

LECTURE 23

16 April 2013

ANNOUNCEMENTS

- HW 9 due Friday
- Worksheet on intellectual property for recitation this week
- Platform debate on intellectual property next week
- Midterm 2 grade available on Moodle
 - Specific questions about your answer sheet should be directed toward your TA
 - Feel free to ask me about test questions, conceptual problems

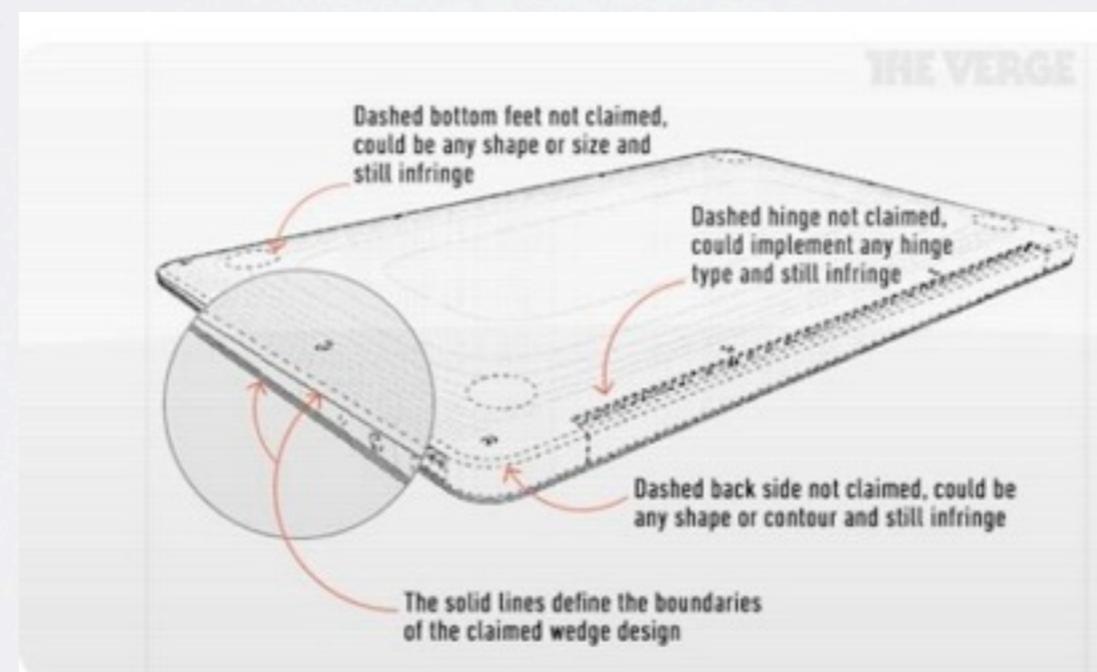
OUTLINE

- Intellectual Property
- NEXT TIME: Monopolistic Competition

REVIEW: THE PHARMACEUTICAL INDUSTRY

- What is distinctive?
- Drug research (a fixed cost) is extremely expensive
 - Industry measures set R&D \$40 billion / year
 - Other estimates claim \$800 million spent / new pill
- Patents are used as incentives for these firms to make the research new drugs
 - Patents offer monopoly rights for a while and allow the firm to charge a higher price
 - Higher price (and actual profits) may allow it to overcome the FC
- When patents die out, these original drugs are quickly replaced by cheaper “generics”

MODELING PATENTED MONOPOLIES



Apple patent for “wedged computers”

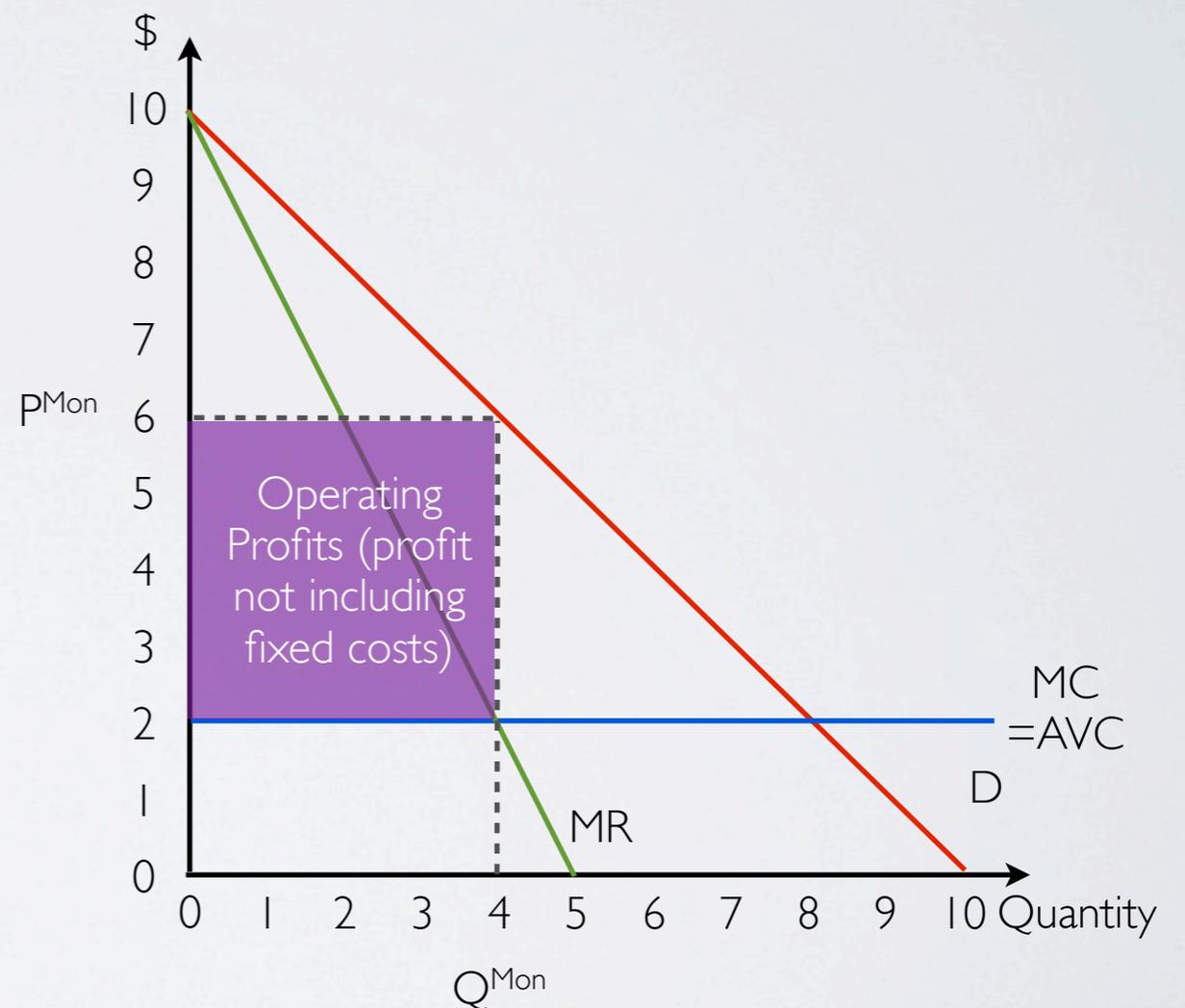
MACLAND'S PHARMACEUTICAL INDUSTRY

- Big Pharma is MacLand's new pharmaceutical firm deciding whether to invest in the drug Wigitor, sure to cure apple-bourne diseases
- Whether it will invest or not depends on how much money it expects to make in the market after developing the drug
- So this will depend on whether it can secure a patent for its product
 - While patents are complicated animals in real life, we will assume that having a **product patent** simply means the firm has monopoly rights in its sale
 - Now we can figure out the firm's **operating profits** (profits not including fixed costs) for a number of patent scenarios

CASE A: PHARMA GETS A PATENT

- Suppose the graph to the right depicts the cost structure of Big Pharma and demand **from one individual**
- Notice that $MC=AVC$, not ATC ; we will need to include fixed costs later
- Assuming Big Pharma can secure a monopoly with its patent, it will produce 4 units of Wigitor for $P=\$6$
- So total operating profit **per sick person** is $Q^*(P-AVC)=4*(6-2)=16$

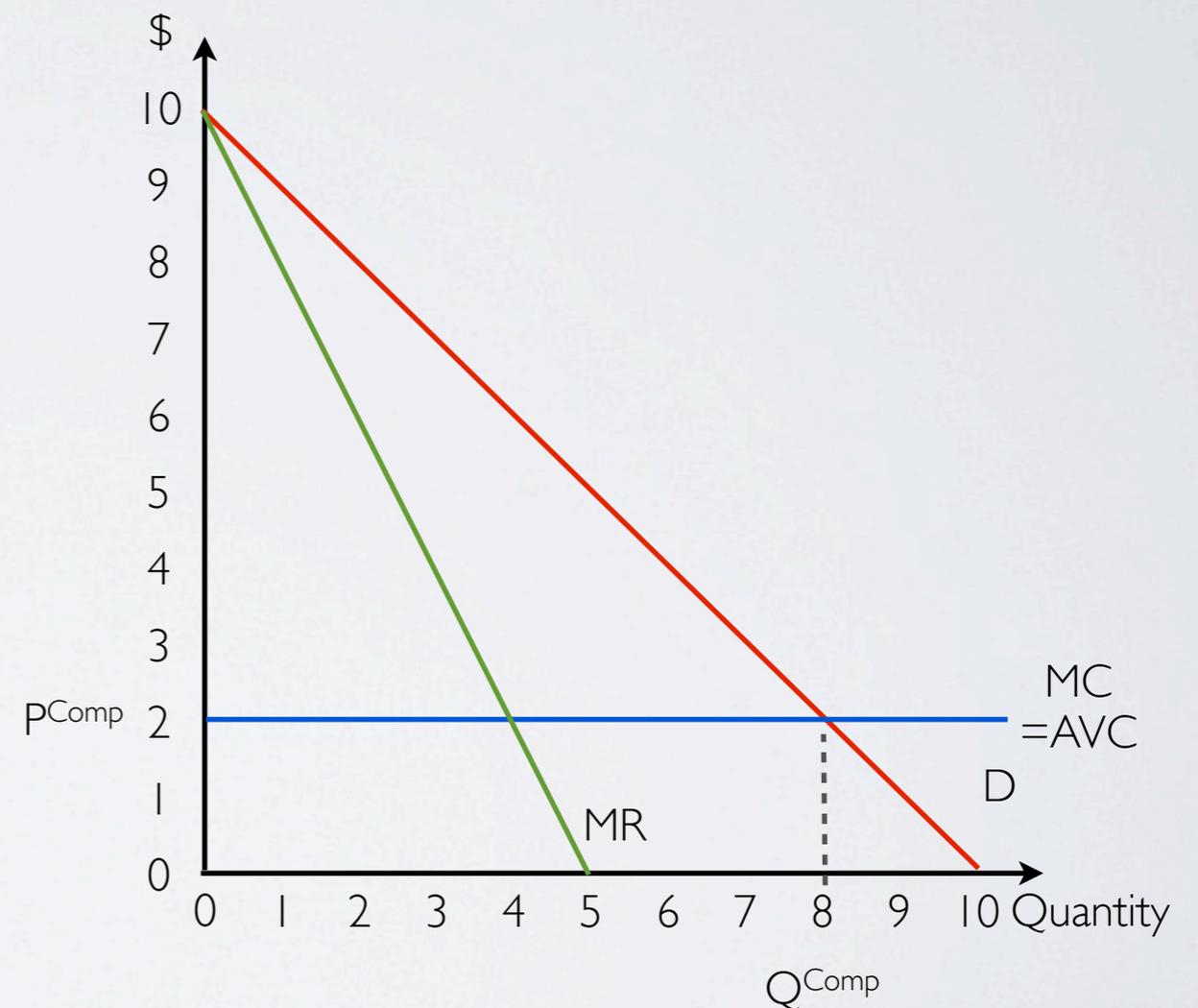
Big Pharma Cost and Demand



CASE B: NO PATENTS

- This might be the case after a patent expires or if there is poor enforcement of patents (like in India before 1995)
- Removing patents means that Big Pharma loses his monopoly power so the market can become competitive
- We know if there is free entry, prices will go to marginal cost
- So each firm (including Big Pharma) is making 0 profit now

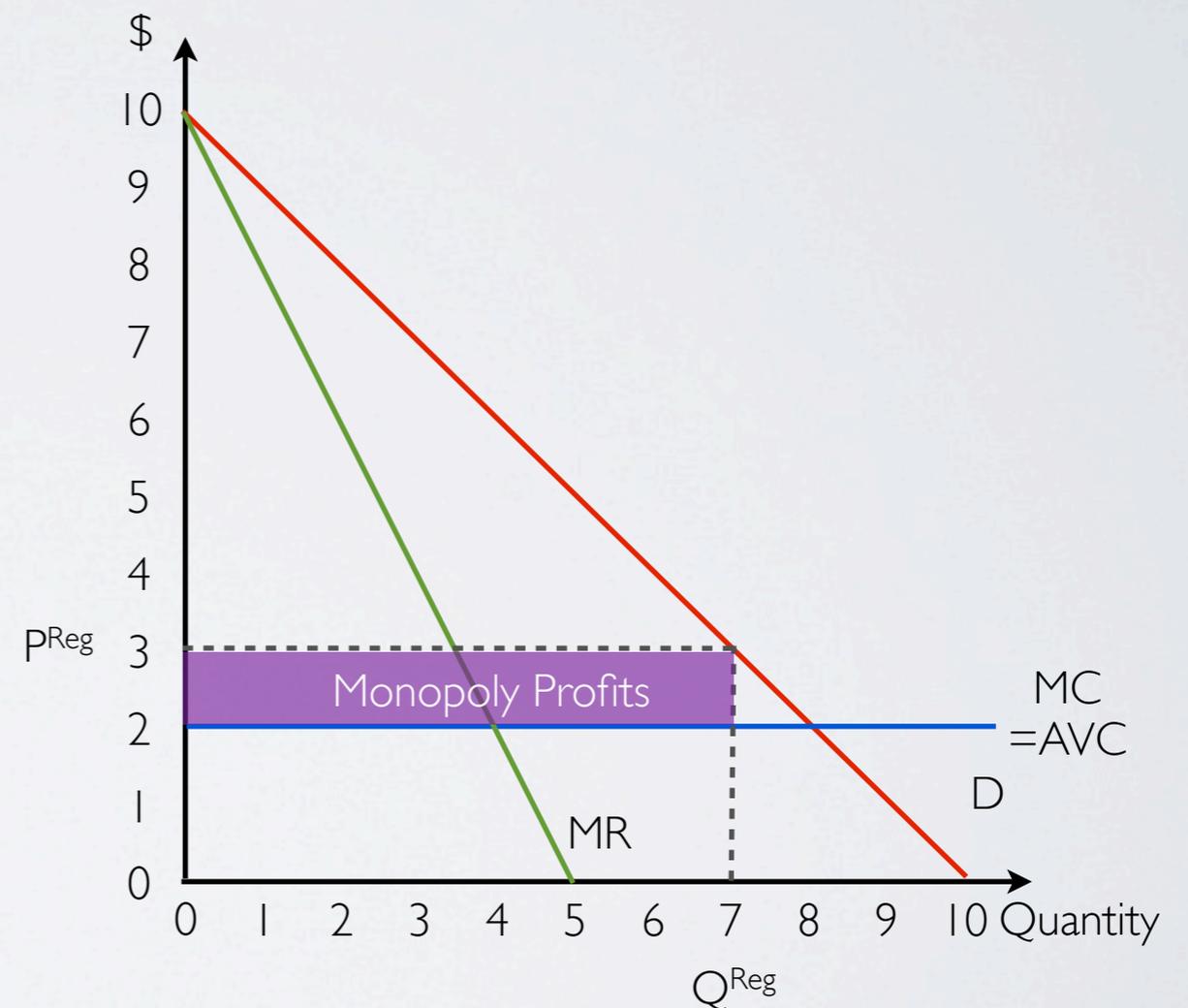
Big Pharma Cost and Demand



CASE C: PATENT WITH REGULATED PRICE

- In many cases the government might grant monopoly rights to a firm (like an electricity company) but worry about the high prices
- The response is to create a **regulated monopoly**, which, for example, is a monopoly that has a price cap
- Suppose Big Pharma has a patent on Wigitor but can't sell for more than \$3
- Now at the regulated price of \$3, the quantity demanded is 7 units
- Profits **per sick person** of the monopoly fall from \$16 to \$7

Big Pharma Cost and Demand



BIG PHARMA: TOTAL PROFITS

Suppose Big Pharma operates in all world regions with the following characteristics; what are global profits?

System	Patent, Unregulated	Patent, Regulated	No Patents
Associated Region	US	Other Developed	Other
Profit per sick person	\$16	\$7	0
Population	300 million	600 million	BIG
Share sick	10%	10%	N/A
Number sick	30 million	60 million	N/A
Annual Operating Profit	\$480 mil	\$420 mil	\$0

Global operating profits are \$900 million

BIG PHARMA: TOTAL PROFITS

- \$900 million is the total annual operating profits, but patents last longer than one year
- For example, suppose the patent rights in every country last 20 years
 - Big Pharma makes \$900 million for 20 years
 - Over its lifetime, the drug makes \$18 billion
- This is, of course, a simplification since some other company might develop a better drug in that time period

INVESTMENT INCENTIVE

- This is all hypothetical, though; we have yet to answer whether Big Pharma will even bother inventing this drug
- If fixed costs are too high and profits too low, it may not
- Big Pharma's investment decision will take into account:
 1. Cost of R&D (a fixed cost)
 2. Likelihood of successfully creating this drug
 3. Potential profits if successful

EXPECTED VALUE OF INVESTMENT

- These 3 considerations give us the **net expected value of investment** into Wigitor research
 - 2 and 3 tell us expected profits
 - Suppose chance of success in development of drug is 50/50 and potential global profits are \$18 billion
 - If Big Pharma fails to make the drug, it makes \$0
 - 50% chance of making \$18 billion, 50% chance of making 0
 - **Expected profits** (expected because we initially do not know whether research will succeed) is $50\% * \$18 \text{ billion} + 50\% * 0 = \9 billion
- **Net expected value of investment here** is then \$9 billion - Fixed Cost of Research

INVESTMENT DECISION I

- Big Pharma executives meet and discuss these figures to decide whether to do Wigitor R&D
- Expected value of this investment is \$9 billion
- If the fixed cost of research is **higher** than \$9 billion, then there is no way they will agree to the project because net expected return is negative
- If fixed cost of research is **lower** than \$9 billion, then maybe the executives will agree to the investment
- Investment is not a given in this case, we need to consider a bit more

INVESTMENT DECISION II

- Suppose research cost is less than \$9 billion, there is still a chance that Big Pharma makes (\$0 - fixed cost of research) if the research fails
- The research is still a risky gamble for Big Pharma
- So the decision to invest will depend on
 - How much risk Big Pharma execs are willing to tolerate
 - How low is the fixed cost (if it is very low, even with a big chance they may be willing to go forward)
- Typical R&D costs for drugs are around \$800 million, and if success were actually 50/50 most companies would be pretty happy

PATENT POLICY IMPLICATIONS



PATENTS, REGULATED MONOPOLY

- Based on the previous discussion, changing profitability should change incentive to develop drug
- Suppose the US changes patents so they come attached with a price cap (change from case A to C in the US)
- Then profits per sick person falls from \$16 to \$7 and annual profits in the US fall from \$480 million to 30 million sick *\$7 = \$210 million
- So global profits from the US and other developed countries fall to \$630 million (2/3 of the old level of \$900 million)
- The lower drug profitability reduces the incentive to create the drug



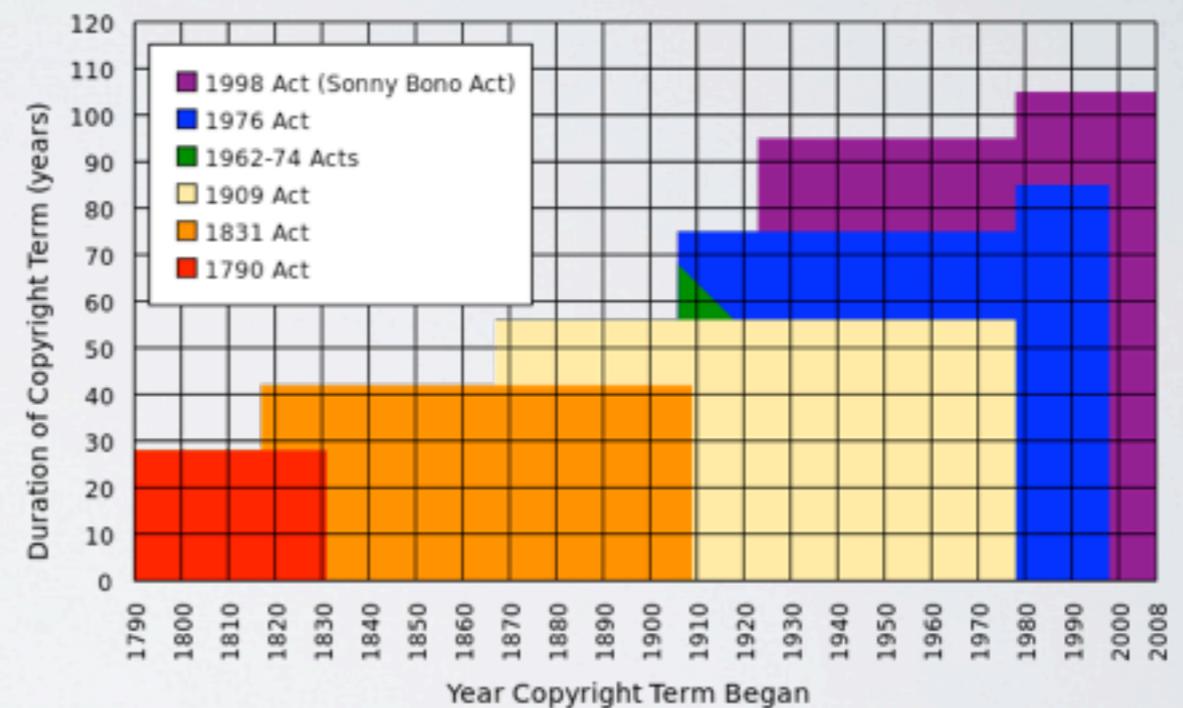
USVA Hospitals is a collection of medical facilities controlled by the government

POLICY I: REGULATED MONOPOLY

- This argument claims that weaker patents bear the cost of less innovation (research and development)
- Notice also that the US bears a disproportionate amount of the cost in our world (it is true in real life as well)
 - Weaker patent laws in the US slices a large portion of the market for pharmaceutical producers (or any producer of new technology?)
 - So weak patent laws in the US has a bigger negative impact on the incentives to innovate than a smaller market (Canada ... Luxembourg) with weak patent laws does

POLICY 2: SHORTER PATENTS

- Regulated monopolies are not the only way to “weaken” patents
- Suppose the US decides to replace 20 year patents with 5 year patents
- Then \$900 million annual profit over 20 years of \$18 billion becomes \$4.5 billion for the 4.5 years of the patent
- With the 50/50 success rate, expected profits are down \$2.25 billion



Copyrights, a source of protection for “creative innovation” have been increasing in duration

Source: Wiki

POLICY 2: SHORTER PATENTS

- Benefits to shorter patents
 - Recall that monopolies cause distortions to the market
 - When Big Pharma loses its monopoly power with the expiration of the patent, there should be gains to total surplus
 - In particular, we might appreciate that consumers can get drugs at lower cost in the competitive market
- The negative is that perhaps these drugs will not be developed at all, which might be a big loss if it the drug could have saved many lives (and not something like an aspirin knock off)

POLICY 3: INTERNATIONAL IP STANDARDS

- Part of the problem for Pharma we saw is that the developing world had poor or no patent enforcement
- Perhaps could reduce patent strength in the States by convincing developing world to focus on stronger protections
- In 1995 (with the creation of the WTO) Trade-Related Aspects of Intellectual Property Rights (**TRIPS**) was signed and came into effect in 2005
- By TRIPS developing countries agreed (were forced) to agree to respect intellectual property protections in exchange for trade concessions in the WTO

POLICY 3: INTERNATIONAL IP STANDARDS

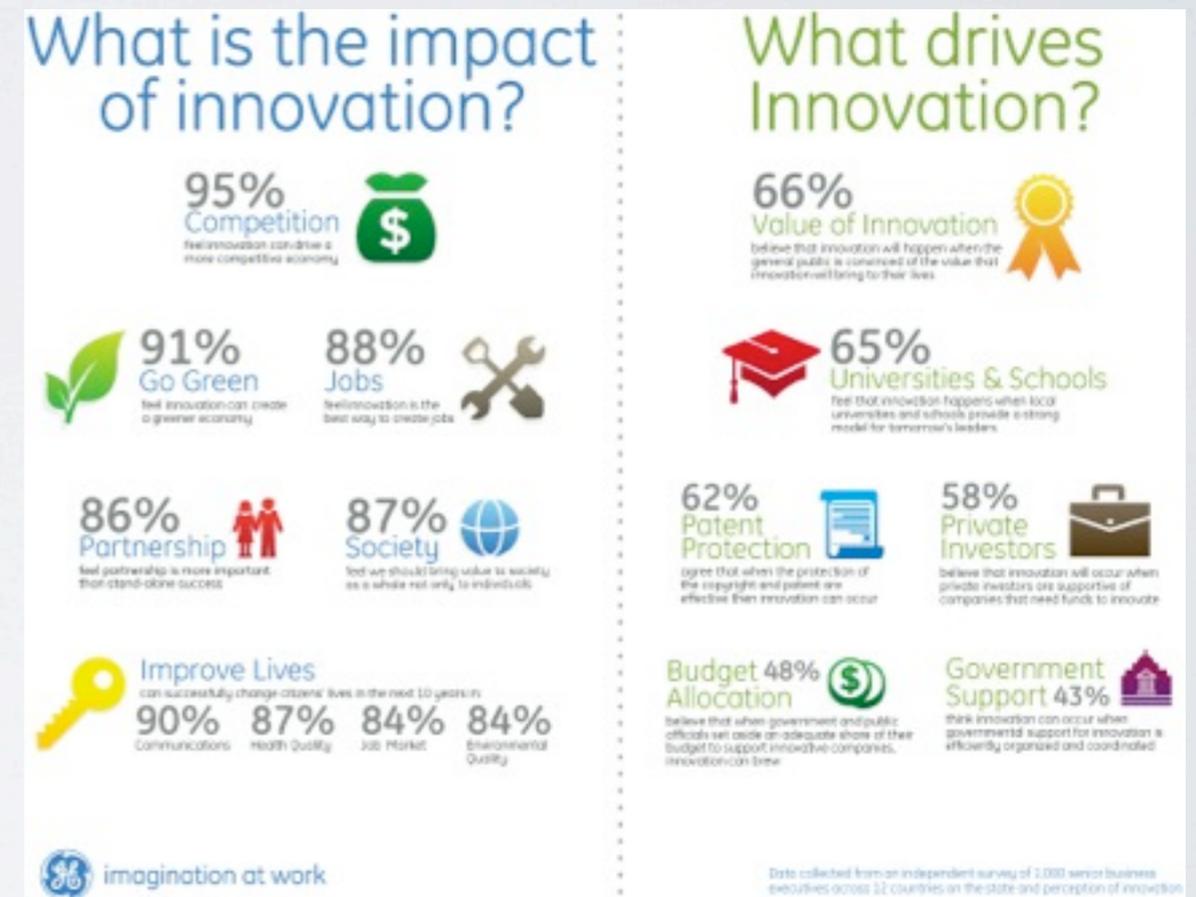
- Benefit: extra profitability can encourage new research, allow weaker patent laws in developed country
- Costs and Implementation Issues:
 - Poorer countries are too poor to pay the prices charged in developed countries; why not offer different prices?
 - Recall imperfect price discrimination monopolies; different pricing rules DO NOT work if you cannot discriminate
 - Problem is people in rich countries might find a way to just buy cheaper drugs from developing countries
 - Charging only high prices gives developing countries an incentive to violate the agreement to respect IP rights

POLICY 3: INTERNATIONAL IP STANDARDS

- To wit:
 - May 2007 (AP): “President Luiz Inacio Lula da Silva took steps Friday to make an inexpensive generic version of an AIDS drug made by Merck & Co. available in Brazil despite the US drug company’s patent. Silva issued a “compulsory license” that would bypass Merck’s patent on the AIDS drug efavirenz, a day after the Brazilian government rejected Merck’s offer to sell the drug at a 30 percent discount.”
 - Brazil is an increasingly wealthy country, and we still have this type of IP enforcement issue

PROFIT INCENTIVE DRIVES INNOVATION

- Traditional thought leads us to claim that innovation is driven by a firm's desire to make big profits off of new products
- Traditional thought is not necessary true and some economists have taken up a zealous case against intellectual property rights



Loosely measuring the importance of different components on innovation incentives

DEVELOPING UNPROFITABLE PRODUCTS

- Consider Big Pharma deciding whether to develop a drug to treat tuberculosis (TB)
 - Most cases are in the developing world where there are no patent enforced patents laws protecting a monopoly rights to its product
 - Then Big Pharma has no incentive to develop the product
- These drugs are obviously very important too (or malaria treatments as another example); how are they developed?

DEVELOPING UNPROFITABLE PRODUCTS

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Global operating profits are about \$0

DEVELOPING UNPROFITABLE PRODUCTS

- These types of products (particularly drugs) are subsidized by
 - Government agencies: USAID, United Nations DP, WHO
 - Private charities, such as the Bill and Melinda Gates Foundation (\$750 million was dedicated to TB research)
- Even Boeing commercial airlines are the result of research originally financed by the US to develop jet planes for the military

POLICY 4: FINANCE RESEARCH THROUGH PUBLIC

- We mentioned the need for public or charitable financing in some industries last time (e.g. original jet plane research)
- Just need to worry about splitting cost of research with other countries
- For example, the LHC by CERN was a multi-government financed project open to physicists across the world



Location of Large Hadron Collider in Europe

POLICY 4: FINANCE RESEARCH THROUGH PUBLIC

- Benefit 1: With very little operating profit, research or creative activity (think of subsidizing Mozart...) might still take place
 - Like wikipedia financed or open source software funded by donation
 - Donation (unless you are Bill Gates) not really feasible for drugs..
- Benefit 2: Even without IP protection like patents or copyrights, profits can be earned on creative activity
 - Musicians may not make money on CDs but can use them to promote concert tours (don't need IP to make money on concerts)
 - It used to the other way around
- Benefit 3: Patents and innovation can be used to block innovation
 - Brace yourself for a rare criticism of Apple...

COUNTERPOINT

PATENTS BLOCKING INNOVATION

- **Example 2: Patenting Human Genes**

- Allowed in the US
- Myriad and the University of Utah have a patent on a gene to test for breast cancer
- Any test that uses the gene must be permitted by them, and they sell the right for \$3000
- Inventing better tests using the gene would also require a big payment, lest they be sued

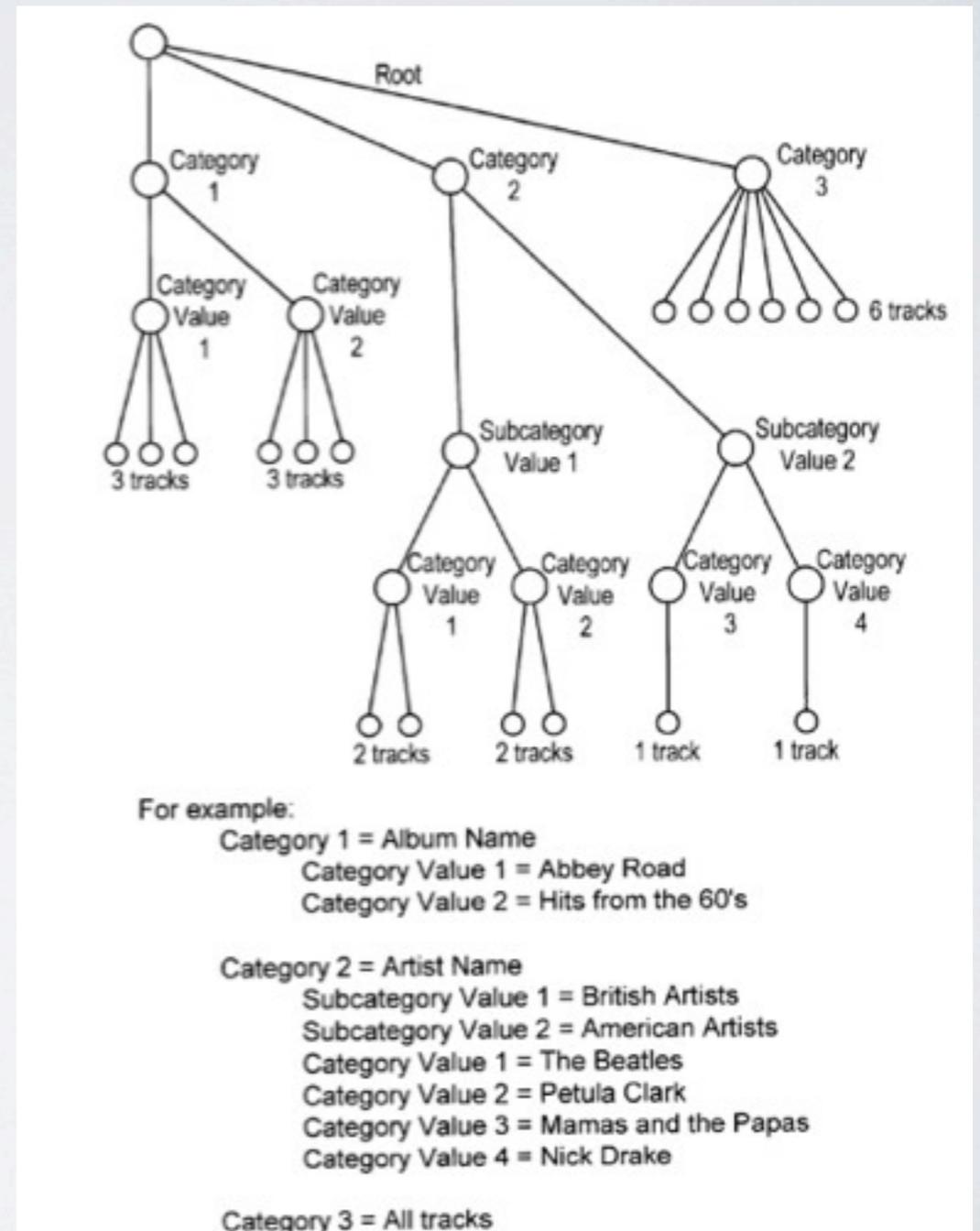


Think small

PATENTS BLOCKING INNOVATION

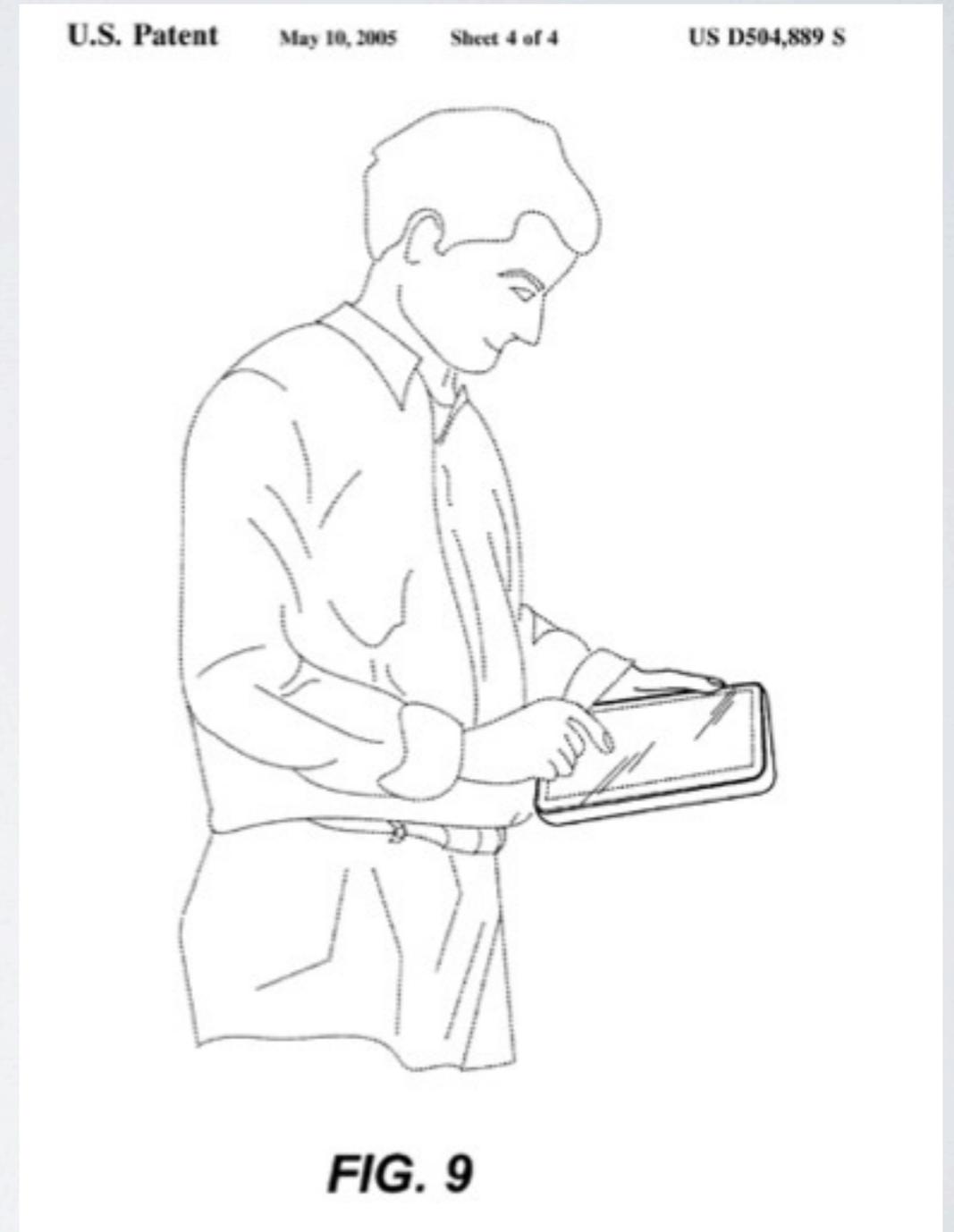
- **Example 3: Apple's iPhone**

- Complicated tale of cynicism
- In 2005 Creative Labs received a patent for “automatic hierarchical categorization of music by meta data” - basically patent for organizing music by album, genre, etc..
- Sounds like an iPod? and Apple had to pay \$100 million to settle with Creative Labs in 2006
- Steve's response with the iPhone was to patent everything



PATENTS BLOCKING INNOVATION

- **Example 3: Apple**
- Patents include
 - Screen pinching
 - Magnet for cover (iPad)
 - Glass staircases
 - Rounded corners
- Now are used to block competitors like Samsung (of course Samsung really copies some stuff ...)



Pinching = Happiness

APPLE'S APOLOGY TO SAMSUNG IN UK

In the ruling, the judge made several important points comparing the designs of the Apple and Samsung products:

“The extreme simplicity of the Apple design is striking. Overall it has undecorated flat surfaces with a plate of glass on the front all the way out to a very thin rim and a blank back. There is a crisp edge around the rim and a combination of curves, both at the corners and the sides. The design looks like an object the informed user would want to pick up and hold. It is an understated, smooth and simple product. It is a cool design.”

“The informed user’s overall impression of each of the Samsung Galaxy Tablets is the following. From the front they belong to the family which includes the Apple design; but the Samsung products are very thin, almost insubstantial members of that family with unusual details on the back. They do not have the same understated and extreme simplicity which is possessed by the Apple design. *They are not as cool.*” (emphasis added)

ISSUES FOR DEBATE

- Should IP protections be weakened or strengthened? Should they differ by product type?
- Should certain product types (human genes?) be excluded from patent protection?
- Music and file sharing? (Avoid the fight from recitation last year)
- Think about the economics: How will incentives for research and creative activity change? What is the impact on social surplus (and who benefits and loses)?

DISCUSSION

- **“Patent’s Defeat in India Is Key Victory for Generic Drugs”**
 - What arguments did the Indian Supreme Court make for rejecting the Novartis’s patent?
 - What are the benefits to pushing for stronger patent protections abroad? The costs?
 - Who gains and who loses from strong patents?

SUMMARY

- Patents and intellectual property rights effectively give firms monopoly rights over the production of a particular good
- In general traditional thought claims that if profitability increases with patent strength, stronger patents should increase the incentive to innovate (there are those who disagree though)
- When the market does not offer a firm a profit motive to innovate, we need charitable or public sector-driven programs to drive research