Economics 1: Introduction to Economics

J. Bradford DeLong <delong@econ.berkeley.edu>
Administrivia

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
Meta-Announcement

• We are moving announcements and administrivia out of lecture time and onto the “announcements” bCourses page...

• That is all...
Webtools and Other Matters...

- [https://bcourses.berkeley.edu/courses/1411451/assignments/syllabus](https://bcourses.berkeley.edu/courses/1411451/assignments/syllabus)
  - Problem Set 3 due Feb 24/25...
  - Paper Assignment: Dasgupta, Slee, Friedman and Friedman, or any two...
    - Details to follow...
Where We Are in the Runup to the Midterm...

- Feb 22: ch. 10: Externalities/Property Rights/; ch. 11: Information/Asymmetries
- Feb 24: ch 12: Labor Markets and Income Distribution
- Feb 24: Problem Set 3 due
- Feb 24: Paper assignment
- Feb 29: ch 13: Regulation and Cost-Benefit Analysis

- Pre-Midterm Review Monday March 7
- Midterm Monday March 9
Orientation

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
To Your i>Clickers!

• Problem Set 3 so far seems to be:

  A. Too short and too easy
  B. Too short and too hard
  C. Just right
  D. Too long and too easy
  E. Too long and too hard
The Market Balance Sheet: Pro

• The competitive market in equilibrium, from the perspective of a utilitarian seeking to achieve the greatest-good-of-the-greatest-number:

1. Allocates the roles of producers and sellers to those who can make and sell in a way least costly to society’s resources, those with the lowest opportunity cost.

2. Produces at a scale that exhausts all possible win-win exchanges

3. Allocates the goods produced to those with the greatest willingness-to-pay—those who, by the money standard, need and want it the mos
A Little Perspective...

• We are marching through the “how do markets go wrong?” part of the course...

• Out-of-equilibrium, rigidified by government, uncompetitive, non-rival (increasing returns to scale), externalities (in production and in consumption, positive and negative), information asymmetries, non-excludible (public goods etc.), maldistributions, miscalculations...

• That makes nine kinds of things that have gone wrong.

• Today is externalities day
A Little Perspective... II

• We are marching through the “how do markets go wrong?” part of the course...

• Out-of-equilibrium, rigidified by government, uncompetitive, non-rival (increasing returns to scale), externalities (in production and in consumption, positive and negative), information asymmetries, non-excludible (public goods etc.), maldistributions, miscalculations...

• That makes nine kinds of things that have gone wrong.

• Today is externalities day
Externalities

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
Today We Do Externalities

• The book has lots of smart things to say about externalities…

• And:
  • The Coase Theorem
  • The Tragedy of the Commons
  • Positional Goods

• I’m going to take a parallel track

• I’m going to detour back into the deep logic of why the market works, and why “externalities”—positive and negative—are a problem…
Today We Do Externalities

• My first cousin Phil Lord’s “The Lego Movie” was cheated of its “Best Animated Picture” Oscar nomination

• Something about the Academy being suspicious of a film that was essentially a two-hour toy commercial

• So let’s do externalities in the context of The Lego Movie
Today We Do Externalities

• Lego bric manufacturers produce and sell plastic brics…

• Master builders buy brics to make things…

• But Lego bric factories emit toxic plasticized smoke

• And that pollutes Cloud-Cuckoo Land…

  • (That’s a reference to classical Greek drama: Aristophanes, *The Birds* Νεφελοκοκκυγία, Nephelokokkygia)
To Your i>Clickers

• Should we expect the market economy to make the right decisions in such a situation?

A. Yes, a competitive market in equilibrium produces Pareto-optimal results

B. No. When the market makes the right decisions, it does so because it takes account of and properly weighs the consequences. With this “pollution externality” present, it cannot do so.

C. Yes, a competitive market in equilibrium maximizes the social welfare function

D. No—but the costs of using government to try to fix it will generate government failure problems worse than the errors of the marketplace.

E. Yes, because this externality does not involve a good or service sold on the market it has no effect on market optimality
Should we expect the market economy to make the right decisions in such a situation?

A. Yes, a competitive market in equilibrium produces Pareto-optimal results <<

B. No. When the market makes the right decisions, it does so because it takes account of and properly weighs the consequences. With this “pollution externality” present, it cannot do so.

C. Yes, a competitive market in equilibrium maximizes the social welfare function

D. No—but the costs of using government to try to fix it will generate government failure problems worse than the errors of the marketplace.

E. Yes, because this externality does not involve a good or service sold on the market it has no effect on market optimality
To Your i>Clickers III

• Should we expect the market economy to make the right decisions in such a situation?

A. **Yes, a competitive market in equilibrium produces Pareto-optimal results**

B. No. When the market makes the right decisions, it does so because it takes account of and properly weighs the consequences. With this “pollution externality” present, it cannot do so.

C. Yes, a competitive market in equilibrium maximizes the social welfare function.

D. No—but the costs of using government to try to fix it will generate government failure problems worse than the errors of the marketplace.

E. Yes, because this externality does not involve a good or service sold on the market it has no effect on market optimality

• I say B: C is rarely true, B is sometimes true—but not with externalities—and E is simply wrong.

• D is, I think, ideology: whether government failures from attempting to correct externalities are cures worse than the diseases is an empirical question that varies from case to case: not a theoretical a priori conclusion.
No, We Should Not Expect the Right Decisions to Be Made by a Market with an Externality

• Individual bric producers sell only if the market price is greater than their opportunity cost…

• Individual master builders buy only if the market price is less than her willingness-to-pay…

• All possible win-win deals between master builders and bric producers are made, and no not win-win deals between those two groups are made…

• But Unikitty and the other inhabitants of Cloud-Cuckoo-Land do not get a say—and their lungs are coated with plastic smoke…

  • This cannot work out well when the market gives some important stakeholders no voice in the decision at all…
To Your i>Clickers

• What should the government do in the case of the externality?

A. Forbid bric producers to use any production process that pollutes Cloud-Cuckoo Land?

B. Tell Unikitty and the other inhabitants of CCL to go and use the courts—to sue the individual bric producers under the doctrines of tort law for damages to repair the economic harm that air pollution does them?

C. Tell Unikitty and other inhabitants of CCL to buy gas masks?

D. Impose a quota on maximum allowable production in order to limit the damage from pollution?

E. Impose a tax to force bric producers (and master builders!) to take account of the damage they inflict on Cloud-Cuckoo Land, and then use the revenue for pollution remediation (or some other benefit to CCL?)
To Your i>Clickers II

- I say:
  - E. Impose a tax to force bric producers (and master builders!) to take account of the damage they inflict on Cloud-Cuckoo Land, and then use the revenue for pollution remediation (or some other benefit to CCL >>

- A is wrong: to forbid bric production may mean that we are giving up something of immense social benefit in order to guard against what may be a small harm.

- B is wrong: tort law has not, historically, dealt well with externalities.

- C is also wrong: why should Unikitty be required to pay for dealing with a situation she did nothing to create?

- And D is a less-destructive but still flawed version of A…
Emily:  

E. Impose a tax to force bric producers (and master builders!) to take account of the damage they inflict on Cloud-Cuckoo Land, and then use the revenue for pollution remediation (or some other benefit to CCL)

A.C. Pigou, *The Economics of Welfare*
What Would a Rational Society Do?

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
Our Market for Brics

• Supply:
  • $P_s=10+0.000005Q$

• Demand:
  • $P_d=100-0.00001Q$
Our Market Omniscient, Benevolent Central Planner for Brics

• Seek to figure out what is going on…
• First: how valuable are the brics produced?
• Demand:
  • \( P_d = 100 - 0.00001Q \)
• Suppose we choose to produce an amount \( Q \), and sell it
• What will the average valuation be?
Our Market Omniscient, Benevolent Central Planner for Brics II

- Demand:
  - $P_d = 100 - 0.00001Q$
- Suppose we choose to produce an amount $Q$, and sell it
- What will the average valuation be?
  - $AWtP = (100 + P_d)/2$
- What will the total value be?
  - $TV = Q \times (100 + P_d)/2$
  - $TV = Q \times (100-0.000005Q)$
Our Market Omniscient, Benevolent Central Planner for Brics III

- **Supply:**
  - $P_s = 10 + 0.000005Q$

- **Average Cost:**
  - $AC = (10 + P_s)/2$

- **Total Cost:**
  - $TC = Q \times (10 + P_s)/2$
  - $TC = Q \times (10 + 0.0000025Q)$
Our Market Omniscient, Benevolent Central Planner for Brics IV

- Total Surplus:
  - $TS = TV - TC$
  - $TS = Q \times (90 - 0.0000075Q)$
- We can march up the number of brics from zero all the way up to 10,000,000—at which point there is no more demand for brics.
- What do we get?
Our Market Omniscient, Benevolent Central Planner for Brics V

- Total Surplus:
  - $TS = TV - TC$
  - $TS = Q \times (90 - 0.0000075Q)$
- We can march up the number of brics from zero…
- What do we get?
- We know what we get:
  - 6M brics
  - $270M societal surplus
- The market does it for us

<table>
<thead>
<tr>
<th>Brics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>1,000,000</td>
<td>$82,500,000</td>
</tr>
<tr>
<td>2,000,000</td>
<td>$150,000,000</td>
</tr>
<tr>
<td>3,000,000</td>
<td>$202,500,000</td>
</tr>
<tr>
<td>4,000,000</td>
<td>$240,000,000</td>
</tr>
<tr>
<td>5,000,000</td>
<td>$262,500,000</td>
</tr>
<tr>
<td>6,000,000</td>
<td>$270,000,000</td>
</tr>
<tr>
<td>7,000,000</td>
<td>$262,500,000</td>
</tr>
<tr>
<td>8,000,000</td>
<td>$240,000,000</td>
</tr>
<tr>
<td>9,000,000</td>
<td>$202,500,000</td>
</tr>
<tr>
<td>10,000,000</td>
<td>$150,000,000</td>
</tr>
</tbody>
</table>
Our Market Omniscient, Benevolent Central Planner for Brics VI

- Total Surplus:
  - $TS = TV - TC$
  - $TS = Q \times (90 - 0.0000075Q)$
- We can march up the number of brics from zero…
- What do we get?
- We know what we get:
  - 6M brics
  - $270M$ societal surplus
- The market does it for us
A More Visual Representation of Total Value

• If no brics are used, the value of brics is zero...
• Suppose that we look at how much the master builders would be willing to pay for the first 100,000 brics...
A More Visual Representation of Total Value II

- The first 100,000 brics are worth...
- Nearly 10,000,000...
- Actually, 9,950,000...
- The master builder who buys the 100,000th bric is not willing to pay $100 for it—he is only willing to pay $99 for it...
- So by the time you reach 100,000 brice, each extra bric you add is only adding $99 rather than $100 to the societal value...
A More Visual Representation of Total Value III

• And the total for the first 1,000,000 brice is up to 95,000,000…

• But we keep on (hypothetically) finding more and more brice, and seeing what they are worth to the master builders who want them…

• By the time we reach 6,000,000 brics…

• The willingness-to-pay of the master builder who purchases the 6,000,000th bric is down to $40…

• And our total value is at $420,000,000—growing less than half as fast with each bric as it grew at the beginning…
Plus a More Visual Representation of Total Cost

• We can do a similar graph for total cost, looking first at the $10 cost of producing the first bric…
• On up to the $15 cost of producing the millionth…
• With the total cost, as we add the opportunity cost of using the resources to make each bric up and up, of the first million brics amounting to $12,500,000…
Plus a More Visual Representation of Total Cost II

- Looking first at the 10 cost of producing the first bric…
- On up to the 15 cost of producing the millionth, with the total cost of the first million brics at $12,500,000…
- And the 6,000,000 bric requires 40 in resources to call it forth, with a total cost of $150,000,000
Value, Cost, and Surplus

• And by the 10,000,000th bric the marginal cost of the next bric is up to 60, and the total cost has reached $350,000,000…

• With the surplus being the gap between the “value” and “cost” curves…

• And with the job of the central planner being to choose the quantity that produces the highest outcome on the surplus curve…
Value, Cost, and Surplus II

- All this is encapsulated in the three equations:
  - $TV = Q(100 - 0.00001Q/2)$
  - $TC = Q(10 + 0.000005Q/2)$
  - $TS = 90Q - 0.0000075Q^2$
- There is a lot of information packed into these few symbols, isn’t there?
- To convey the same information would require a huge table, or oceans and oceans of words.
Value, Cost, and Surplus III

- Total Surplus is maximized when:
  - \( \frac{d}{dQ}(TS) = 0 \rightarrow Q = \frac{90}{0.000015} \)
  - \( Q = 6,000,000 \)
- Which is not a terribly big surprise, is it?
- Our market is the benevolent central planner…
Pigou: Giving Those Affected a Voice in Determining the Market Equilibrium

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
But: Back to Our Pollution Problem

- We have three stakeholders in this market:
  - Value to consumers:
    - \( TV = Q \times (P_{d0} + P_d)/2 \)
  - Cost to producers:
    - \( TC = Q \times (P_{s0} + P_s)/2 \)
  - But also: externality cost to Cloud-Cuckoo Landers:
    - \( XC = -(P_x)Q \)
  - The competitive market maximizes \( TV-TC \).
  - But there is the externality \( XC \) as well…
Pigou’s Insight

- Consumers: $TV = Q \times (P_{d0} + P_d)/2$
- Producers: $TC = Q \times (P_{s0} + P_s)/2$
- Externality cost to Cloud-Cuckoo Landers: $XC = -(P_x)Q$
- The competitive market maximizes $TV-TC$.
- But if we make the buyers and sellers pay the $XC$ too, all will be well!
What Would Our Benevolent, Omniscient Central Planner Market Want to Do?

- Our market chooses:
  - \( Q = (P_{d0} - P_{s0})/(s + d) \)
- But we want:
  - \( Q = (P_{d0} - P_{s0} - P_x)/(s + d) \)
- But what is our equation for the equilibrium quantity when we impose a per-unit tax of \( T \) on the market?
- Yes! It is:
  - \( Q = (P_{d0} - P_{s0} - T)/(s + d) \)
What Would a Well-Working Market Do?

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
Back to Our Pollution Problem…

• Three stakeholders:
  • Value to consumers:
    • $TV = Q \times (P_{d0} + P_d)/2$
  • Cost to producers:
    • $TC = Q \times (P_{s0} + P_s)/2$
  • Externality cost to Cloud-Cuckoo Landers:
    • $XC = -(P_x)Q$
Let’s Put Down Some Numbers

• Value to consumers:
  • \( TV = Q \times \frac{P_{d0} + P_d}{2} \)
  • \( TV = Q \times \frac{100 + 100-0.00001Q}{2} \)

• Cost to producers:
  • \( TC = Q \times \frac{P_{s0} + P_s}{2} \)
  • \( TC = Q \times \frac{10 + 10+0.000005Q}{2} \)

• Externality cost to Cloud-Cuckoo Landers:
  • \( XC = -(P_x)Q \)
  • \( XC = -30Q \)
What Would Our Benevolent, Omniscient Central Planner Want to Do?

• Now we have three things happening in this marketplace:
  • Value to consumers:
    • $TV = Q \times (100 - 0.000005Q) = 100Q - 0.000005(Q^2)$
  • Cost to producers:
    • $TC = Q \times (10 + 0.0000025Q) = 10Q + 0.0000025(Q^2)$
  • Externality cost to Cloud-Cuckoo Landers:
    • $XC = -30Q$
  • Net value to consumers and producers:
    • $NV = 60Q - 0.0000075(Q^2)$
What Would Our Benevolent, Omniscient Central Planner Want to Do? II

• Net value to consumers and producers:
  • NV = 60Q - 0.0000075(Q^2)
• Maximized at a quantity of 4,000,000 lego brics produced
  • Compare to 6,000,000 produced by competitive market

<table>
<thead>
<tr>
<th>Brics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>1,000,000</td>
<td>$52,500,000</td>
</tr>
<tr>
<td>2,000,000</td>
<td>$90,000,000</td>
</tr>
<tr>
<td>3,000,000</td>
<td>$112,500,000</td>
</tr>
<tr>
<td>4,000,000</td>
<td>$120,000,000</td>
</tr>
<tr>
<td>5,000,000</td>
<td>$112,500,000</td>
</tr>
<tr>
<td>6,000,000</td>
<td>$90,000,000</td>
</tr>
<tr>
<td>7,000,000</td>
<td>$52,500,000</td>
</tr>
<tr>
<td>8,000,000</td>
<td>$0</td>
</tr>
<tr>
<td>9,000,000</td>
<td>-$67,500,000</td>
</tr>
<tr>
<td>10,000,000</td>
<td>-$150,000,000</td>
</tr>
</tbody>
</table>
What Would Our Benevolent, Omniscient Central Planner Want to Do? III

• Total value is maximized when:
  • \( Q = (P_{d0} - P_{s0} - P_x)/(s + d) \)
• But what is our equation for the equilibrium quantity when we impose a per-unit tax of \( T \) on the market?
  • \( Q = (P_{d0} - P_{s0} - T)/(s + d) \)
What Would Our Benevolent, Omniscient Central Planner Market Want to Do? IV

- Total value is maximized when:
  - \( Q = \frac{(P_{d0} - P_{s0} - P_x)}{(s + d)} \)
- But what is our equation for the equilibrium quantity when we impose a per-unit tax of \( T \) on the market?
- Yes! It is:
  - \( Q = \frac{(P_{d0} - P_{s0} - T)}{(a + b)} \)
- So set: \( T = P_x \)
- But note that finding what \( P_x \) is can be a very hard problem
What Would Our Benevolent, Omniscient Central Planner Market Want to Do? V

- Total value is maximized when:
  - \( Q = \frac{(P_{d0} - P_{s0} - P_x)}{(s + d)} \)
- But what is our equation for the equilibrium quantity when we impose a per-unit tax of \( T \) on the market?
  - Yes! It is:
    - \( Q = \frac{(P_{d0} - P_{s0} - T)}{(a + b)} \)
  - So set: \( T = P_x \)
- CS: $80,000,000
- PS: $40,000,000
- XC: -$120,000,000
- Revenue: $120,000,000
The Moral!

• When you have an externality…
The Moral! II

• When you have an externality…
• Find out what the willingness to pay to avoid the externality (if negative) or gain (if positive spillover) is…
The Moral! III

• When you have an externality…
• Find out what the willingness to pay to avoid the externality (if negative) or gain (if positive spillover) is…
• Impose that on the market as a tax (or bounty)…
The Moral! IV

• When you have an externality…
• Find out what the willingness to pay to avoid the externality (if negative) or gain (if positive spillover) is…
• Impose that on the market as a tax (or bounty)…
• And the competitive market equilibrium is once again the societal calculating mechanism for managing our collective division of labor we are looking for…
Externalities: The Puzzle of Setting the Tax

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
We Had a Nasty Pollution Externality

• Bric dust from the Lego bric-producing factories was being blown up into the air…

• And coating the lungs of the denizens of Cloud-Cuckoo Land…

• And destroying its ecology as well…
We Decided to Impose a Pigovian Tax...

- Yes!

- E. Impose a tax to force bric producers (and master builders!) to take account of the damage they inflict on Cloud-Cuckoo Land, and then use the revenue for pollution remediation (or some other benefit to CCL)

- A.C. Pigou, *The Economics of Welfare*
And So We Dealt with the Externality!

- AND CLOUD CUCKOO-LAND WAS SAVED, THANKS TO...

- A.C. Pigou, *The Economics of Welfare*

- But at what level should we set the externality-compensating tax?
What Should the Tax Be?

• How would you go about calculating what the proper value of the Pigouvian tax for the right to pollute would be?

• A thought experiment:
  
  • Suppose we could set up a competitive market for the right to pollute (or for the right to be free from pollution)…
  
  • We could let the market find an equilibrium price for the right to pollute—if we knew what the socially-optimum quantity of pollution was
  
  • And we could let the market determine the equilibrium quantity for pollution—if we knew what the socially-optimum cost of pollution was…
  
• But without either of those pieces of information, we face the problem of “government failure”

• Nevertheless, we know that not attempting to implement a Pigovian tax is worse than the government failure would be…
Threshold Externalities and Cap and Trade

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
We Had, in Our Market for Brics

- Supply:
  - \( P_s = 10 + 0.000005Q \)
- Demand:
  - \( P_d = 100 - 0.00001Q \)
- Externality:
  - \( XC = -30Q \)
But What If We Have a More Complicated “Threshold” Externality?

- Supply:
  - \( P_s = 10 + 0.000005Q \)
- Demand:
  - \( P_d = 100 - 0.00001Q \)
- Threshold Externality
But What If We Have a More Complicated “Threshold” Externality? II

• Supply:
  • \( P_s = 10 + 0.000005Q \)
• Demand:
  • \( P_d = 100 - 0.00001Q \)
• Threshold Externality
• You can calculate a tax…
But What If We Have a More Complicated “Threshold” Externality? III

- Supply:
  - $P_s = 10 + 0.000005Q$
- Demand:
  - $P_d = 100 - 0.00001Q$
- Threshold Externality
- You can calculate a tax...
- But what if, after you have calculated the tax, something happens to shift demand?
Then You Are in Huge Trouble!

- Threshold Externality
- You can calculate a tax...
- But what if, after you have calculated the tax, something happens to shift demand?
- Then you are in big trouble…
You Then Want a Tradable Permit, or a Cap-and-Trade System…

• Threshold Externality
• You can calculate a tax…
• But what if, after you have calculated the tax, something happens to shift demand?
• Then you are in big trouble…
• You want to find a way to control quantities and not adjust prices…
Connections to the Theory of the Firm...

- Threshold Externality
- You can calculate a tax...
- But what if, after you have calculated the tax, something happens to shift demand?
- Then you are in big trouble...
- You want to find a way to control quantities and not adjust prices...
- Connections to the theory of the firm...
Property Rights and Ronald Coase

February 22, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
What About “The Coase Theorem”?


• Truth to tell, I have never been a great fan…
  • By contrast, I think Coase’s (1937) “The Nature of the Firm”, 16(4) Economica 386–405 is great…

• Valid insights concerning trying to cut property rights “at the joints”…

• Valid insights about assigning liability to the “least-cost risk avoider”

• One set of issues concerning the Coase theorem in section exercises.

• But Coase has a joker in the deck: “assume no bargaining costs…”
The Market System: Balance Sheet

February 17, 2016 8-9 AM
Wheeler Auditorium, U.C. Berkeley
The Market Balance Sheet: Pro

- The competitive market in equilibrium, from the perspective of a utilitarian seeking to achieve the greatest-good-of-the-greatest-number:

1. Allocates the roles of producers and sellers to those who can make and sell in a way least costly to society’s resources, those with the lowest *opportunity cost*.

2. Produces at a scale that exhausts all possible *win-win exchanges*.

3. Allocates the goods produced to those with the greatest *willingness-to-pay*—those who, by the money standard, need and want it the mos
The Market Balance Sheet: Con

1. Out of Equilibrium
2. Government Distortions: market messed up by quotas or price fixing
3. Market Power:
   A. Luck or entrepreneurial skill
   B. Government license
   C. Monopolistic Competition: market power baked into market structure
4. Natural Monopoly
   D. Competition can be unsustainable because of non-rivalry or increasing-returns
   E. Competition can be inefficient because of non-rivalry or increasing-returns
5. Externalities: third parties’ interests taken into account via Pigovian mechanisms

• Still to come: information asymmetries, non-excludability (public goods etc.), maldistributions, miscalculations...
Questions?