Principles of Economics
When Competitive Markets Cannot Work Optimally

Non-Rivalry

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Markets Work Well When…

• …producers face the right incentives so that they feel the entire consequences in their own pocketbooks…
Markets Work Well When...

II

• ...producers face the right incentives so that they feel the *entire* consequences in their own pocketbooks...

• This requires:

  • That the marginal revenue earned by producers—the extra money they get from making and selling one more unit—be equal to the marginal total value, to the willingness-to-pay, of demanders
Markets Work Well When…

III

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  • That the marginal cost to producers—how much they have to pay to assemble the resources to produce an extra unit, plus whatever opportunity cost and disutility they suffer—is equal to the total marginal cost to society as a whole of producing an extra unit
Markets Work Well When…

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• If not, not!
Markets Won’t Work Well When...

- If not, not!

- If marginal revenue is not equal to the marginal social value—the highest unsatisfied willingness-to-pay...

- ... then producers will not face the right incentive to produce at the margin
Markets Won’t Work Well When… II

• If not, not!

• If the producer’s marginal revenue is not equal to the marginal social value—the highest unsatisfied willingness-to-pay…

• … then producers will not face the right incentive to produce at the margin

• If the producer’s marginal cost is not equal to the marginal burden on society of producing an extra unit…

• … then producers will not take proper account of the burden on society of producing an extra unit
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- We have seen this with externalities
Fixing the Market

• If the producer’s marginal cost is not equal to the marginal burden on society of producing an extra unit…
  
  • … then producers will not take proper account of the burden on society of producing an extra unit

• We have seen this with externalities

• The fix is to—somehow—calculate what the wedge between producer marginal costs and marginal societal burdens are

• And impose a tax (or a subsidy)

• \textbf{IF} you can do the calculation
Fixing the Market?

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• And impose a tax (or a subsidy)

  • **IF** you can do the calculation

  • “**IF MY GRANDMOTHER HAD WHEELS, SHE WOULD BE A BUS!”**
Non-Rivalry

• Today we are going to consider a different source of market failure than externalities

• Today we are going to consider “non-rivalry”
The Set-Up...

- Every weekend new movie(s) are released
- Gotta release new movies every weekend!
  - The demand for new movies is different from the demand for old movies
- Demand for new movies: \( P_d = 100 - 0.2 \times Q \)
The Set-Up... II

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- Demand for new movies: \( P_d = 100 - 0.1 \times Q \)

- Each new movie costs 5000 to make
  - Those are the *only* costs of making a movie

- People don’t care which new movie they see

- Ample space in theaters
The Set-Up... IV

• Every weekend new movie(s) are released

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The Weekly Market for New Movies

- If 50 people go to the movies, average cost = 100
- If 100 people go to the movies, average cost = 50
- If 200 people go to the movies, average cost = 25
Non-Rivalry and Increasing Returns to Scale

- Very few things are completely non-rival
- Some of things are very non-rival
- A huge number of things are somewhat non-rival
- Increasing returns to scale
  - Things that only need to be done once…
What Is the First-Best?

• We calculate this in steps…

• First, what is the total value to moviegoers for the demand curve:

  • \( P_d = 100 - 0.1 \times Q \)

  • ?
Ladies and Gentlemen, to Your i>Clickers...

- First, what is the total value to moviegoers, for the demand curve: \( P_d = 100 - 0.1 \times Q \), if 100 people go to the movies?
  - A. 10000
  - B. 9000
  - C. 50,000
  - D. 9500
  - E. None of the above
Ladies and Gentlemen, to Your i>Clickers...: Answer

• First, what is the total value to moviegoers, for the demand curve: \( P_d = 100 - 0.1 \times Q \), if 100 people go to the movies?
  
  • A. 10000 B. 9000 C. 50,000 D. 9500 E. None of the above

• Maximum willingness-to-pay \( P_{d0} = 100 \)

• At a quantity of 100 \( P_d = 90 \)

• Average willingness-to-pay for moviegoers is 95

• \( 95 \times 100 = 9500 \)
Ladies and Gentlemen, to Your i>Clickers...

• First, what is the total value to moviegoers, for the demand curve: \( P_d = 100 - 0.1 \times Q \), if 1000 people go to the movies?

  • A. 10000
  • B. 9000
  • C. 50,000
  • D. 9500
  • E. None of the above
Ladies and Gentlemen, to
Your i>Clickers…: Answers

• First, what is the total value to
  moviegoers, for the demand curve:
  \( P_d = 100 - 0.1 \times Q \), if 1000 people go
to the movies?

  • A. 10000 B. 9000 C. 50,000 D.
  9500 E. None of the above

• Maximum willingness-to-pay \( P_{d0} = 100 \)

• At a quantity of 1000, \( P_d = 0 \)

• Average willingness-to-pay for
  moviegoers is 50

• 50 \times 1000 = 50,000
Ladies and Gentlemen, to Your i>Clickers...

• For the demand curve: \( P_d = 100 - 0.1 \times Q \), what is total value \( TV \) as a function of the quantity produced \( Q \)?

  • A. \( 100Q + 0.2Q^2 \)
  • B. \( 100Q + 0.05Q^2 \)
  • C. \( 100Q - 0.05Q^2 \)
  • D. \( 50000 + 100Q - 0.05Q^2 \)
  • E. None of the above
Ladies and Gentlemen, to Your i>Clickers...: Answers

• For the demand curve: \( P_d = 100 - 0.1 \times Q \), what is total value TV as a function of the quantity produced Q?

• A. \( 100Q + 0.2Q^2 \)

• B. \( 100Q + 0.05Q^2 \)

• C. \( 100Q - 0.05Q^2 \)

• D. \( 50000 + 100Q - 0.05Q^2 \)

• E. None of the above
Ladies and Gentlemen, to Your i>Clickers....: Answers II

• For the demand curve: \( P_d = 100 - 0.1 \times Q \), what is total value TV as a function of the quantity produced Q? A. \( 100Q + 0.2Q^2 \) B. \( 100Q + 0.05Q^2 \) C. \( 100Q - 0.05Q^2 \) D. \( 50000 + 100Q - 0.05Q^2 \) E. None of the above

• Two ways to do it:
  
  • Integrate
  
  • Average willingness to pay
Integrate!

\[ Q_d = Q \]
\[ \int_{Q_d=0}^{Q_d=Q} P_d(Q_d) dQ \]
\[ Q_d = Q \]
\[ \int_{Q_d=0}^{Q_d=Q} [100 - 0.1Q_d] dQ \]
\[ Q_d = Q \]
\[ \int_{Q_d=0}^{Q_d=Q} 100 dQ - \int_{Q_d=0}^{Q_d=Q} 0.1Q_d dQ \]
\[ Q_d = 0 \]
Integrate! II

\[
\begin{align*}
\int_{Q_d=0}^{Q_d=Q} P_d(Q_d) dQ \\
\int_{Q_d=0}^{Q_d=Q} [100 - 0.1Q_d] dQ \\
100Q_d \bigg|_{Q_d=0}^{Q_d=Q} - \int_{Q_d=0}^{Q_d=Q} 0.1Q_d dQ \\
100Q - 0.05Q^2
\end{align*}
\]
Average Willingness to Pay

- Demand: $P_d = 100 - 0.1 \times Q$
- At a quantity of 0, $P_d = P_{d0} = 100$
- At a quantity of $Q$, $P_d = 100 - 0.1 \times Q$
- Avg willingness-to-pay is: $(100 + 100 - 0.1 \times Q)/2$
  - $= 100 - 0.05 \times Q$
- Quantity is $Q$
- Total Value $TV = AWTP \times Q = (100 - 0.05 \times Q) \times Q$
  - $TV = 100Q - 0.05 \times Q^2$
Ladies and Gentlemen, to
Your i>Clickers!

• What Is the total cost to society of making a movie?
  
• A. 0.1Q

• B. Movies are free to make

• C. 5000

• D. 5000 + 0.1Q

• E. None of the above
Ladies and Gentlemen, to Your i>Clickers!: Answer

• What is the total cost to society of making a movie?

• A. 0.1Q

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• C. 5000

• D. 5000 + 0.1Q

• E. None of the above
Ladies and Gentlemen, to Your i>Clickers!

• Is there a point to making more than one movie a week?

  • A. No: Hollywood talent is scarce, and if you make two movies at once you must pay inflated prices for supplies and skilled workers

  • B. Yes: if two movies are being made at the same time, they can share crews and so economize on production costs

  • C. No: given the demand curve, everybody is just as happy to see one movie as another

  • D. Yes; moviegoers can choose to go to whatever movie they like the most

  • E. None of the above
Ladies and Gentlemen, to Your i>Clickers! Answers

• Is there a point to making more than one movie a week? A. No: Hollywood talent is scarce, and if you make two movies at once you must pay inflated prices for supplies and skilled workers B. Yes: if two movies are being made at the same time, they can share crews and so economize on production costs C. No: given the demand curve, everybody is just as happy to see one movie as another D. Yes; moviegoers can choose to go to whatever movie they like the most E. None of the above

• The right answer given this setup is C: there are no benefits to variety (or the benefits to variety are small)

• In the real world, this is an important issue to think about: how much variety is worth producing?

• Henry Ford vs. Alfred P. Sloan…
What, Then, Is the Weekly Benefit-Cost Analysis for the Movie Industry?

- **Total Value:** \( TV = 100Q - 0.05 \times Q^2 \)
- **Total Cost:** \( TC = 5000 \)
- **Total Surplus**
  - \( TS = TV - TC \)
  - \( TS = (100Q - 0.05 \times Q^2) - (5000) \)

- How many people should go to the movies, and what price should the movie theater charge?
Ladies, Gentlemen, and Wannabee Warner Bros. Execs, to Your i>Clickers!

• TS = \((100Q - 0.05 \times Q^2) - (5000)\): How many people should go to the movies, and what price should the movie theater charge?

• A. \(Q = 500; P = 50\)
• B. \(Q = 947; P = 5.3\)
• C. \(Q = 1000; P = 0\)
• D. \(Q = 2000; P = 2.50\)
• E. None of the above
Ladies, Gentlemen, and Wannabees
Warner Bros. Execs, to Your
\textgreater\textgreater\textgreater\textgreater\textgreater\textgreater Clickers!: Answer

- \( TS = 100Q - 0.05 \times Q^2 - 5000 \):

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- Why C? It comes out of the math:
Ladies, Gentlemen, and Wannabee Warner Bros. Execs, to Your i>Clickers!: Answer II

• TS = 100Q - 0.05 x Q^2 - 5000:

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• TS = 100Q - 0.05 x Q^2 - 5000:

• How many people should go to the movies, and what price should the movie theater charge? A. Q = 500; P = 50  
  B. Q = 947; P = 5.3  
  C. Q = 1000;  
  P = 0  
  D. Q = 2000; P = 2.50  
  E. None of the above

• Why C? It comes out of the math:

\[
\frac{d}{dQ} (TS) = \frac{d}{dQ} (100Q - 0.05Q^2 - 5000) = 0
\]

\[
100 - 0.1Q = 0
\]

\[
Q = 1000
\]
Ladies, Gentlemen, and Wannabees
Warner Bros. Execs, to Your
i>Clickers!: Answer IV

Or, if you prefer…

**Total Surplus as a Function of Number of Moviegoers**

![Graph showing total surplus as a function of number of moviegoers. The graph peaks around the middle number of moviegoers, indicating an optimal point.]
First-Best with Non-Rivalry

- Make movies free
First-Best with Non-Rivalry II

• Make movies free

• The societal cost of adding an extra moviegoer is zero—the movie is already made
First-Best with Non-Rivalry

- Make movies free
- The societal cost of adding an extra moviegoer is zero—the movie is already made
- There is no burden imposed on the rest of society by adding another moviegoer
First-Best with Non-Rivalry

IV

• Make movies free

• The societal cost of adding an extra moviegoer is zero—the movie is already made

• There is no burden imposed on the rest of society by adding another moviegoer

• Since there is no burden imposed on society, there is no reason to make anybody who wants to go think twice before going
First-Best with Non-Rivalry

V

• Make movies free

• The societal cost of adding an extra moviegoer is zero—the movie is already made

• There is no burden imposed on the rest of society by adding another moviegoer

• Since there is no burden imposed on society, there is no reason to make anybody who wants to go think twice before going

• There is no reason to have moviegoers pay any price at all…
Non-Rival Commodities Want to Be Free!!!!

• But there is an obvious problem...
Non-Rival Commodities
Want to Be Free!!!! II

• But there is an obvious problem...

• What is the obvious problem here?
Non-Rival Commodities Want to Be Free!!!! III

• But there is an obvious problem…

• What is the obvious problem here?

• And there is an obvious solution: this is what taxes are for

• Public provision of non-rival goods
Non-Rival Commodities Want to Be Free!!!! IV

- But there is an obvious problem...

- What is the obvious problem here?

- And there is an obvious solution: this is what taxes are for

- Public provision of non-rival goods
  
  - NIH
  - DoD
  - DARPA
  - UCB
  - Fire Departments
  - Police Departments
  - Roads and bridges (unless and until they become congested)
  - Etc.
But What If We Don’t Want to Nationalize the Movie Industry and Give Products Away for Free?

• What reasons could we have for not wanting to nationalize the movie industry?
But What If We Don’t Want to Nationalize the Movie Industry and Give It Away?

- What reasons could we have for not wanting to nationalize the movie industry?
  - Don’t trust bureaucracy
  - Want to spur innovation
  - Are in the pocket of the Hollywood lobby
A Not-Nationalized Movie Industry: Non-Rival, But Excludible

• New movies are non-rival: you make it, and then can show it to as many people as are willing to pay that weekend
  • For no additional cost

• But you can charge a price
  • A ticket-taker
  • The first-run movie is excludible