

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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- 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
 - 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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 - 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
- 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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Fixing the Market

- If the producer's marginal cost is not equal to the marginal burden on society of producing an extra unit...
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- 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)
- **IF** you can do the calculation

Fixing the Market?

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- 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)
- **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”

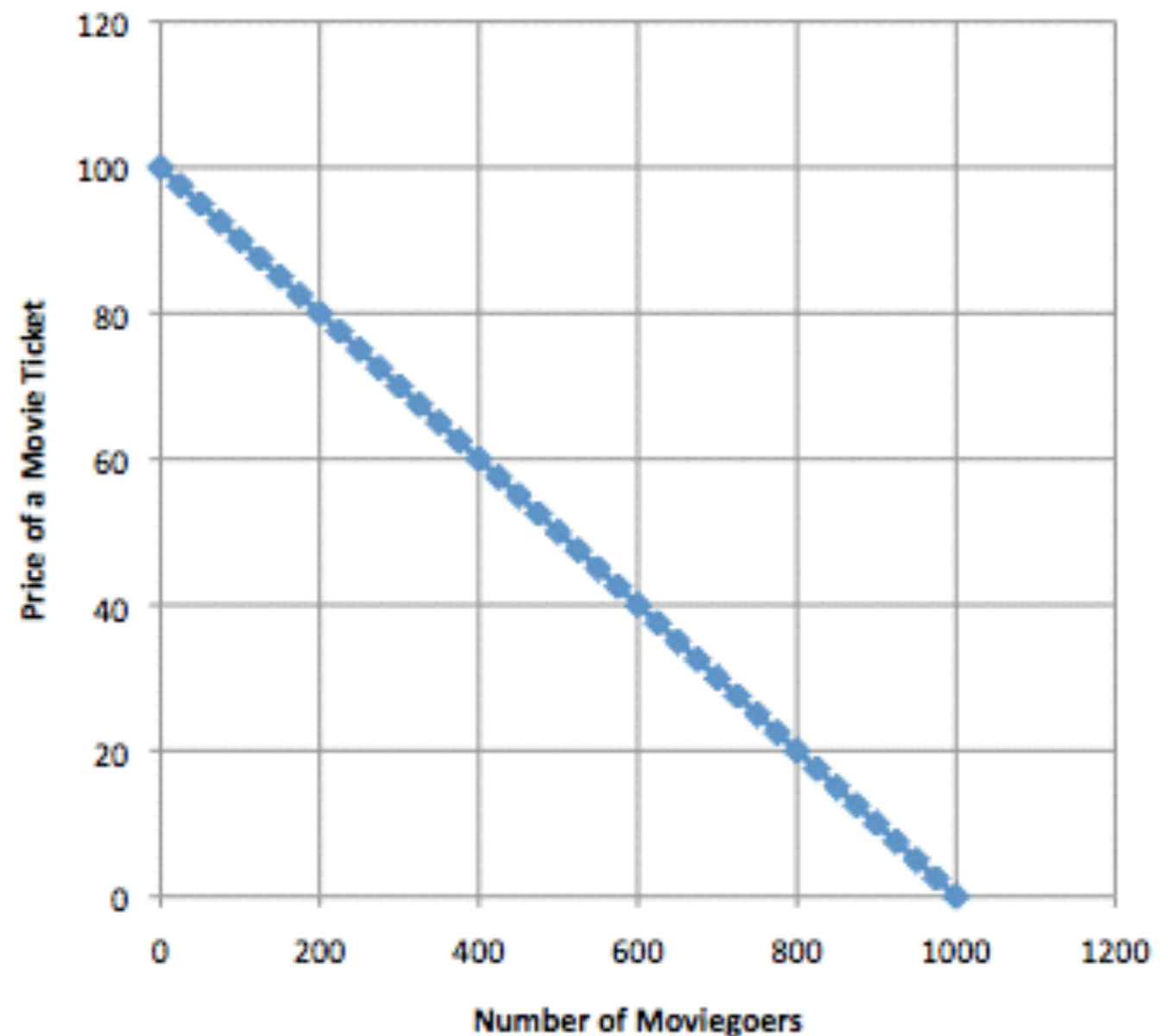
The Set-Up...

- 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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The Weekly Market for New Movies



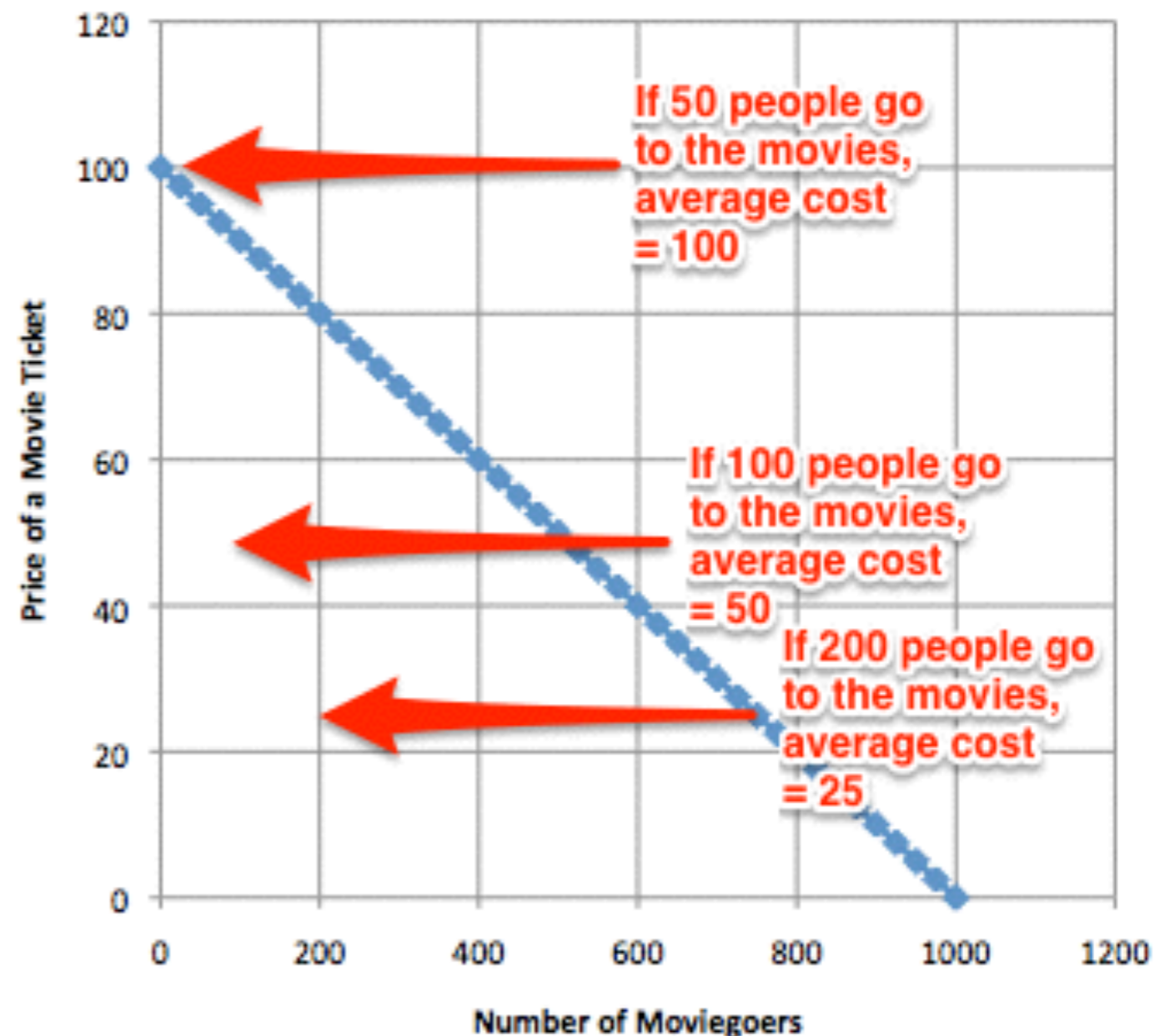
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- Each new movie costs 5000 to make
 - Those are the *only* costs of making a movie
- People don't care which new movie they see
- Ample space in theaters

The Set-Up... IV

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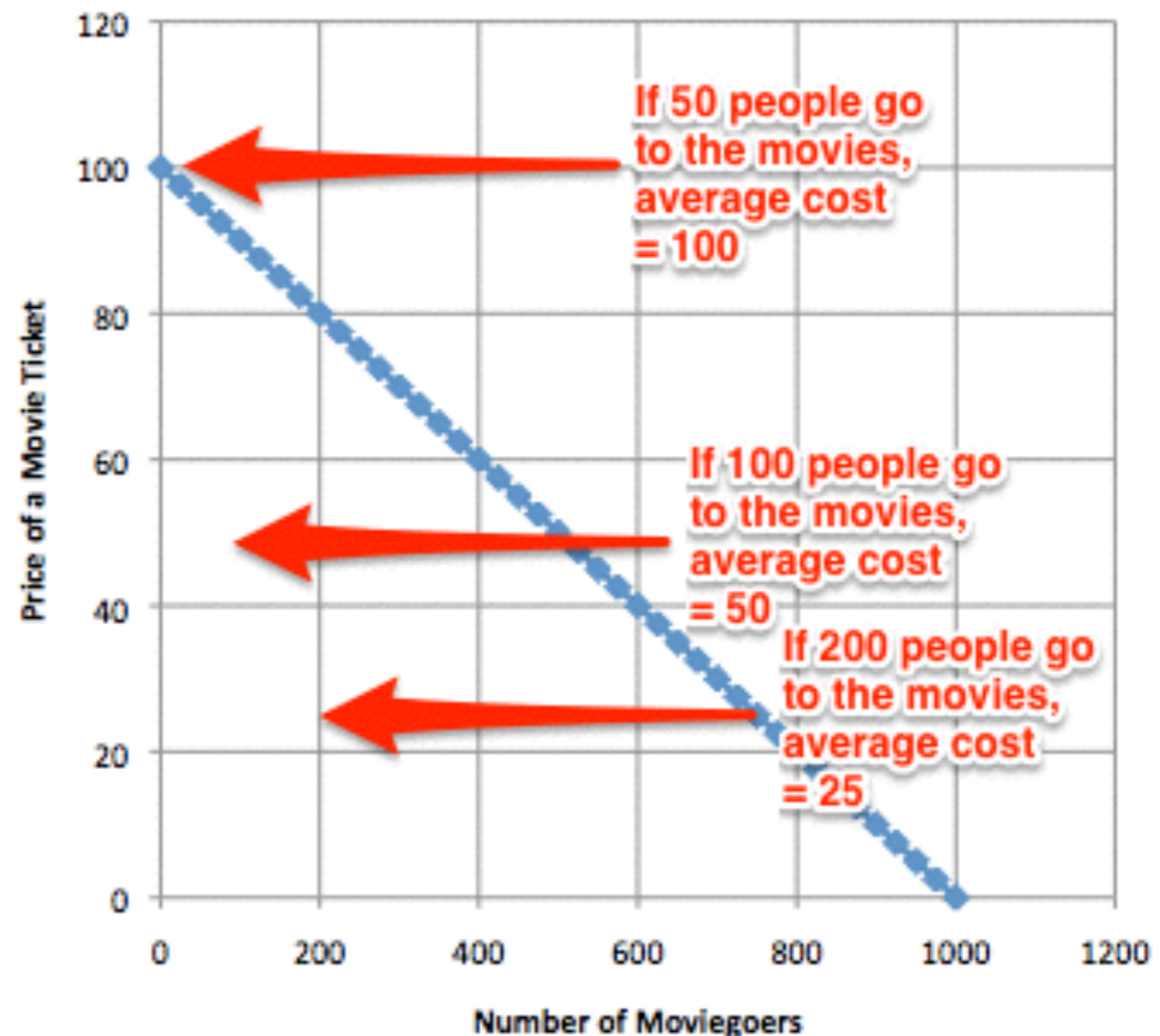
The Weekly Market for New Movies



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...

The Weekly Market for New Movies

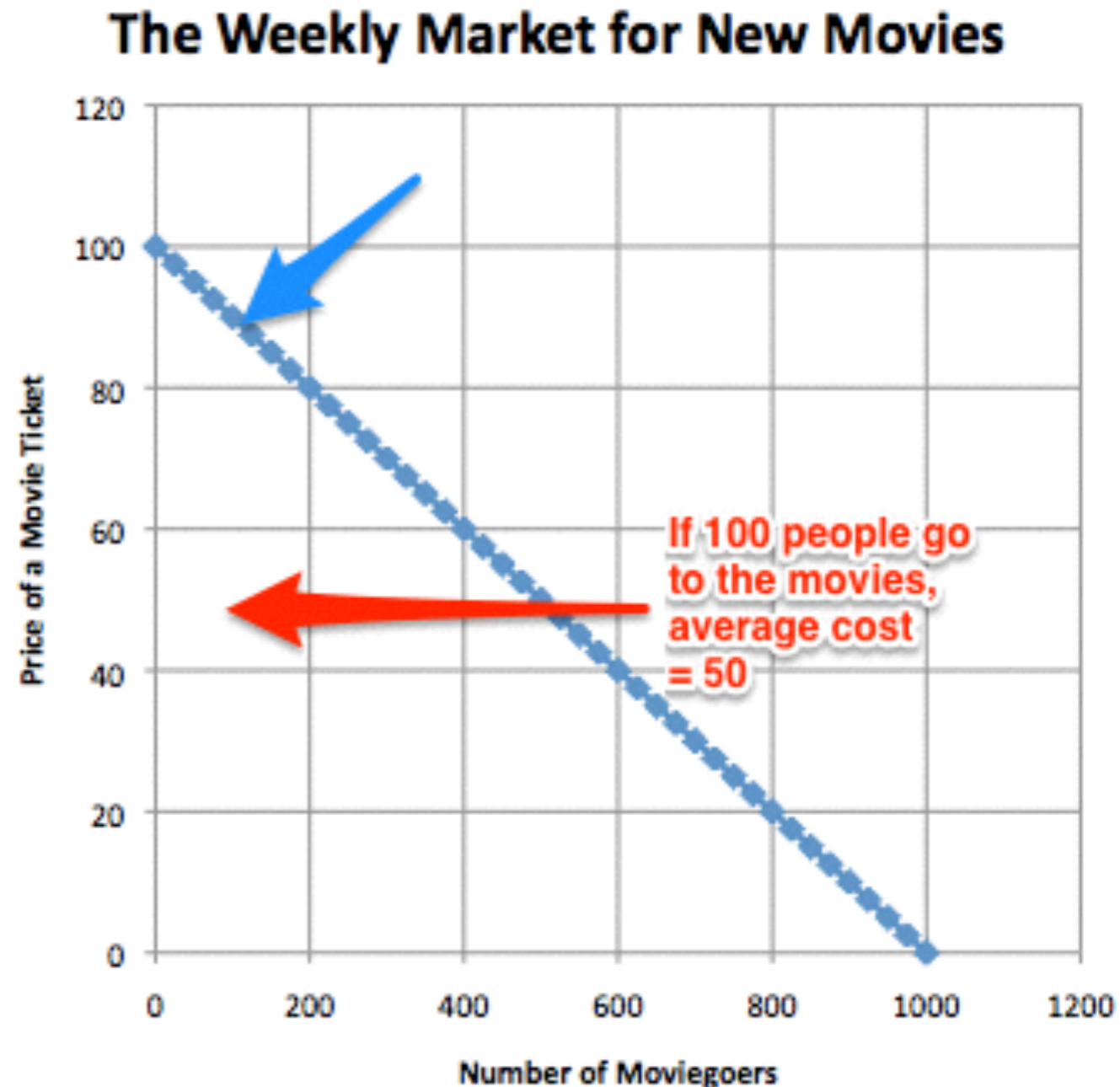


What Is the First-Best?

- We calculate this in steps...
- First, what is the total value to moviegoers for the demand curve:
 - $P_d = 100 - 0.1 \times Q$
- ?

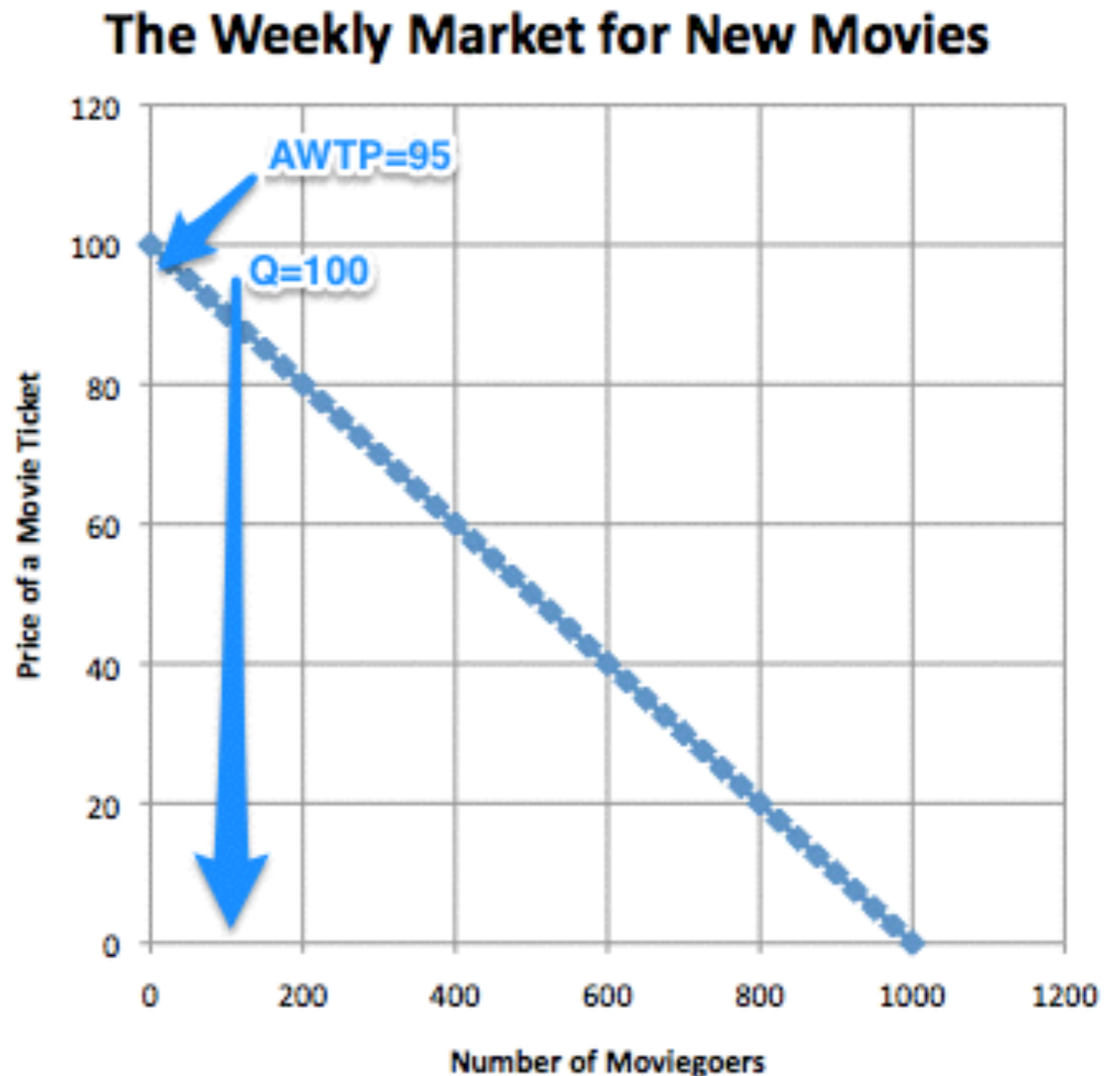
Ladies and Gentlemen, to Your i>Clickers...

- 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



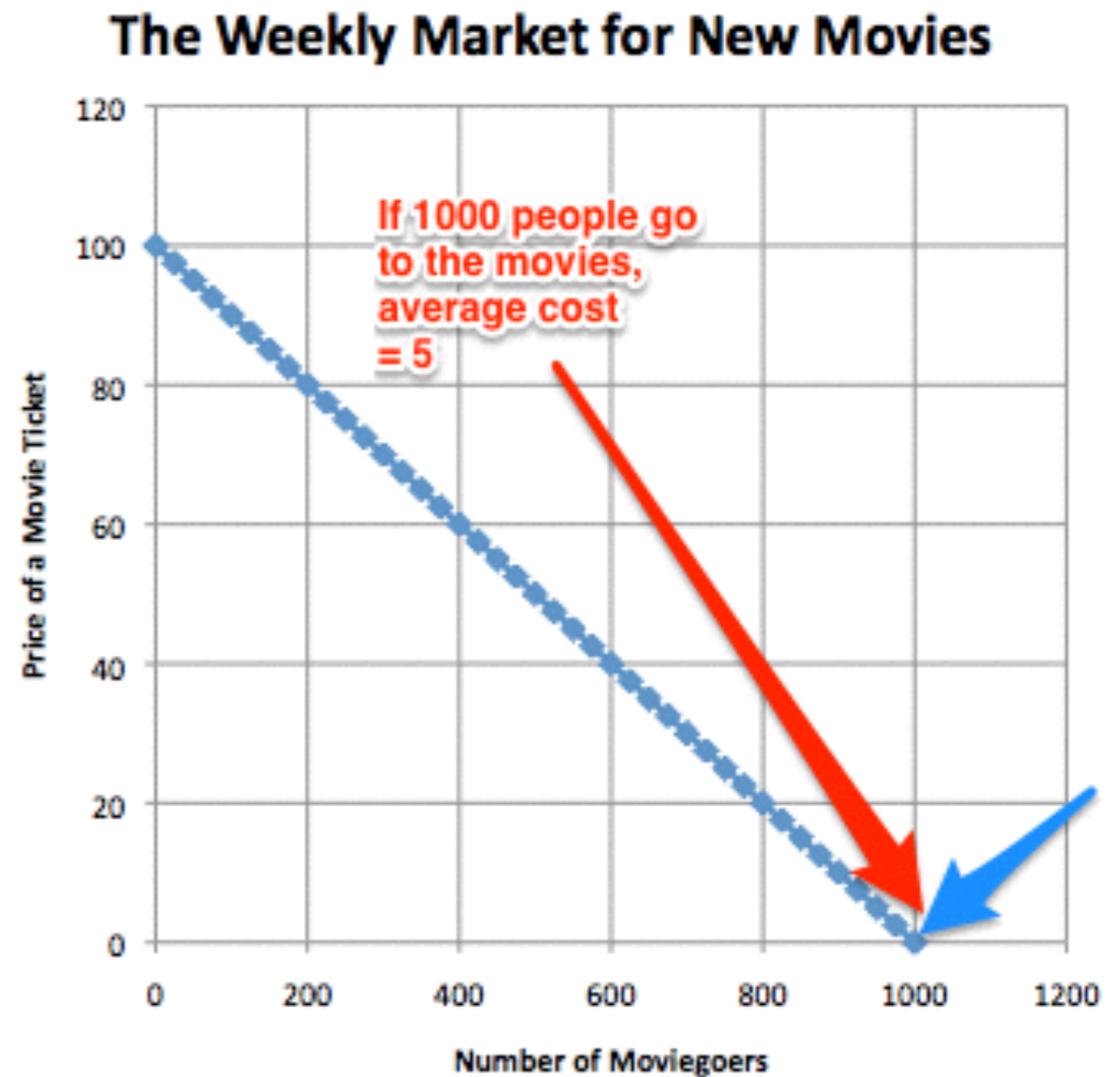
Ladies and Gentlemen, to Your i>Clickers...: Answer

- 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...

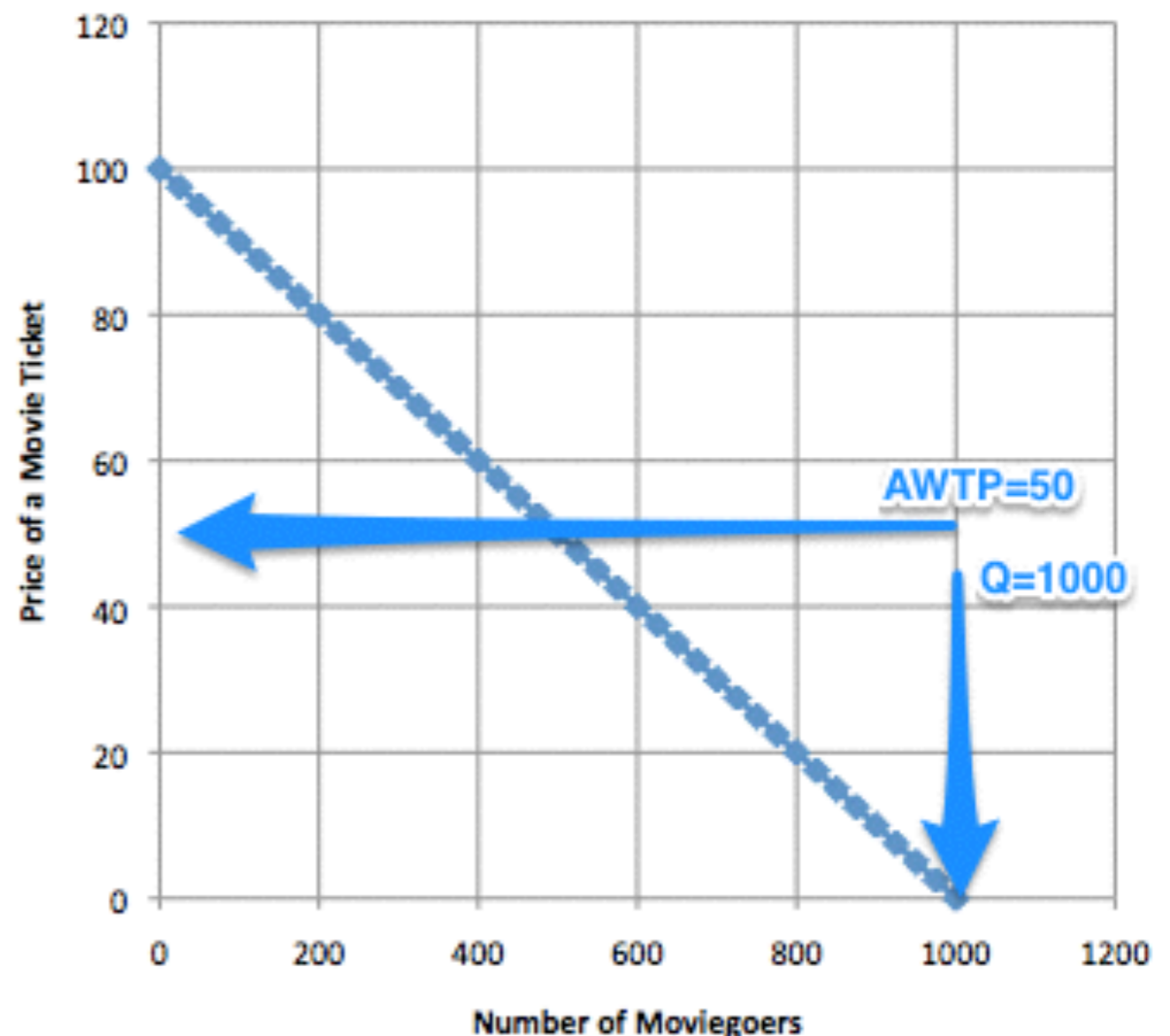
- First, what is the total value to moviegoers, for the demand curve: $P_d = 100 - 0.1 \times Q$, if 1000 people go to the movies?
 - A. 10000
 - B. 9000
 - C. 50,000
 - D. 9500
 - E. None of the above



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**
- **$50 \times 1000 = 50,000$**

The Weekly Market for New Movies



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

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 - **C. $100Q - 0.05Q^2$**
 - D. $50000 + 100Q - 0.05Q^2$
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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!

$$\int_{Q_d=0}^{Q_d=Q} P_d(Q_d) dQ$$

$$\int_{Q_d=0}^{Q_d=Q} [100 - 0.1Q_d] dQ$$

$$\int_{Q_d=0}^{Q_d=Q} 100 dQ - \int_{Q_d=0}^{Q_d=Q} 0.1Q_d dQ$$

Integrate! II

$$\int_{Q_d=0}^{Q_d=Q} P_d(Q_d) dQ$$

$$\int_{Q_d=0}^{Q_d=Q} [100 - 0.1Q_d] dQ$$

$$\int_{Q_d=0}^{Q_d=Q} 100 dQ - \int_{Q_d=0}^{Q_d=Q} 0.1Q_d dQ$$

$$100Q_d \Big|_{Q_d=0}^{Q_d=Q} - \int_{Q_d=0}^{Q_d=Q} 0.1Q_d dQ$$

$$100Q_d \Big|_{Q_d=0}^{Q_d=Q} - 0.05Q_d^2 \Big|_{Q_d=0}^{Q_d=Q}$$

$$100Q - 0.05Q^2$$

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

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 - A. $0.1Q$
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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 Wannabee Warner Bros. Execs, to Your i>Clickers!: Answer

- $TS = 100Q - 0.05 \times Q^2 - 5000$:
- 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
- **Why C? It comes out of the math:**

Q	TS
0	-5000
100	4500
200	13000
300	20500
400	27000
500	32500
600	37000
700	40500
800	43000
900	44500
1000	45000
1100	44500
1200	43000
1300	40500
1400	37000
1500	32500
1600	27000
1700	20500
1800	13000
1900	4500
2000	-5000

Ladies, Gentlemen, and Wannabee Warner Bros. Execs, to Your i>Clickers!: Answer II

- $TS = 100Q - 0.05 \times Q^2 - 5000$:
- 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
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1300	40500
1400	37000
1500	32500
1600	27000
1700	20500
1800	13000
1900	4500
2000	-5000

Ladies, Gentlemen, and Wannabee Warner Bros. Execs, to Your i>Clickers!: Answer III

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

- **Why C? It comes out of the math:**

$$TS = 100Q - 0.05Q^2 - 5000$$

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

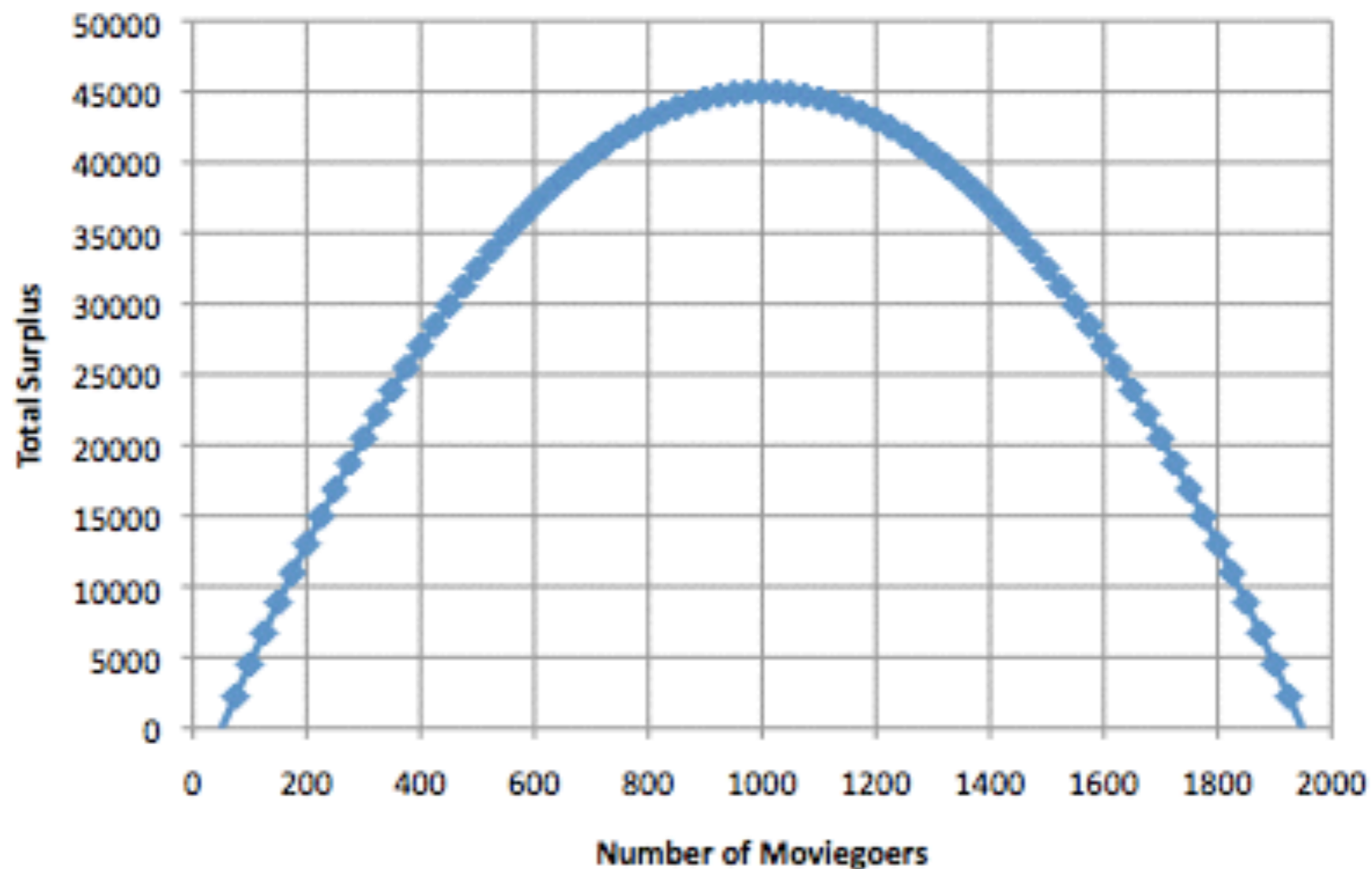
$$100 - 0.1Q = 0$$

$$Q = 1000$$

Ladies, Gentlemen, and Wannabee Warner Bros. Execs, to Your i>Clickers!: Answer IV

- Or, if you prefer...

Total Surplus as a Function of Number of Moviegoers



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

III

- 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