Economics 1: Spring 2012
Consumers and Firms

J. Bradford DeLong, Lanwei Wang, and a cast of thousands...

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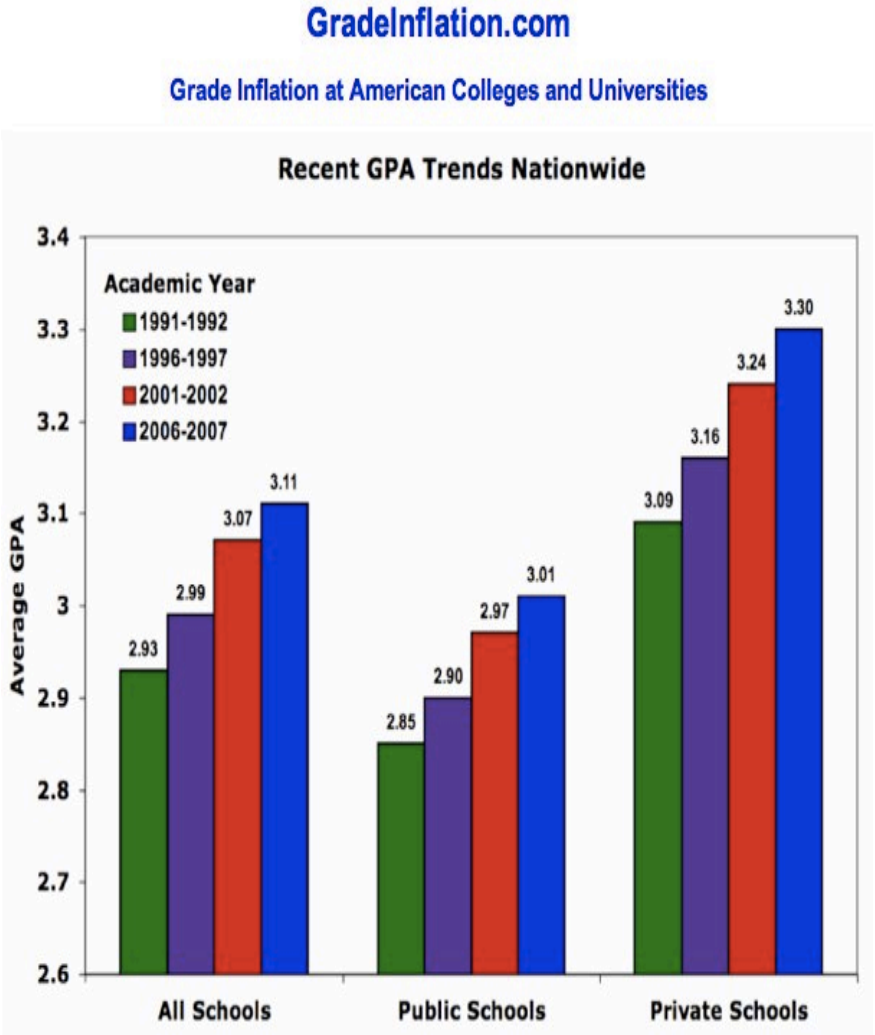
The Midterm…

- Median grade is a B…
- If you want the median grade to be higher than a B, you know how to do it: impress us…
- One of the things you buy with your extra $15,000/year of tuition at The Farm would be grade inflation…
- Remember: a B at Berkeley is, in general and on average, a high B+ down at The Farm

- Source: http://www.gradeinflation.com/



Ladies and Gentlemen, to Your iClickers…

- A. I want to pay $10,000 a year in tuition and fees and go to a university where they focus on educating students and have an average grade of B.
- B. I want to pay $25,000 a year in tuition and fees and go to a university where they focus on maximizing alumni gifts and have an average grade of B+/A-.
- C. I am an out of state student, and go to a university where they (a) charge me $25,000 a year in tuition and (b) give me an average grade of B anyway.

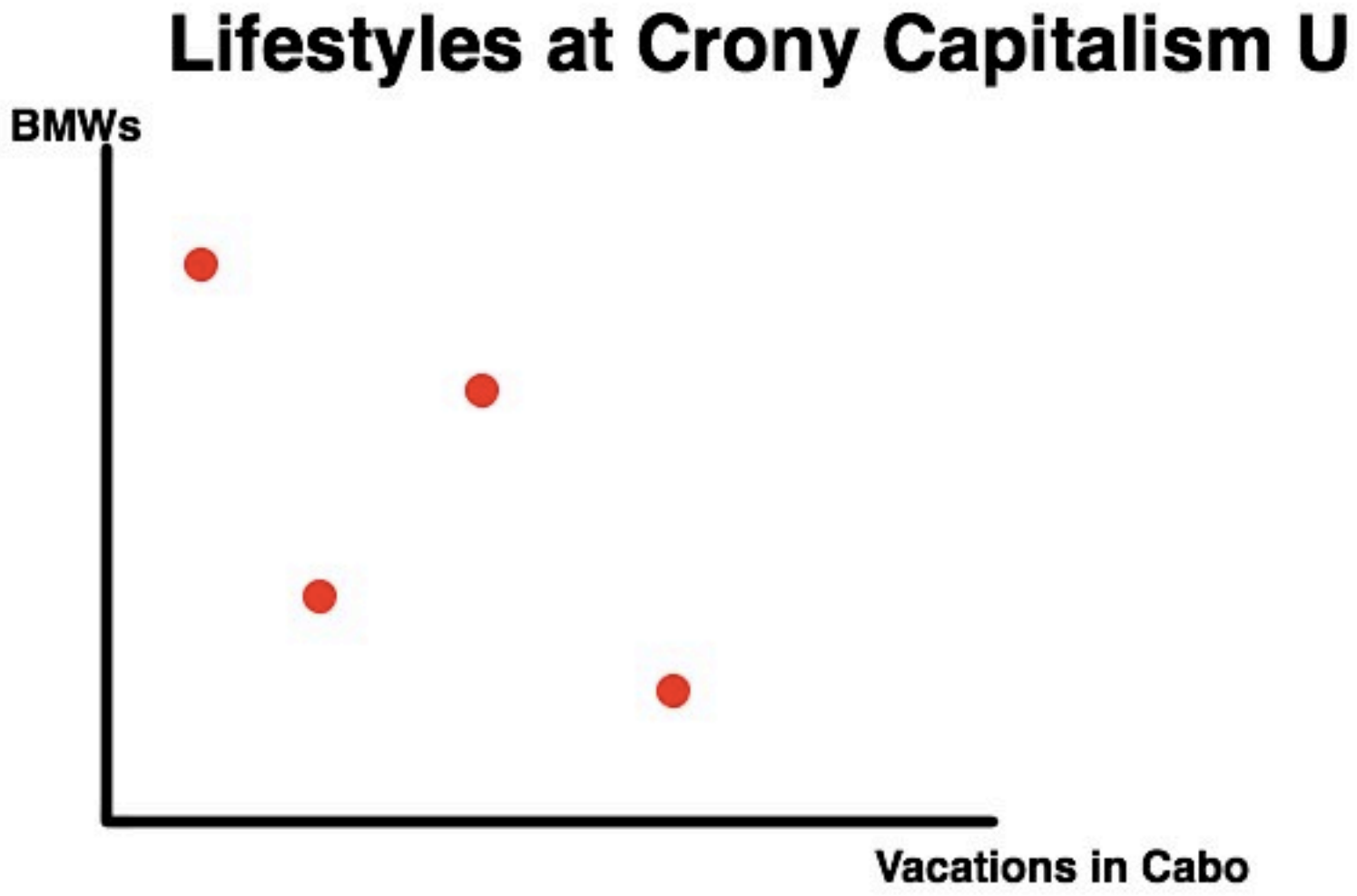
New Examples…

- People—the GSIs especially—are sick of Sunnydale
- And people—the GSIs especially—are sick of yoga lessons and lattes
- So let's move 40 miles south of Sunnydale to the town of Old Stick
- And let's leave U.C. Sunnydale behind for Crony Capitalism University
- And let's say that the people in Old Stick spend their money on two and only two things:
  - Renting BMWs
  - Taking vacations in Cabo San Lucas

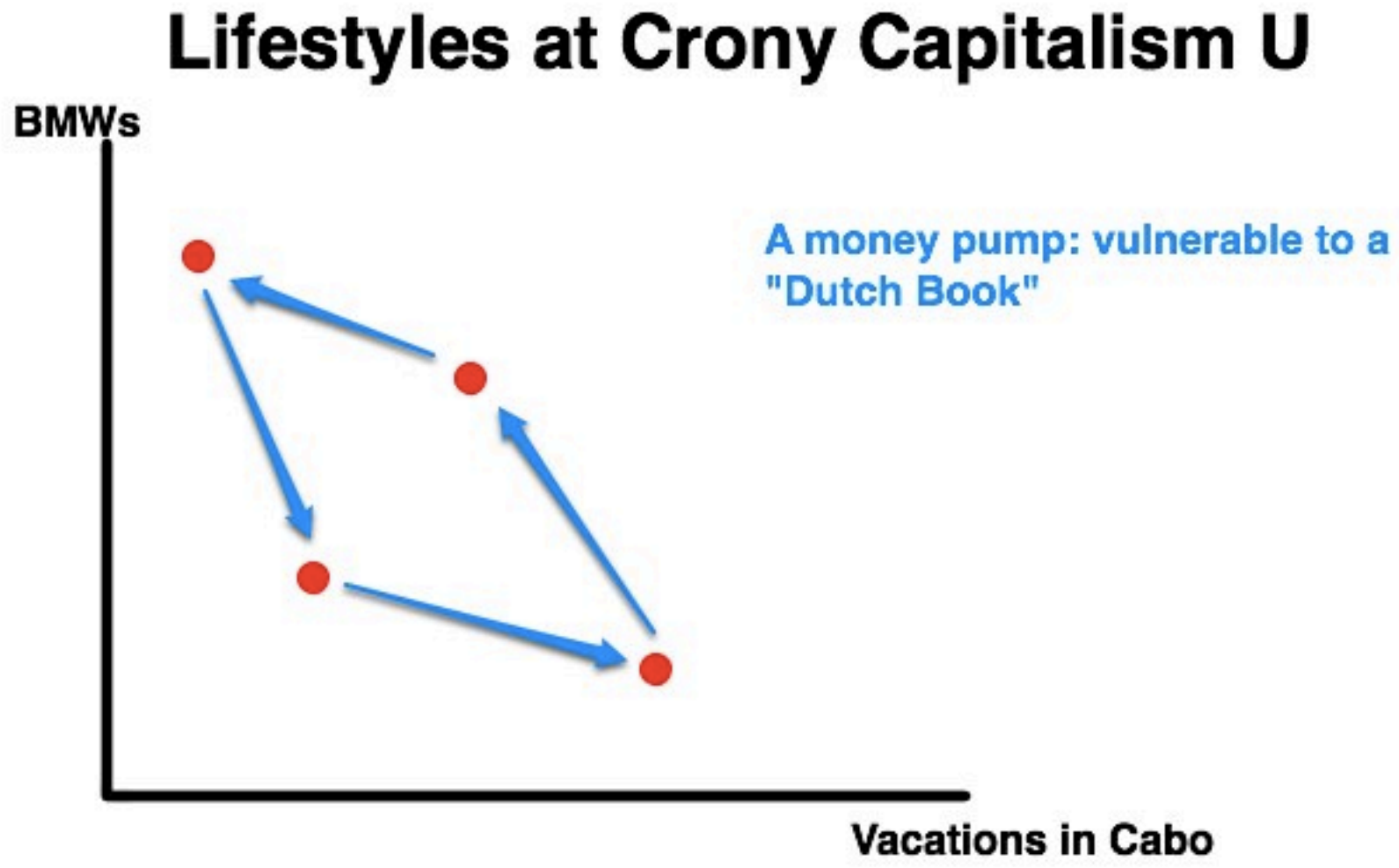
But Email Me Suggestions…

- The will of the class as we go forward is that I should try to pick the people in my examples from the set of slacker celebrities—or, rather, from celebrities who are successfully managing their careers but whose public presentation of self involves the slacker nature
- But I am interested in suggestions as to where these examples should take place (Sunnydale, CA; Old Stick; etc….)
- And I am interested in suggestions as to what the commodities in the examples should be…
- Email suggestions to delong@econ.berkeley.edu

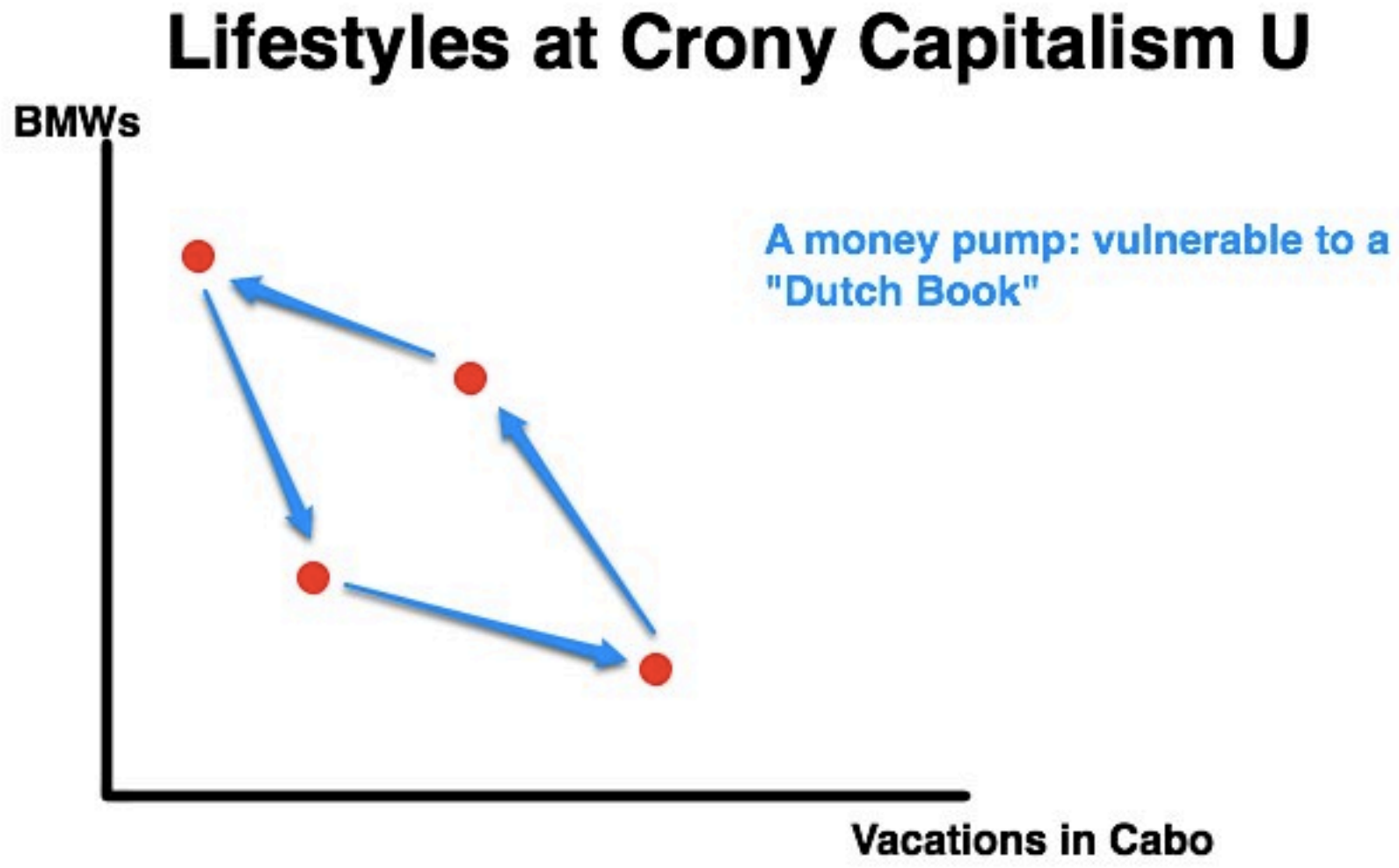
How Do/Should Consumers Behave?



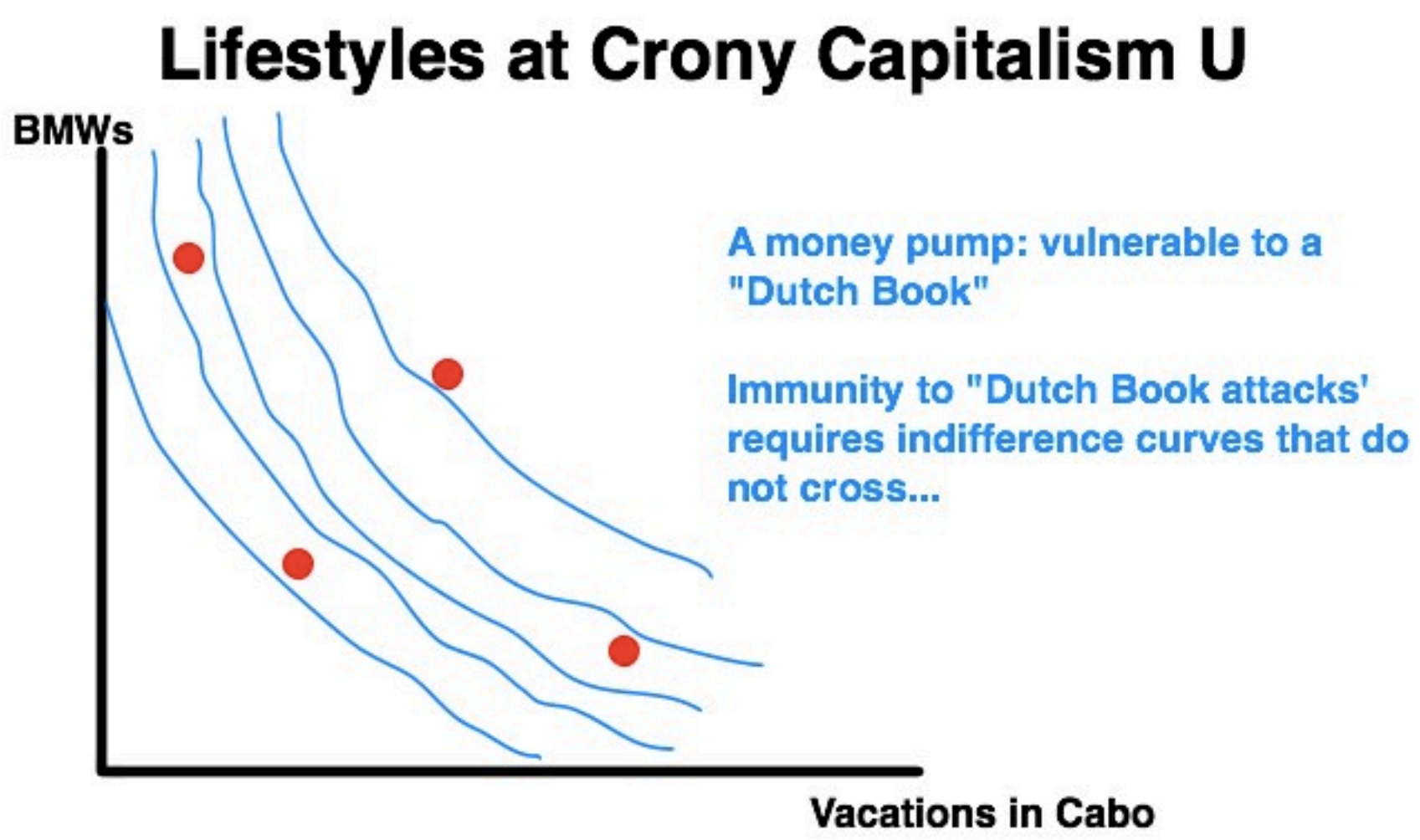
How Do/Should Consumers Behave? II



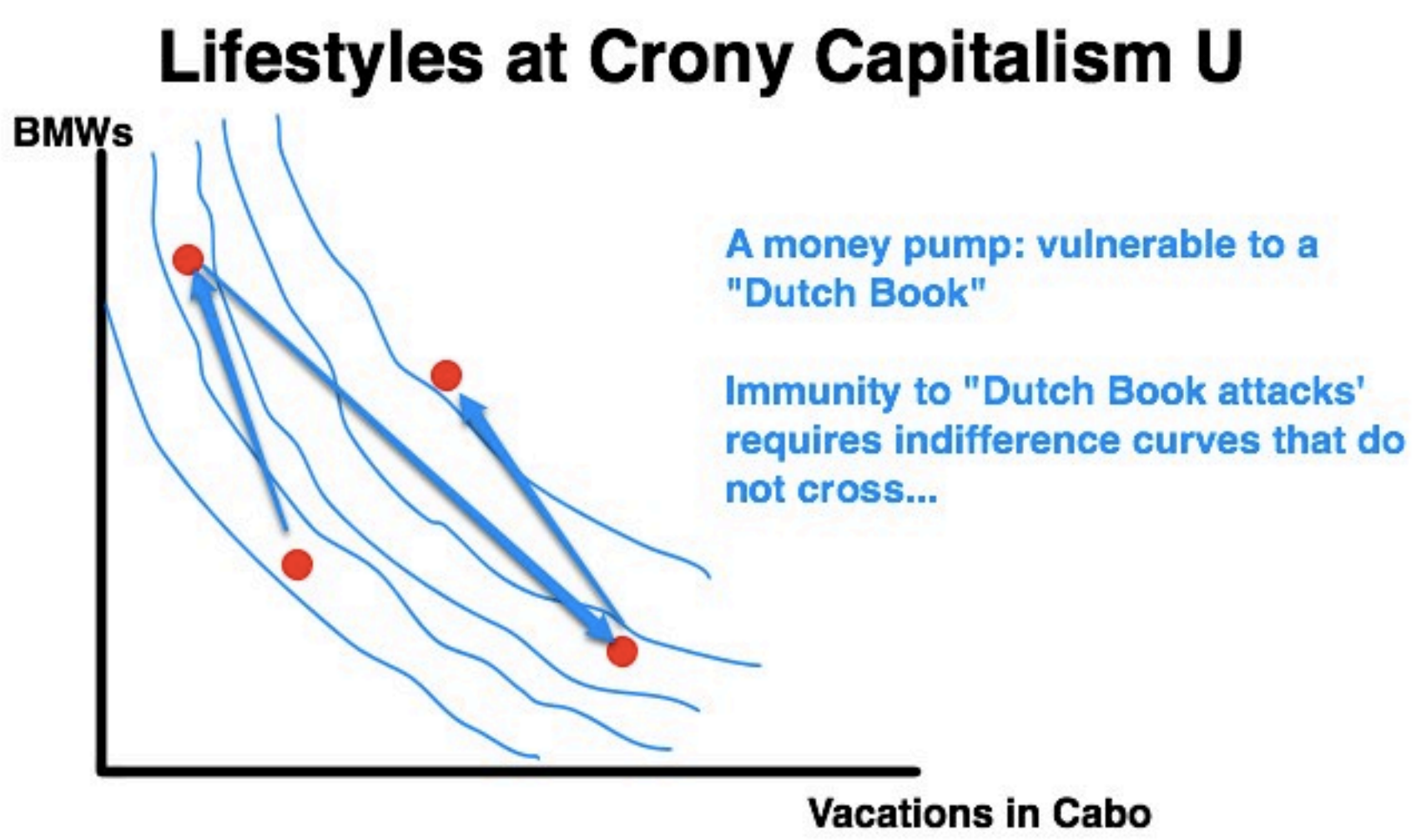
How Do/Should Consumers Behave? III



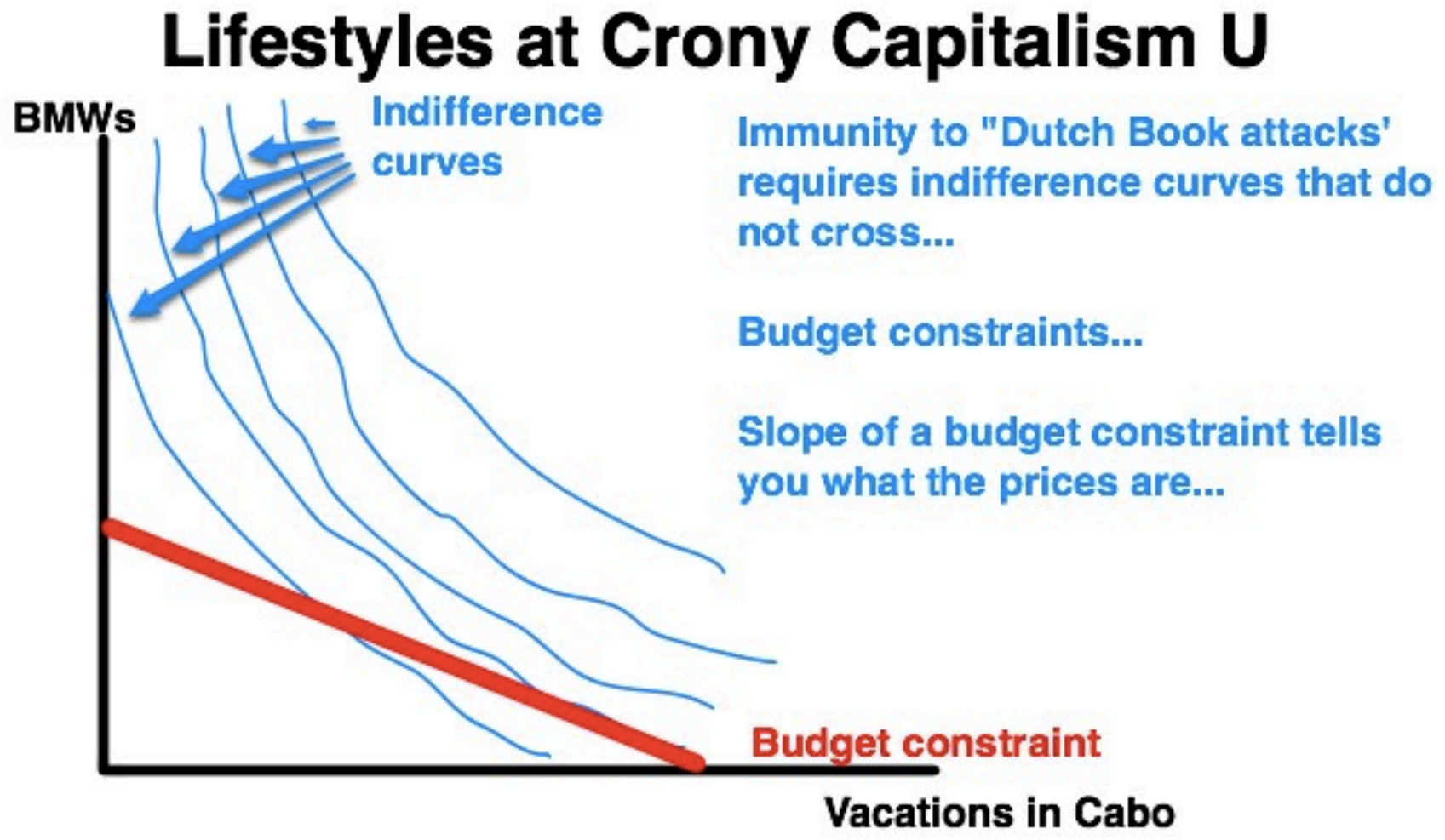
How Do/Should Consumers Behave? IV



How Do/Should Consumers Behave? V



How Do/Should Consumers Behave? VI



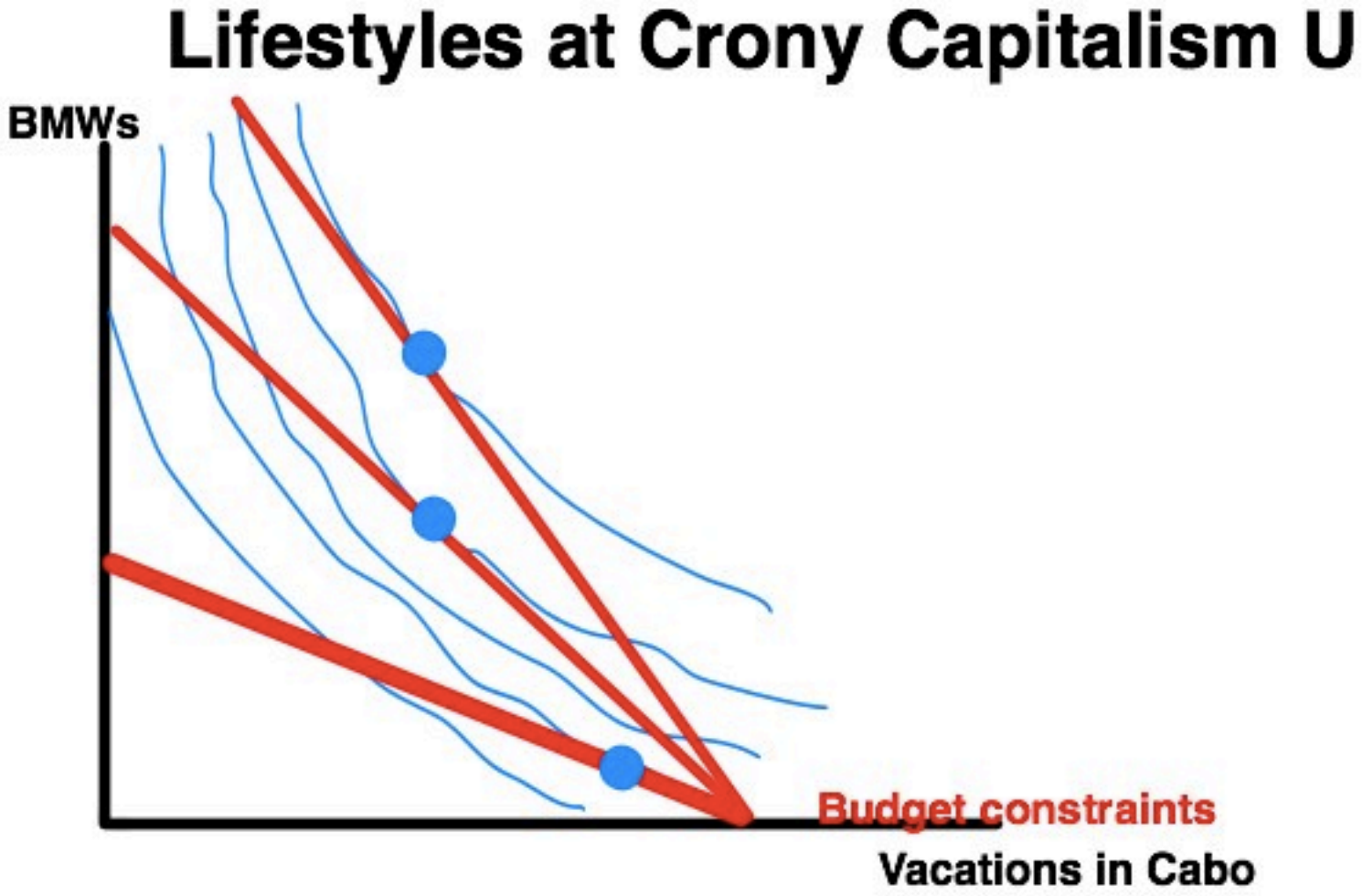
Utility Functions

- You can give each indifference curve a number—with "better" indifference curves having a numbers
- Do that, and you find that you have defined a utility function:
  - U = U(rides in BMWs, vacations in Cabo)
- Every consistent pattern of behavior—i.e., not vulnerable to a Dutch Book attack—has a utility function representation
  - And once we have a function, we can use algebra

Thinking at the Margin

- Marginal rates of substitution
  - If I have to give up one ride in a BMW, how many vacations in Cabo would I have to take to keep me as happy?
- The price system
  - If I buy one less ride in a BMW, I have more money: how many vacations in Cabo would I be able to buy with the extra money
- Where the MRS = P, the consumer is at his or her happiest…

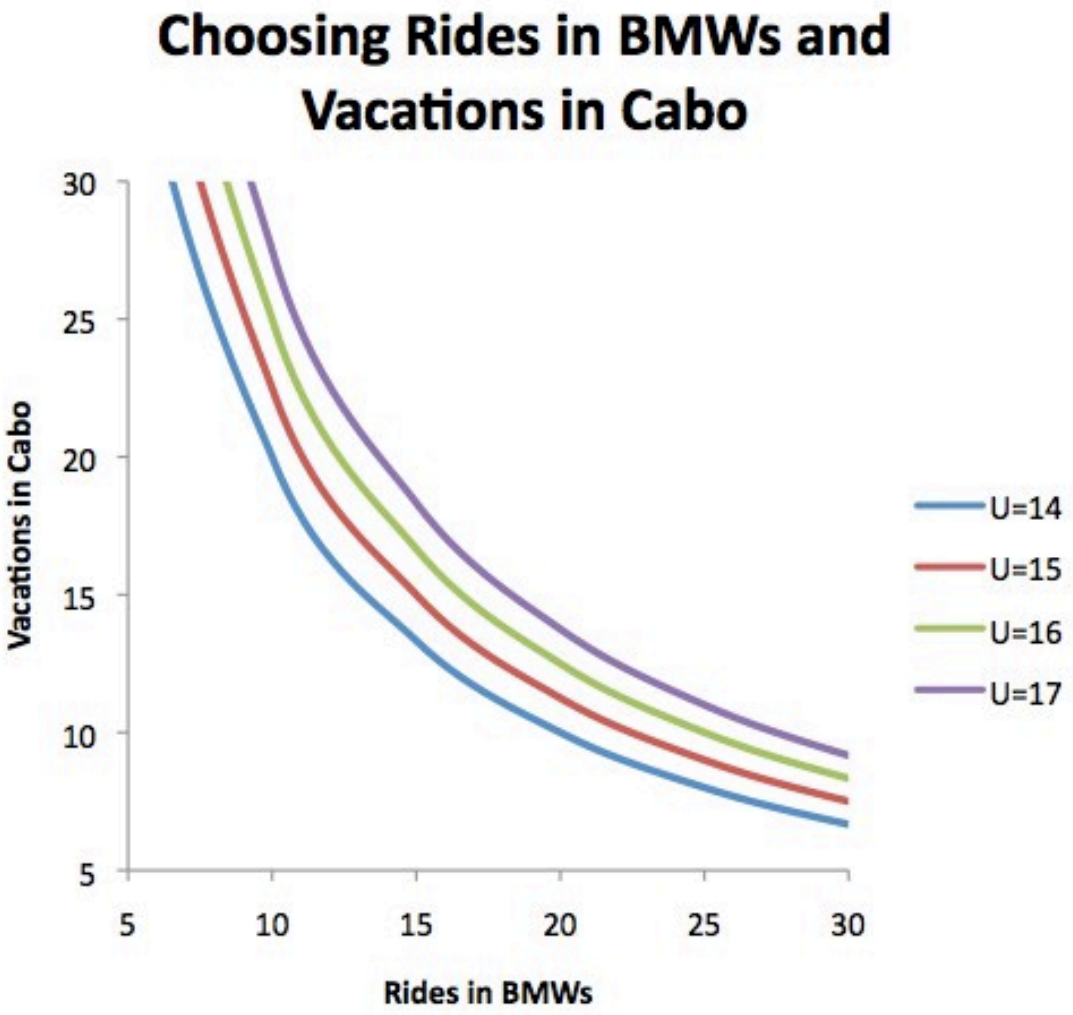
How Do/Should Consumers Behave? VII



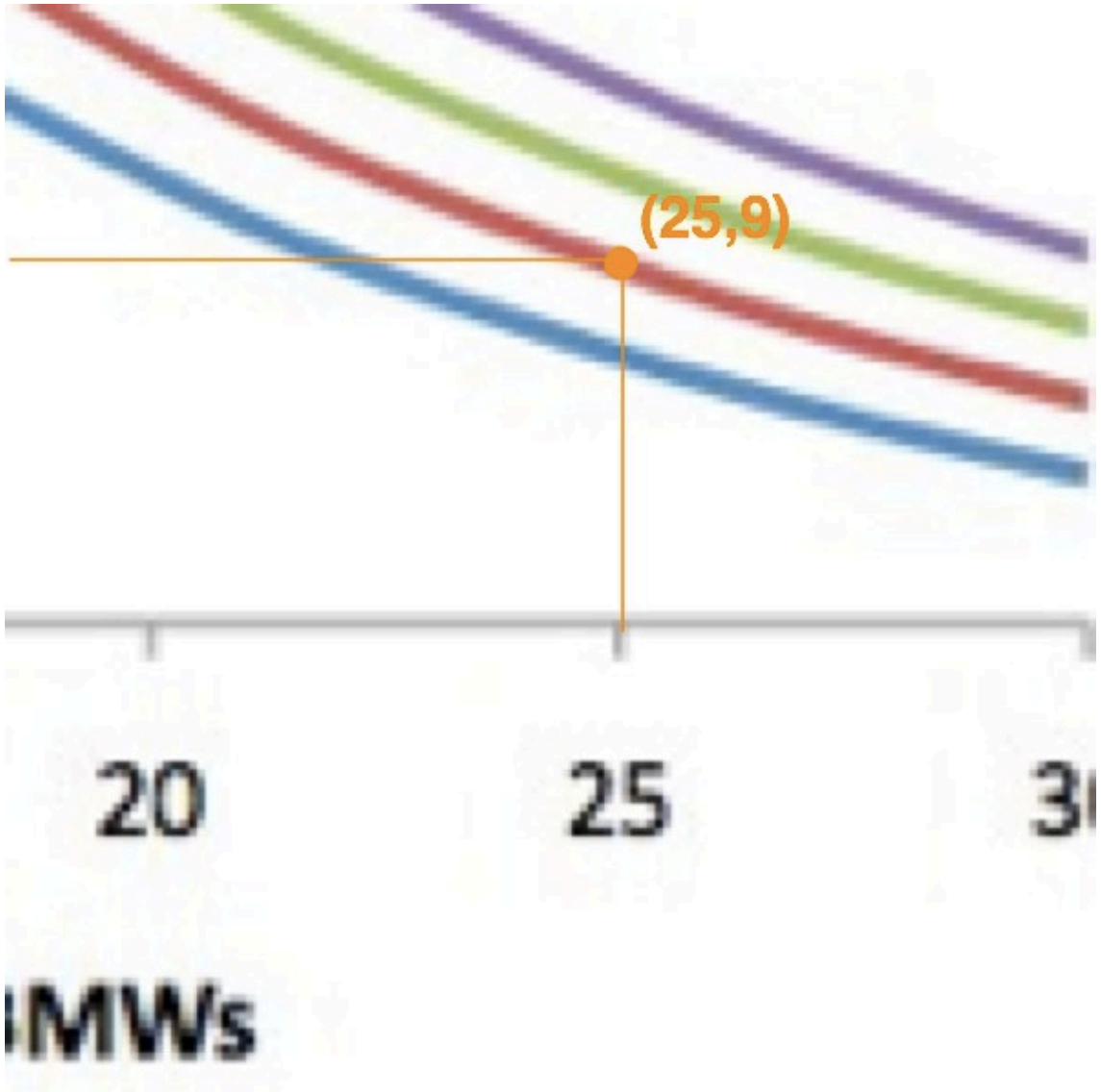
An Example of a Utility Function

- B for rides in BMWs, V for vacations in Cabo
- $U = B^{\theta} \times V^{1-\theta}$
- And let's say $\theta = 1/2$…
- A Calculation
  - Suppose in an average month we are taking 25 rides in BMWs, and 9 vacations in Cabo…
  - $U = 25^{(1/2)} \times 9^{(1/2)} = 5 \times 3 = 15$
  - Now suppose we take 24 rides in BMWs; how many vacations in Cabo would we have to take in an average month to make us equally happy?
  - $15 = (24)^{(1/2)} \times V^{(1/2)}$
  - $225 = 24 \times V$
  - $V = 225/24 = 9.375$

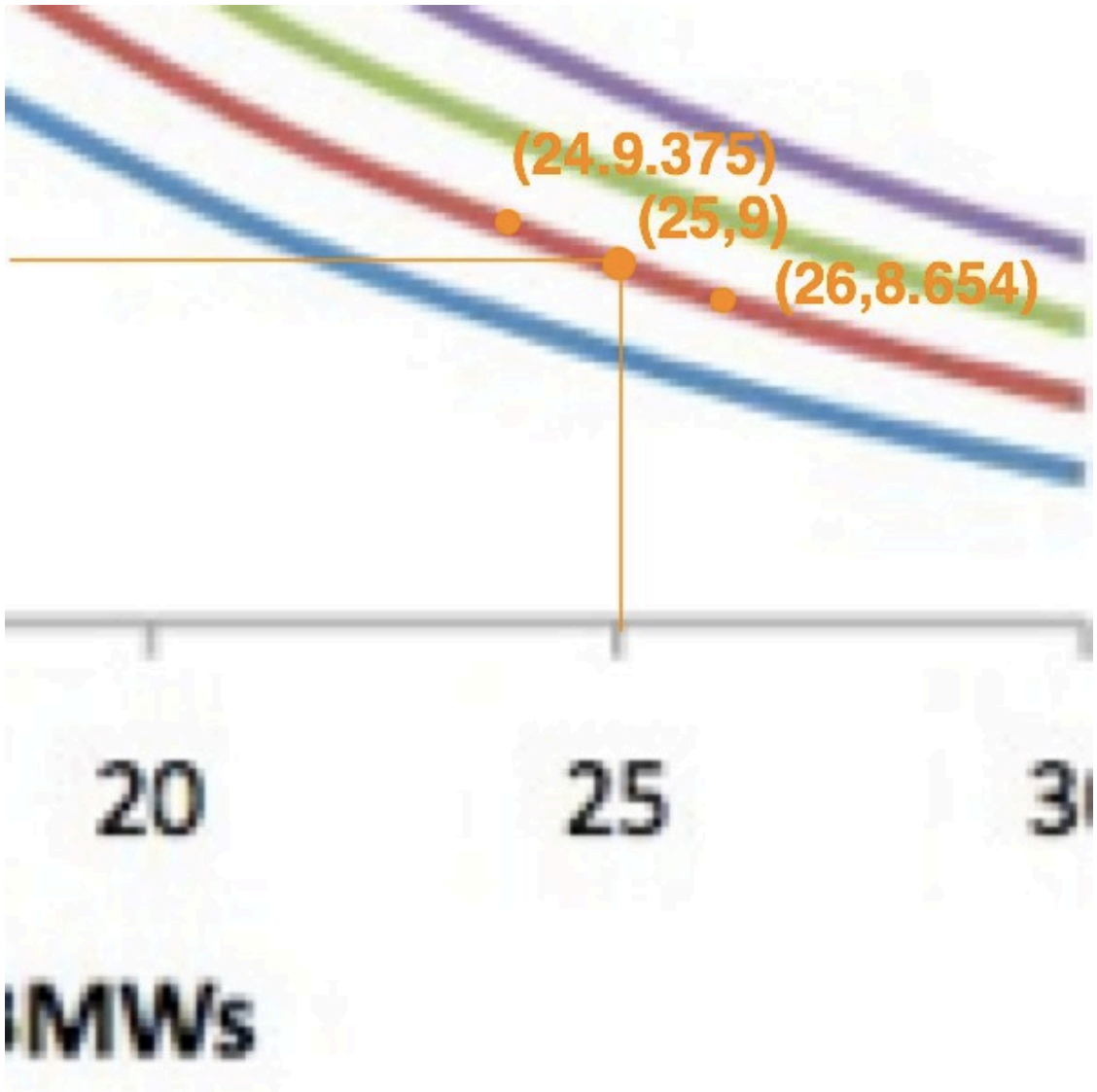
Or, Geometrically



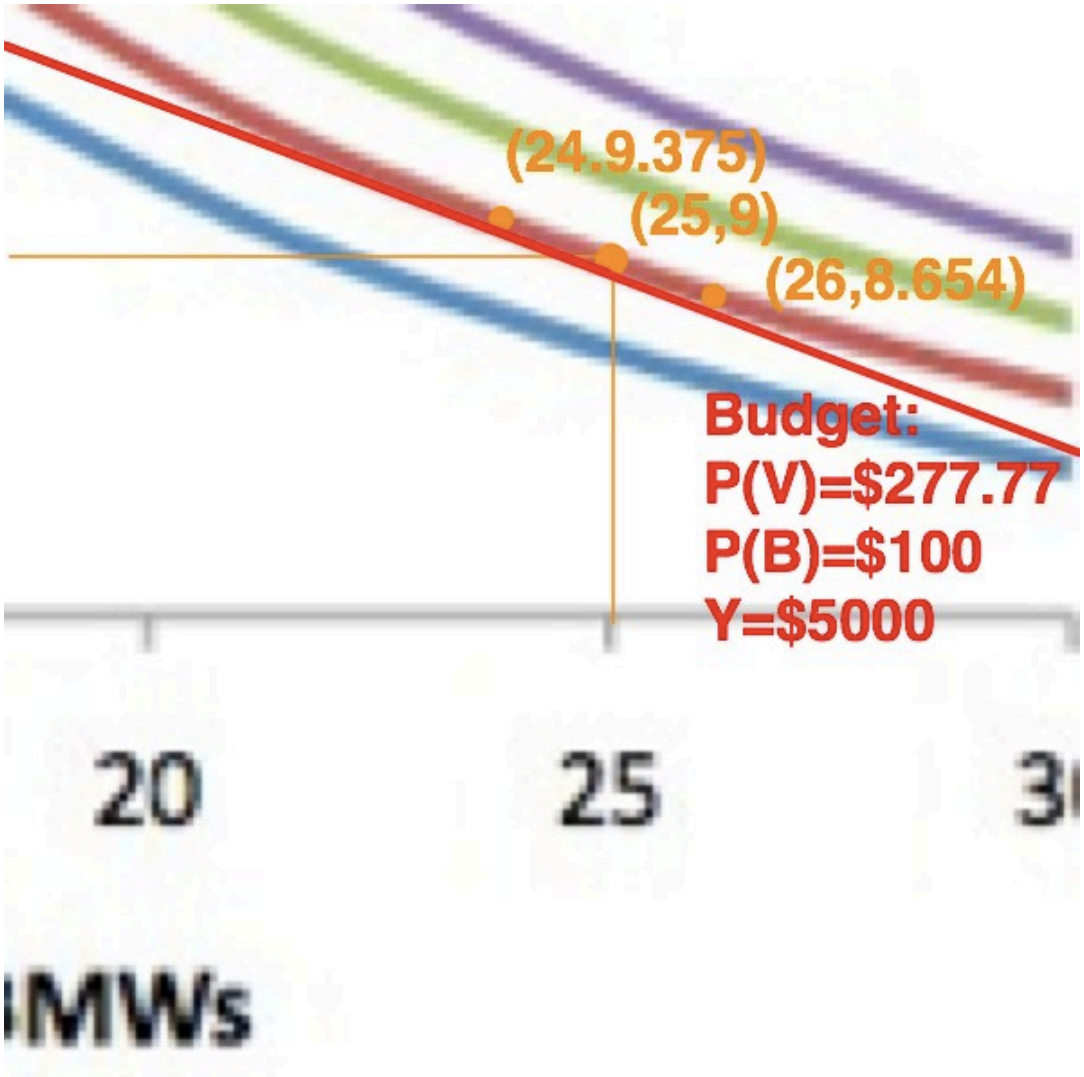
Or, Geometrically II



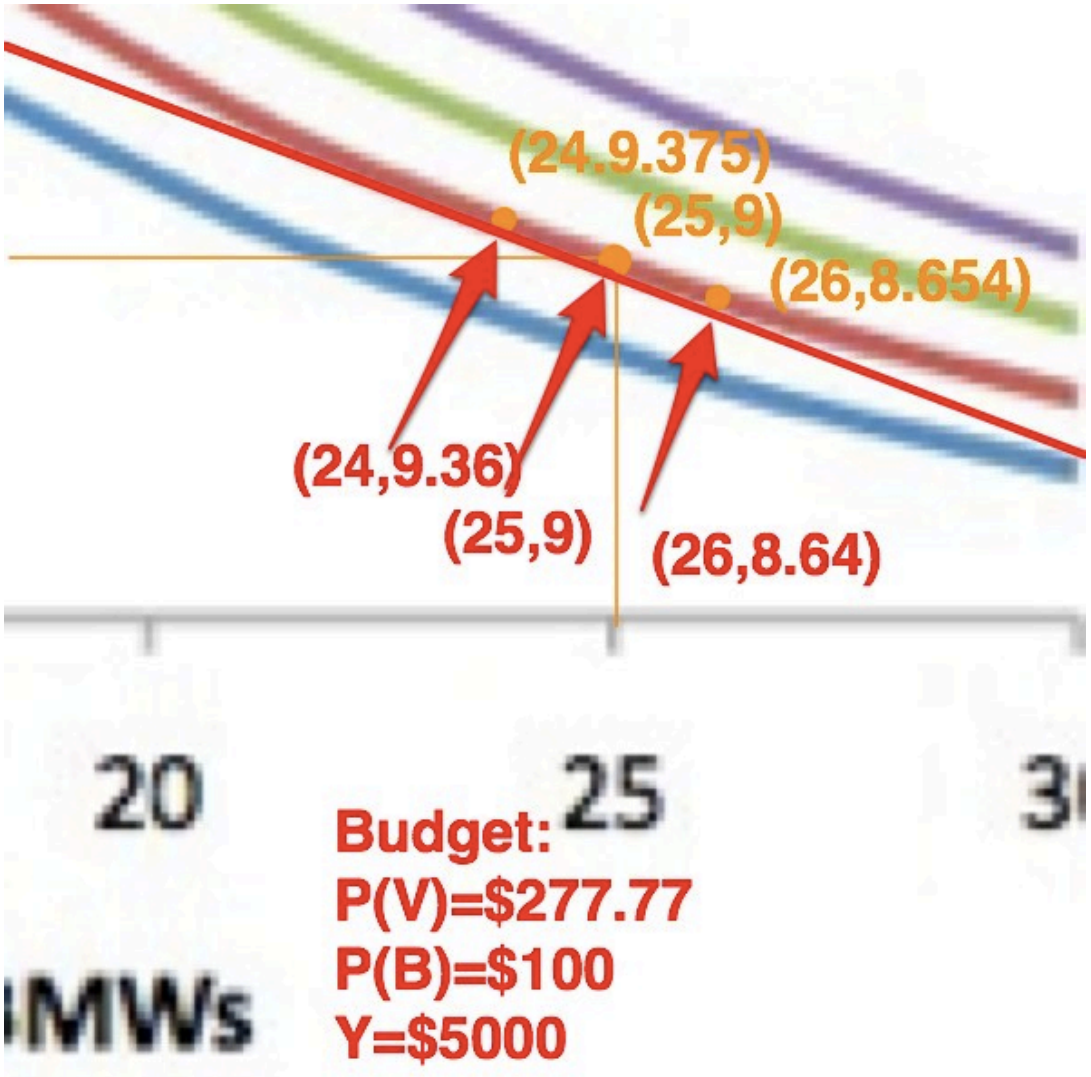
Or, Geometrically III



Or, Geometrically IV



Or, Geometrically V



Ladies and Gentlemen, to Your iClickers…

- The reason that we use utility functions is that:
  - A. It gives us a powerful mathematical tool
  - B. It makes it certain that households are not behaving inconsistently and incoherently—are not vulnerable to a "Dutch Book"
  - C. It provides a good shorthand description of what average consumer behavior is likely to be

Assessing Utility Functions

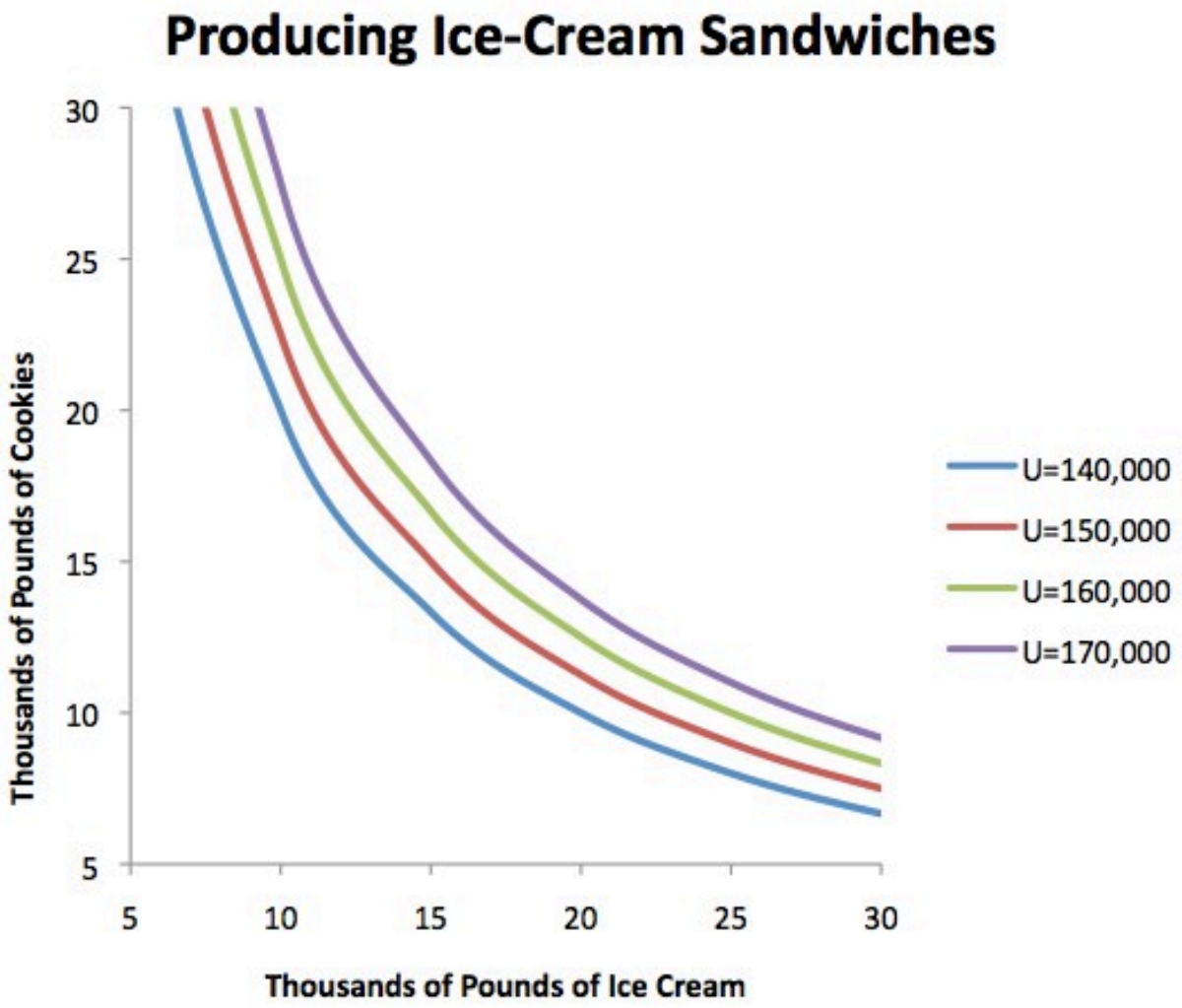
- Does anybody do these calculations in deciding what to spend their money on?
  - No
- But if people are roughly consistent in their choices…
- And if you have a lot of people so that deviations cancel out due to the law of large numbers…
- Then in total people will act *as if* the average consumer is doing these calculations…
  - You can push this too far: honey-nut cheerios
- Does it seem as though we are treating consumers as utility machines? Commodities go in, and utility comes out? As if they are some kind of businesses?

We Are! The Economic Model of the Firm Is the Same as the Economic Model of the Household

- Utility Function → Production Function
- Indifference Curve → Isoquant
- MRS in Consumption →MRS in Production
- Budget Constraint → Cost

- The production of ice-cream sandwiches
  - Ice cream
  - Cookies
  - Variable proportions

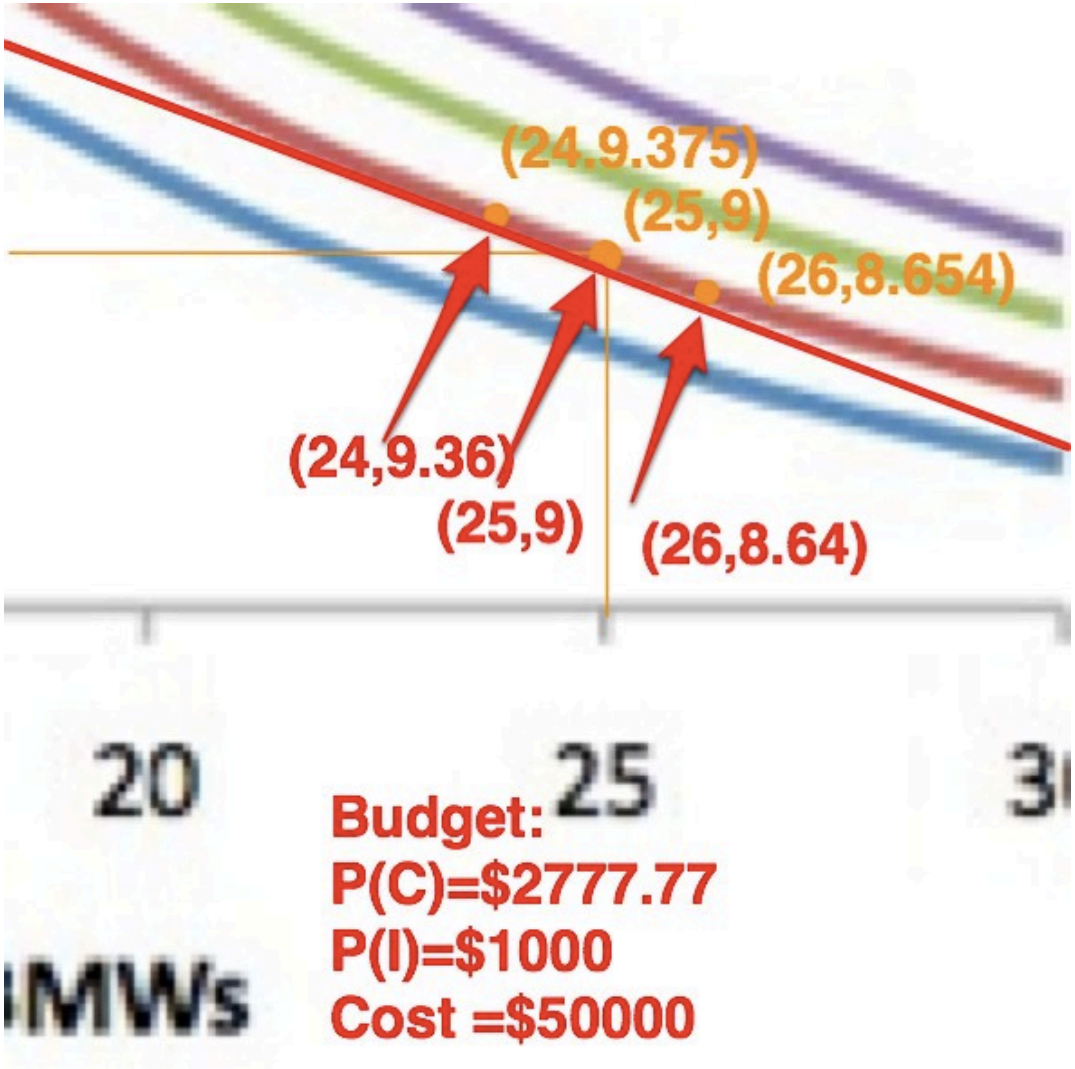
Producing Ice-Cream Sandwiches



An Example of a Production Function

- I for thousnds of pounds of ice cream, C for thousands of pounds of cookies
- $U = 10{,}000 \times I^{\theta} \times C^{1-\theta}$
- And let's say $\theta = 1/2$…
- How do you produce, say, 150,000 ice-cream sandwiches most cheaply?
  - It depends on the prices

Or, Geometrically, the Least-Cost Way to Produce 150,000 Ice-Cream Sandwiches



Let's Use Our Production Function for Ice-Cream Sandwiches

- $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$
- Let's calculate what our marginal rate of substitution is. Let's change I to I+ΔI and C to C-ΔC
- $S' = 10{,}000 \times (I+\Delta I)^{\theta} \times (C+\Delta C)^{1-\theta}$
- $S' = (10{,}000 \times I^{\theta} \times C^{1-\theta}) + (10{,}000 \times C^{1-\theta} \times \theta I^{\theta-1}\Delta I) - (10{,}000 \times I^{\theta} \times (1-\theta)C^{-\theta}\Delta C)$ + {other terms we ignore}
- $S' - S = (10{,}000 \times C^{1-\theta} \times \theta I^{\theta-1}\Delta I) - (10{,}000 \times I^{\theta} \times (1-\theta)C^{-\theta}\Delta C)$
- $0 = (10{,}000 \times C^{1-\theta} \times \theta I^{\theta-1}\Delta I) - (10{,}000 \times I^{\theta} \times (1-\theta)C^{-\theta}\Delta C)$
- $0 = C^{1} \times \theta I^{-1}\Delta I - (1-\theta)\Delta C$
- $\Delta C = (\theta/(1-\theta))(C/I)\,\Delta I$

Or I Can Say: We Do the Algebra and Conclude…

- For the production function:
  - **$S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$**
- The marginal rate of substitution from (C,I) to (C-ΔC,I+ΔI) is:
  - **$\Delta C = (\theta/(1-\theta))(C/I)\Delta I$**
- For costs to be minimized:
  - $\Delta C = (P_i/P_c)\,\Delta I$
- Which means that, for this production function:
  - $C/I = (P_i/P_c)\,((1-\theta)/\theta)$
  - Which means:
    - **The cost-minimizing firm spends a share θ of its cost budget on cookies**
    - **The cost-minimizing firm spends a share 1-θ of its cost budget on ice cream**
- "Cobb-Douglas" production (and utility!) functions

Ladies and Gentlemen, to Your iClickers…

- The idea that firms decide what factors of production in order to minimize the costs of what they produce is more solid than the idea that consumers decide what goods and services to purchase to maximize some consistent utility function because…
  - A. …firms are rational bureaucratic organizations, while individuals are emotional psychological inconsistent messes.
  - B. …firms that don't minimize cost compete with firms that do, find themselves losing money, go bankrupt, and vanish.
  - C. They aren't: both assumptions are equally right.
  - D. They aren't: both assumptions are equally wrong.

Using Production Functions

- For our ice cream sandwich production function:
  - $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$
  - With $\theta=1/3$, and ice cream and cookies purchased in 1,000-lb. lots…
- Suppose that we want to make 10,000 ice-cream sandwiches…

Ladies and Gentlemen, to Your iClickers…

- $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$, with $\theta=1/2$, suppose that we want to make 10,000 ice-cream sandwiches…
- How much will it cost us if cookies and ice cream both cost $500 when bought in 1000-lb lots?
  - A. $10000
  - B. $500
  - C. $1000
  - D. $2000
  - E. Cannot be determined with the information given

The Solution

- Our problem:
  - $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$, with $\theta=1/2$, suppose that we want to make 10,000 ice-cream sandwiches…
  - How much will it cost us if cookies and ice cream both cost $500 when bought in 1000-lb lots?
- Solution:
  - $\theta=1/2$ means that we spend 1/2 of our total cost on ice cream and 1/2 on cookies. Call total cost COST:
  - C = COST/1000; I= COST/1000:
  - $S = 10{,}000 \times (\text{COST}/1000)^{.5} \times (\text{COST}/1000)^{.5}$
  - $S = 10{,}000 \times (\text{COST}/1000) = 10 \times \text{COST}$
  - To make 10,000 ice-cream sandwiches would cost $1000

Ladies and Gentlemen, to Your iClickers…

- $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$, with $\theta=1/2$, suppose that we want to make 10,000 ice-cream sandwiches…
- How much will it cost us if cookies cost $500 and ice cream costs $2000 when bought in 1000-lb lots?
  - A. $10000
  - B. $500
  - C. $1000
  - D. $2000
  - E. $2500

The Solution

- Our problem:
  - $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$, with $\theta=1/2$, suppose that we want to make 10,000 ice-cream sandwiches…
  - How much will it cost us if cookies cost $500 and ice cream costs $2000 when bought in 1000-lb lots?
- Solution:
  - $\theta=1/2$ means that we spend 1/2 of our total cost on ice cream and 1/2 on cookies. Call total cost COST:
  - C = COST/1000; I= COST/4000:
  - $S = 10{,}000 \times (COST/1000)^{.5} \times (COST/4000)^{.5}$
  - $S = 10{,}000 \times (COST/2000) = 5 \times COST$
  - To make 10,000 ice-cream sandwiches would cost $2000

Comparison

- $S = 10{,}000 \times I^{\theta} \times C^{1-\theta}$, with $\theta=1/2$, suppose that we want to make 10,000 ice-cream sandwiches…
  - When cookies cost $500 and ice cream costs $500, it cost us $1000 to make 10,000 ice-cream sandwiches.
  - When cookies cost $500 and ice cream costs $2000, it cost us $2000 to make 10,000 ice-cream sandwiches.
- You would think that if you are buying equal equal amounts of cookies and ice cream, and if the price of half of what you are buying quadruples, then your cost would go up 2.5-fold: not to $2000 but to $2500.
- What's going on here? Why does your cost only go up to $2000?

Ladies and Gentlemen, to Your iClickers…

- You would think that if you are buying equal equal amounts of cookies and ice cream, and if the price of half of what you are buying quadruples, then your price would go up 2.5-fold: not to $2000 but to $2500. What's going on here? Why does your price only go up to $2000?
  - A. When the price of ice cream goes up, you buy more ice cream, and that makes it cheaper to make each ice cream sandwich.
  - B. When the price of ice cream goes up, you shift the ice-cream sandwich recipe so that it has more cookie and less ice cream—and buying more cookies and less ice cream shaves costs from what they would have been if you had bought the same amount as you did when prices were equal.
  - C. There is a mistake in the previous slide: the cost is not $2,000 but $2,500.
  - D. The fact that there is a square root sign in the production function means that costs go up with the square root of the price of the commodity whose price is changing.
  - E. I do not know.