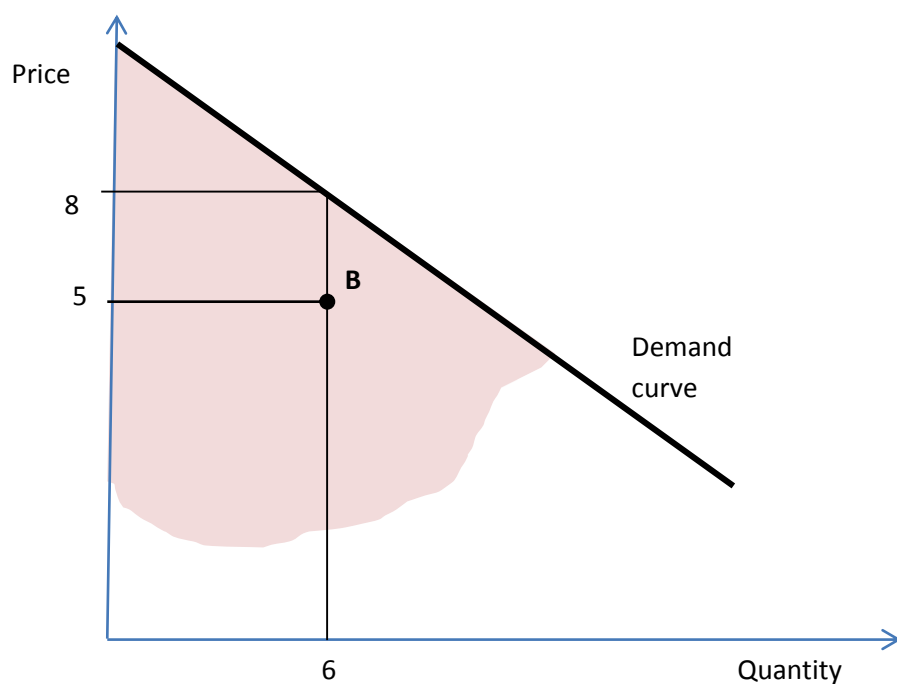
3. Now put the curves together in the market. Any point in the purple-shaded region is an acceptable deal for both the consumer and the producer. In other words, every deal within this region is a Pareto improvement, and since all the deals corresponding to the region are executed (the market equilibrium quantity is 9), there are no more Pareto improvements remaining. The market equilibrium is Pareto efficient. If the quantity traded were less than 9, there would be some Pareto improvements still possible. If the quantity traded were more than 9, some of the deals would be not acceptable to either the consumer or the producer.
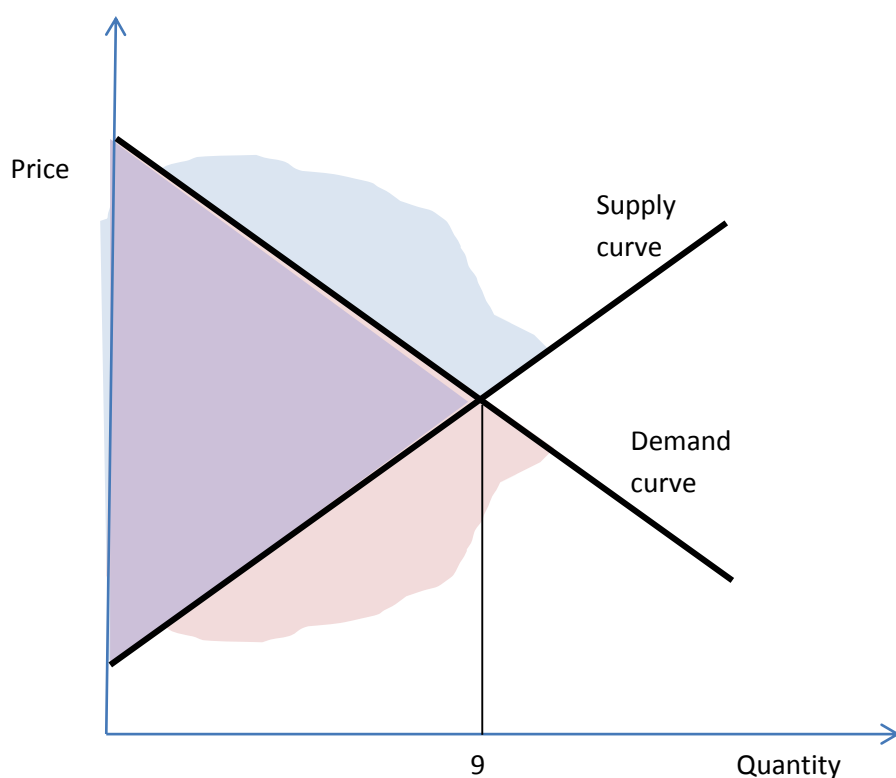
How about Marshall efficiency in this market? Every time a consumer buys something, she gains value (that is, she is a winner) and the producer gives up value (he's a loser). But the consumer pays an appropriate price – that is what compensates the loser and still makes the consumer better off. The prices in a free market act as a

compensation mechanism. Every potential Marshall improvement will be made voluntarily by the buyers and sellers; the use of price turns every potential Marshall improvement into a Pareto improvement.

Information and Efficiency + Benevolence

One non-obvious observation about this market equilibrium is that it has very low information requirements. To choose the best quantity demanded, a consumer only needs to know the price in the market and her own value for the good. To choose the profit-maximizing quantity supplied, a firm only needs to know the price in the market and its own cost of production.

If there were a benevolent dictator trying to achieve the efficient outcome in the same world, she would need to know other peoples' and firms' values and costs. That would be very hard. Note also that in the free market there is no trying to help other people – no benevolence needed – and yet the equilibrium is efficient.

Because the markets are so good at producing the efficient outcomes, they give rise to ideologies that have many followers. In the words of Yoram Bauman that you may remember from a previous class (Principles of Economics, Translated), "Governments Are Stupid." People exchanging in the markets do fine job without the government, and because of the lower information requirements and no need to rely on somebody's benevolence, they probably do a better job than the governments would. When it come to the ideologies, think Libertarians, "right-wing think tanks" (not really always for the free markets), Fraser Institute, Milton Friedman (you may want to find out, on your own, who these people, parties, and organizations are if you do not know).

The First Fundamental Theorem of Welfare Economics

The observation that the markets produce efficient outcomes in market equilibria has been expressed in various ways in economics writing. The most commonly used one is from Adam Smith, "the father of modern economics" (Book IV, Chapter II, paragraph IX of *The Wealth of Nations*):

> But the annual revenue of every society is always precisely equal to the exchangeable value of the whole annual produce of its industry, or rather is precisely the same thing with that exchangeable value. As every individual, therefore, endeavours as much as he can both to

employ his capital in the support of domestic industry, and so to direct that industry that its produce may be of the greatest value, every individual necessarily labours to render the annual revenue of the society as great as he can. He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an **invisible hand** to promote an end which was no part of his intention. Nor is it always the worse for the society that it was not part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good. It is an affectation, indeed, not very common among merchants, and very few words need be employed in dissuading them from it.

In Public Economics today, we usually state this as the ***First Fundamental Theorem of Welfare Economics***:

Under some common conditions, the equilibrium in a free, unregulated, market produces an efficient allocation. The conditions are:

- the markets are complete
- there is no monopoly (no market power)
- there are no externalities
- there are no public goods
- there is perfect information

Notice that this theorem implies (although it does not make it necessary) that inefficiencies appear when some of the conditions of the First Fundamental Theorem are violated. Learning about these conditions (what they mean), what happens when they do not hold, and what could the government do to remedy the resulting inefficiencies will make a good part of this course.

Extra Note

Efficiency is not the only measure of goodness. We may very much care about other things, and be willing to trade some efficiency if it necessary to achieve other goals. Some of them may be

- Equality or equity
- Sustainability
- Security
- Fairness
- Serving a greater power
- Freedom
- Civil liberties

This list is not exhaustive.