

FINAL EXAMINATION
2002

Instructions: You have three hours to complete this exam. This exam is closed-book: no books or notes are allowed. In addition, you may *not* use a graphical calculator or one that stores words, user-specified functions, or spreadsheets. Answer *all* questions in the blue books that are provided. Be sure to write your name and the name and number of the course on all blue books that you hand in and indicate how many blue books you are handing in, in total. Be as clear and legible as possible. The exam consists of 3 parts and 9 questions in total. Please note that ALL work must be shown to receive credit.

Part I: Short Question and Answer Section. (Total points: 30) Please limit your response to NO LONGER than 3 or 4 sentences (take into account that each question is only worth 5 points).

1. A classic way of introducing pollution regulation into an urban area is the “rollback” method. First, you determine the maximum tolerable level of a particular pollutant, X_s . Next, you find the maximum current concentration of that pollutant in the urban area, X_m . Presumably, it is the case that $X_s < X_m$ (otherwise, there is no problem). Regulations then require all polluters in the city to reduce emissions from their current level of e_m to $e_s = e_m (X_s/X_m)$. Discuss the efficiency of this approach.
2. Chris has been hired by the city of Cambridge to design a hazardous waste landfill and she is trying to decide whether it is worth spending \$1,000,000 to install a special liner that reduces the probability of a leak from 0.001 to 0.0001. If a leak does occur, the expected number of fatal cancers in Cambridge can be expected to rise by 100. Suppose that Chris recommends the installation of the special liner. What do we know about her valuation of a life saved? (I am looking for a numeric response here.)
3. The development of microwave transmission technology in the 1950s is often given as a reason why the long distance telephone market stopped being a natural monopoly as sending long distance telephone signals over microwave transmission stations require a much lower fixed cost than doing so over wires. Microwave transmission stations, however, have been largely replaced by fiber optic wire in the 1990s, which has meant a return to stringing wires between locations. Why might long distance telephone not be a natural monopoly industry, even with this technological change?
4. Demsetz has suggested that one way to avoid natural monopoly regulation is by auctioning off the right to be a monopolist in a particular market through a franchise license. Does franchise bidding necessarily lead to an efficient outcome? Why or why not?
5. During regulation, airline prices were fixed above cost and airlines could not compete in price. What was the result of this regulatory practice with respect to food quality and safety, and can you justify the airlines’ response in these two areas?

6. A large petroleum refinery was located directly across the street from an elementary school in a small community outside of the Los Angeles Greater Metropolitan area. The pollution from the refinery posed a potential health threat to the children at the school. But, because the community and the petroleum refinery were on good terms (also, because the petroleum refinery's owner's children attended the elementary school), they had negotiated between themselves about how much pollution could be allowed, and in return, the refinery donated money to the school to build a large indoor play-space for the children. The Governor of California has just recently learned about the placement of the school next to the refinery and has decided to place a pollution tax on the refinery for every unit of pollution it emits. Comment on this policy.

Part II: Numeric Problems. (Total points: 50). Be sure to show all of your work.

7. (25 points) There is a company that is the sole producer of zippers. Its cost function is $C(q) = 50 + 2q$ and the market demand is $D(P) = 100 - P$. There is a large pool of potential entrants, each of which has the same cost function as this company. Assume the Bain-Sylos postulate. Let the incumbent firm's output be denoted by q^1 .
- (1) Derive the residual demand function facing a new firm.
 - (2) Given that the incumbent firm is currently producing q^1 , if a potential entrant was to enter, how much would it produce?
 - (3) Find the limit price.
 - (4) Suppose instead that we assume active firms expect to achieve a Cournot solutions, instead of the Bain-Sylos postulate. Does entry depend on q^1 ? Will there be entry? (You do not need to try and provide a numeric answer: just an explanation.)
8. (25 points) Suppose that there are an unlimited number of firms competing to discover a calorie-less fat substitute (that both tastes good and is good for you -- and no, it's not Olestra!). Each firm can only undertake a single research project for the development of this good. The research project is known to have a constant marginal cost of \$1. The probability, P , that one of the n firms will develop this new product is a function of the total number of firms engaged in the research race and is given by $P = 1 - e^{-0.5085n}$. If this new product is discovered, it will be priced competitively and the present value of total surplus will be \$25. Research can only take place this year and if the good is not developed this year, it will not be developed in the future.
- 1 From society's point of view, find the optimal number of research projects (firms engaged in the research race).

- 2 Assume now that a competitive R&D industry exists and that n is determined by the zero profit condition (that is, there is free entry into the research race). If the government promises the firm that discovers this new product the entire social benefit of \$25, show that 25 firms will enter the patent race assuming that each firm is equally likely to make the discovery.
- 3 Briefly explain why your answer in (i) differs from the number of firms that would enter a competitive patent race from as shown in part (ii).

Part III: Short Essay (Total points: 40).

9. The Toxics Release Inventory (TRI) is a regulation that forces manufacturing plants to publicly disclose their toxic releases to a publicly available data base maintained by the US Environmental Protection Agency. Prior to TRI regulations, there was no tracking of toxic releases in this country. There is no other formal regulation concerning toxic releases (although toxic substances are heavily regulated through command and control strategies which dictate how the substances are stored, transported, and disposed). Only toxic releases for 600 listed toxic substances need to be reported -- and only if the plant either uses or manufactures more than some threshold level of the substance. Examples of some toxic substances that require reporting under TRI include dioxin (a known carcinogen), ammonia (a common household cleaner), and arsenic (a metal which is fatal when ingested or absorbed). TRI data are self-reported -- that is, plants report their own level of toxic releases. Since TRI reporting began in 1987, reported releases (aggregated over all toxics in tons) have declined by over 40 percent nationwide. The EPA claims that TRI regulation has been a huge success.

Discuss this regulation in terms of (1) potential motivations of the EPA for choosing information disclosure over command and control strategies for the toxic releases (including efficiency); (2) how this regulation is supposed to work, theoretically (including the potential effectiveness of this regulation in reducing toxic releases); and (3) any potential weaknesses of using mandatory disclosure rules for toxic releases. Try to use specific examples and evidence from class to support your views.