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Activity title

Monopolies and innovation

Keywords

Monopoly, intellectual property, patent, efficiency, cost, profit, deadweight loss, consumer surplus, producer surplus

Overview of activity (1-2 brief paragraphs)

Stylized version of the pharmaceutical company Bayer deciding whether to make the necessary investment to bring a new drug to market. This application includes the analysis of two different market structures (monopoly vs. perfect competition), two different types of pricing (single price vs. perfect price discrimination)

Short description of activity (1-2 sentences)

Uses Bayer as an example of an innovative firm that relies on intellectual property to recover fixed research and development costs, and make a profit.

Expected student learning outcomes

* Analyzing and contrasting a monopoly’s behavior vs. the behavior of competitive firms.
* Connecting patents and intellectual property with incentives to innovate.
* Comparing the profit-maximizing behavior of a single-price monopolist with perfect price discrimination
* Evaluating different market outcomes

Context for use

* Is the activity appropriate for principles courses, intermediate courses, or selective elective courses?
	+ Principles
* What prior student knowledge is required?
	+ Demand and marginal revenue, cost curves, profit maximization, consumer and producer surplus, deadweight loss.
* Are there class size limitations?
	+ Tested with class of 86 students. Probably would work well with larger classes, as long as the shared responses are visible to all.
* How much time is needed for the activity? Does it extend across more than one class period?
	+ The application can be kept to a 50-minute period, though it can be extended, particularly with a discussion on intellectual property and innovation.
* Is this activity connected to another TBL activity? If so, please provide a link to that activity. For example, is this activity part of a group of activities within a single TBL module?
	+ This application can certainly be used independently, though it has been used as part of a group of activities within a single TBL module.

Teaching notes

This application presents a stylized scenario of a pharmaceutical company that has to decide whether to incur in the fixed costs of researching an antibiotic, and how different legal structures may influence the market structure, or even whether the market exists or not.

Before this application students have read the chapter on monopoly, and they have also solved a classroom exercise on natural monopoly.

Part 1 establishes a common structure across teams. Students should not have significant problems with this part.

Part 2 compares the cost structures of an innovator vs. a follower that copies a formula. Again, students should not face significant problems.

Part 3 allows the students to explore a situation where the innovator is not protected by a patent, and other firms can quickly copy their product. Part 4 can be solved concurrently, with the idea that students will conclude that Bayer would not invest $1 billion in the first place and there would be no new antibiotic in the market, so what may have seemed to be a gain in consumer surplus and efficiency, actually results in no market at all, with no consumer surplus and no producer surplus. Some teams may not have seen through the final consequences of the lack of patents. This is a good point to talk about the role of patents, and how firms innovated before the legal protection of patents. Basically, firms and individuals kept their innovations a secret to try to extract as much as possible from them for as long as they could, before an imitator caught up. Patents are seen as a tradeoff between granting a temporary monopoly to the holder of the patent, while requiring the creator to share the innovation with society, so everyone would know the nature and the details of the innovations, and others could build upon that innovation once the patent expired.

Parts 5, 6, 7, and 8 provide the necessary scaffolding for students to analyze various aspects of Bayer as a monopoly in this market.

Note that in my class each team has a small whiteboard (sometimes called a huddleboard) to respond to most questions, and they share their results by raising their whiteboards simultaneously (the whiteboards/huddleboards are small and light enough that they can be raised by one person, and they are big enough that everyone can observe the results of all other teams).

Assessment of student learning outcomes

Direct observation of team’s responses on their portable whiteboards, as well as the verbal contributions to the large group conversation. The module ends in a capstone test. The final exam also tests these learning outcomes.

Additional resources

None.

Additional information about this activity submission

Information given to student groups for this application exercise

**Application #5: Monopolies and Innovation**

Bayer is a large German pharmaceutical company that was founded in the 19th century. It is perhaps best known as the company that introduced Aspirin.

It is the 1970s, and you are a consultant of the executives at Bayer, who are trying to decide what avenues of research to prioritize. The executives have recently learned about the discovery in Japan of a very potent antibacterial compound called norfloxacin. Bayer scientists claim that they have theories on how to substantially improve on the discovery by the Japanese scientists, to the point where the product they hope to develop would easily outsell norfloxacin and revolutionize the market for antibiotics. An antibiotic so effective would be lifechanging and lifesaving all over the world, as bacterial infections are painful, debilitating, and in many cases deadly. However, the decision is not so simple.

Putting a drug on the market involves substantial costs: the cost of the research to discover the compound (from millions to tens or hundreds of millions), the cost of clinical trials (each of three phases may be hundreds of millions), and the cost of regulatory approval (the FDA again charges millions as a fee for getting approval). Estimates of the average cost range from hundreds of millions to billions of dollars. The marginal cost of producing a drug, by contrast, is substantially lower.

Now, consider Bayer’s problem. Suppose that if it invests, the cost to get the drug from the scientists’ brains to FDA approval is $1 billion. However, once the drug is discovered and information about it published (as is required), other companies can easily produce it without incurring the $1 billion research and development (R&D) cost. These companies would still incur the marginal cost of production, but would effectively have no fixed costs.

1. **Use your whiteboard to show the cost structure and break-even point of Bayer, including whatever curves are necessary to show this.**
2. Bayer knows that an American company, Barr Pharmaceuticals, will likely produce a generic version of the drug as soon as Bayer’s results are released. **Use your whiteboard to show the cost structure and break-even point of Barr Pharmaceuticals as compared to that of Bayer, including whatever curves are necessary to show this.**
3. In addition to Barr Pharmaceuticals, there are many other potential entrants into the generic antibiotic market. What will the long-run price of the drug be, if this is the case? **Use your whiteboard to show the location of the long-run price on your cost structure graph from the previous question.**
4. From a business point of you, would you recommend Bayer to invest? Characterize the consumer and producer surpluses as a consequence of your recommendation. **Write YES or NO, 1 word on consumer surplus, and 1 word on producer surplus on the whiteboard.**

This isn’t quite how the pharmaceutical market works in real-life. Bayer will actually be able to apply for a document that make it illegal for companies like Barr Pharmaceuticals to produce the drug—this document is a patent. With the ability to prevent Barr from producing, Bayer will effectively have a monopoly on the new antibiotic once it discovers it.

1. Return to your diagram of Bayer’s cost structure and add consumer demand. Assume that at least part of the demand curve lies above Bayer’s ATC curve. **Indicate, on your whiteboard, the range of prices/quantities for which Bayer can make a profit.** (Add any other curves that are necessary to show this).

Given that the patent system exists, Bayer decides to go ahead with the research. Congratulations, your company has just discovered ciprofloxacin, 2 to 10 times as strong as norfloxacin, and one of the most widely prescribed antibiotics in the world!

1. **Indicate the profit maximizing price/quantity for Bayer, and shade in the consumer and producer surpluses if Bayer maximizes its profit**.
2. **Shade in the deadweight loss** (and discuss in your groups what it represents).
3. Now, suppose Bayer sells the medicine directly to consumers and can charge a different price on every transaction it makes (this is called pure price discrimination). If it is able to do this, **indicate the consumer surplus, producer surplus, and deadweight loss on your graph.**

**Discussion:** One of the most important stipulations of the patent system is that patent applicants must fully disclose the details of their discovery, to the point that someone trained in the field could reproduce it. Aside from proving that their discovery is valid and useful, what role do you think this plays? (Keep in mind that patents expire after about 20 years.) What if Bayer were only able to patent its invention in Germany, and Barr Pharmaceuticals could still produce the drug in the US? How would this affect surpluses and Bayer’s decision? How might Bayer’s situation differ from the situation of an American company like Merck (think about the size of the US compared to Germany)? Would such a situation be advantageous to certain countries or companies? What are the downsides to Bayer being able to patent its invention in *every* country?