Final Exam
Microeconomics for Public Policy I
Fall 2023
December 13 or 14, 2023

GWID or other number (**not** your name): _____

Exam Instructions

1. **Write your name on page 15.**
2. Write your GWID on each page. If you don't know your GWID, write your birthdate (or some other made-up number) on **each page** including the first. I request this so that if we scan exams we will be sure not to misplace pages.
3. Answer all questions.
4. The exam is graded out of 100 points. Points for each section and question are indicated on the exam.
5. Write legibly. Illegible exams cannot be graded.
6. The final page is intentionally left blank for extra work. If you do extra work on this page (or any other non-standard location) that you would like to be counted, note it clearly near the question you are answering.
7. Label all figures as needed.
8. We give liberal partial credit. If a question has multiple parts and you can't answer one, it is in your best interest to answer all the remaining parts to the best of your ability.
9. **Explain** your answers as needed. When appropriate, you should also explain any assumptions that you make to arrive at your answer. Explanations may yield partial credit.
10. Be concise.

For marking purposes only

Part A _____

Part B _____

Part C _____

total _____

A. Ripped From the Headlines (9 points, 3 each part)

Read the article from the *Wall Street Journal* at the end of the exam.

1. Define economies of scale. Give two examples of economies of scale from the article, and explain why your examples fit your definition.

2. Were the costs of Carnival's older smaller ships (see paragraph "Carnival was pushed to the brink ...") sunk? Why or why not?

3. Carnival's big new ship has onboard wastewater treatment and potable water production via desalinization. Are the construction and operation of these features fixed costs, variable costs or both? Explain why.

B. Short Answer Questions (5 points each, 40 points total)

1. Give two examples of things that could shift the supply curve for chocolate. Describe which way each example shifts the curve and explain why.

2. Explain what public good autopsies produce by referring to the definition of public goods.

3. What are the two conditions for a firm to have a pricing strategy? Explain why the pricing strategy would fail if either condition did not hold.

4. Define marginal cost. If a firm produces eight units at a total cost of 10 and produces nine units at a total cost of 12, what is the firm's marginal cost for the production of 10 units?

5. Name two potential sources of market power, and give an example of each. Please be specific.

6. Suppose that there are three firms in the market for insulated drink mugs and that these three firms all charge a price above marginal cost. If there are no barriers to entry in this market, what should happen to the price of insulated drink mugs in the long run? Explain why.

7. Why might a perfectly competitive firm operate in the short run when it will have negative profits? Explain why, using the conditions under which a firm should operate in the short run.

8. Suppose that a firm operates with marginal product of capital is $MP_K = 5L$, and marginal product of labor is $MP_L = 3K$. The firm faces a wage rate of 3 and a capital rental rate of 2. The firm is currently consuming 2 units of capital, and 3 units of labor. Is the firm optimizing its purchases of capital and labor? If it is not, from which input is it getting more value for the last unit, and which should it purchase more of: capital or labor?

C. Medium Answer Questions (51 points total)

1 (3 points per part, except for (a), (d), and (e), which are 4 points; 24 points total) Pigouvian Taxes, Externalities, and Tax Incidence

Suppose that the market demand for chocolate is equal to $Q = 200 - (4/3)P$. The private marginal cost of chocolate production is $PMC = (1/4)Q + 50$. Chocolate production uses cocoa beans as an input. Sadly, cocoa bean producers use some terrible spray on the beans that harms chickens. Therefore, the social marginal cost of chocolate production is $SMC = (1/4)Q + 75$.

(a) In the absence of government policy, how much chocolate would be produced, and at what price? Draw a price to illustrate this equilibrium.

(b) What is a fixed cost? And what is the fixed cost for chocolate producers?

(c) Define external marginal cost. Calculate the external marginal cost of chocolate production in this problem.

(d) What are the socially optimal levels of price and quantity for chocolate? Calculate these values and draw them in a figure (you can add to your previous figure if you prefer).

(e) Use a picture to show the deadweight loss of the production of the equilibrium amount of chocolate. Calculate the deadweight loss.

(f) Suppose that the government levies a Pigouvian tax of $25 per unit on chocolate producers. What are the equilibrium price and quantity in this case?

(g) Quantify the burden of this tax on consumers and producers of chocolate. Give exact numbers. A picture may be very helpful to figure out the tax burden.

(h) Explain why the larger tax burden you find in (g) falls on the party on which it does.

2 (4 points each; 24 points total). Competition

Answers in this question are sequential. If you don't find the answer to a given sub-question but have some ideas about how to solve the next one, write down as much as is helpful to earn partial credit.

(a) Suppose that the paper industry is perfectly competitive and each firm's marginal cost curve is $MC = (1/4)Q + 40$. If the current market price is 100, how much does one firm produce?

(b) Suppose that the paper industry is competitive and has 100 identical firms, each with marginal cost $MC = (1/4)Q + 40$. What is the equation for the industry supply curve? Draw a picture to illustrate the logic of your addition.

(c) Demand for paper is $P = 60 - (3/400)Q$. Find the market equilibrium price and quantity when there are 100 firms supplying paper.

(d) Now suppose that there is only one firm and it is a monopolist. This monopolist has the industry supply curve you found in part (b). Demand is unchanged from part (c). What is the new market quantity? Draw a graph to indicate the logic to finding this new quantity.

(e) What is the new equilibrium price? How and why does it differ from the price in part (c)? Note the new price on the graph.

(f) Indicate producer and consumer surplus for this monopoly case in a picture where you label axes, intercepts and key points. (You do not need to calculate specific values.) Without calculating specific values for this or the competitive case, compare the areas you have indicated to those in the case of perfect competition. Explain whether producer and consumer surplus are larger, smaller or indeterminately different between the two cases.

https://www.wsj.com/lifestyle/travel/royal-caribbean-icon-seas-economy-7b3c9934

HEARD ON THE STREET

The Startling Economics of the World's Largest Cruise Ship

With its seven pools, six waterslides and dozens of places to eat, drink and gamble, Royal Caribbean's Icon of the Seas brings new meaning to the phrase 'economies of scale'—and it's better for the environment too.

By Spencer Jakab Follow

Nov. 30, 2023 9:00 pm ET

It has been nearly half a century since "The Love Boat" promised "something for everyone." These days, it's actually true.

Before the hit TV show helped popularize them, cruises were derided as being for the "newly wed and nearly dead," and were a lot more expensive than they are today. Those not quite rich enough for their own yacht can still splurge on intimate, luxurious trips or high-octane adventures to places like Antarctica. But most cruisers these days are middle-class Americans or Europeans looking to be fed, pampered and entertained on a floating version of home. Many bring their children. The hyper-efficient industry has made that possible by building megaships that resemble floating theme parks, and even its own islands.

Using tax havens and employing thousands of workers from developing countries has helped keep the cost of cruises down. Their real secret formula, though, has been the economies of scale of modern vessels and cruise ports. A happy side effect is that being lean also increasingly means being green.

In 1980, the first year data is available from industry body Cruise Lines International Association, there were 1.4 million oceangoing cruise passengers. That number had already begun to soar as a direct result of "The Love Boat," the ABC show set aboard the MS Pacific Princess that began its nine-season run in 1977. It was surely one of the most lucrative product placements ever. Next year, CLIA expects 36 million passengers and for the industry to surpass 300 oceangoing vessels—more than most navies.

Many cruises aren't expensive, and sometimes—for example when operators were luring passengers back from the Covid-19 pandemic that shut it down—they have been outright bargains. Mass market operators keep ticket prices low enough to reach full occupancy even during recessions because a substantial part of their cost is the vessels themselves, and their fuel. Once people are on board, more than a third of revenue can come from onboard spending such as drinks, spa treatments, specialty restaurants and gambling.

Next month will see the launch of the world's largest passenger ship, Royal Caribbean's Icon of the Seas, with a maximum capacity of 7,600 people, not

including 2,350 crew members. Its incredible size is a selling point in and of itself, but it also highlights the pursuit of savings.

"You only have one captain, only one bridge team, only one engineering team. The same thing happens in other parts of the ship," says Bill Burke, the chief maritime officer of Carnival, the world's largest cruise company. Carnival launched the first passenger ship exceeding 100,000 gross tons 27 years ago. That was more than twice the size of the Titanic. Icon of the Seas is as big as five Titanics.

The newest megaships are also saving money through energy efficiency that executives from the Love Boat era could only dream of. That show's star, the Pacific Princess, was among the earliest purpose-built cruise ships. Before that, the industry used converted ocean liners that had been made obsolete by intercontinental jet travel in the 1960s. The Pacific Princess burned cheap, dirty bunker fuel and carried about 600 passengers.

Carnival was pushed to the brink financially by the pandemic, but it took the opportunity to sell or "recycle" a number of older, smaller vessels. As an indirect result, it expects to hit an International Maritime Organization target for reducing the greenhouse gas intensity of ships by 2026, years ahead of schedule. Between 2020 and 2022, some 38 ships across the industry were taken out of service, and their average age was six years younger than those retired in the preceding three year span, according to Cruise Industry News.

'The Love Boat,' starring Gavin MacLeod, center, gave a massive boost to the cruise industry. PHOTO: TV GUIDE/EVERETT COLLECTION

The newest megaships have better environmental footprints per passenger, but they pack in the most jaw-dropping amenities too. With 20 decks, Icon of the Seas would have Captain Stubing jumping out of his knee socks. It has about 12 times the internal area of the Pacific Princess, which was scrapped a decade ago, and features seven pools, six waterslides and dozens of places to eat, drink, gamble, exercise or listen to live music. It also has a zip-line, bumper cars, rock-climbing walls, a surf simulator and minigolf.

Icon is powered by relatively clean liquefied natural gas, has a specially coated hull to reduce friction, can hook up to shore power, treats its own waste and can produce nearly all of its water through desalination. Being green pays dividends beyond saving on fuel. With governments and especially cruise destinations aware of the environmental impact of giant vessels and record passenger numbers, there

increasingly are incentives to avoid pollution. But Carnival's Burke points out that bigger ships have downsides, such as where they can sail.

"At some point you begin to limit your ability to get into certain places."

To get around that, and also to save energy and boost revenue, cruise lines have even leased their own private islands a short sail from Florida cruise ports, giving them new names like Castaway Cay and Perfect Day at CocoCay. Often featuring docks that can accommodate megaships, they offer a sanitized version of the tropics where every dollar spent accrues to the cruise line.

Hyper-efficiency is nearing its limit, though, and inflation has affected the industry too. Cruise lines have caused some grumbling by charging more for mandatory onboard gratuities. Norwegian Cruise Lines garnered attention earlier this year for cost-saving steps like reducing turndown service for non-premium cabins and swapping 9-ounce burgers for 7-ounce ones.

Cruisers are showing up in record numbers anyway, and shareholders are celebrating too. After nearly going under amid Covid-19, all three major operators are laden with debt but have seen their shares rebound by an average of 76% just this year.

What's not to love?

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Appeared in the December 2, 2023, print edition as 'The Math Behind The Megaships'.