Econ 301
Fall, 2025
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Problem Set 1

1. (*Exercise 5, Chapter 2, Pindyck-Rubinfeld*)

2. (*Exercise 6, Chapter 2, Pindyck-Rubinfeld*)

3. (*Exercise 7, Chapter 2, Pindyck-Rubinfeld*)

4. (*Canadian Pork*) The estimated demand function (Moschini and Meilke, 1992) for Canadian processed pork is $Q = 171 - 20p + 20p_b + 3p_c + 2Y$, where Q is the quantity in million kilograms (kg) of pork per year, p is the dollar price per kg, p_b is the price of beef per kg, p_c is the price of chicken in dollars per kg, and Y is the average income in thousands of dollars. The estimated supply function is $Q = 178 + 40p + 60p_h$, where p_h is the price of hogs in dollars per kg.

(a) What is the demand function if we hold p_b, p_c and Y at their typical values during the period studied: $p_b = 4$, $p_c = 10/3$ and $Y = 12.5$?

(b) How does the supply function change if the price of hogs p_h doubles from \$1.50 to \$3 per kg?

(c) What are the equilibrium price and quantity of Canadian pork if $p_b = 4$, $p_c = 10/3$, $Y = 12.5$ and $p_h = 1.5$? What are the equilibrium price and quantity when p_h doubles to \$3 per kg?

5. (*NYC in Smoke*) DeCicca and Kenkel (2015) report that the price elasticity of demand for cigarettes is -0.4. Suppose that the daily market demand for cigarettes in New York City is $Q = 20000p^{-0.4}$ and that the market supply curve of cigarettes in the city is a horizontal

line at a price, p, which equals $1.5p_w$, where p_w is the wholesale price of cigarettes. (That is, retailers sell cigarettes if they receive a price that is 50% higher than what they pay for the cigarettes to cover their other costs.)

(a) Assume that the New York retail market for the cigarettes is competitive. Calculate the equilibrium price and quantity of cigarettes as a function of the wholesale price. Let Q^* represent the equilibrium quantity. Find $\mathrm{d}Q^*/\mathrm{d}p_w$.

(b) Suppose retailers now pay a specific tax on each pack of cigarettes of \$1.50 to New York City and \$4.35 to New York State for a total of \$5.85 per pack. Use both math and a graph, show how the introduction of the tax shifts the market supply curve. How does the introduction of the tax affect the equilibrium retail price and quantity of cigarettes?

(c) Given the specific tax, calculate the equilibrium price and quantity of cigarettes as a function of the wholesale price. How does the tax affect $\mathrm{d}Q^*/\mathrm{d}p_w$?

6. (*Apple vs Google*) Ghose and Han (2014) estimate that the demand function for mobile applications at the Apple App Store is $Q_A = 1.4p^{-2}$, and the demand function at Google Play is $Q_G = 1.4p^{-3.7}$, where both quantities are in millions of apps. These demand functions are equal (cross) at one price. Which one? What the elasticities of demand on each demand curve where they cross?

7. (*Care Wanted*) Before Obamacare, economists John Cogan, Glenn Hubbard and Daniel Kessler stated in a 2004 *Wall Street Journal* commentary, "Each percentage-point rise in health-insurance costs increases the number of uninsured by 300,000 people." Assuming that their claim is correct, demonstrate that the price elasticity of demand for health insurance depends on the number of people who are insured by answering: What is the price

elasticity of 200 million people are insured? What is the price elasticity of 220 million people are insured?

8 (*Specific Sales Tax*) Use calculus to show that the less elastic the demand curve, an increase in a specific tax t reduces quantity less and tax revenue more. [Hint: The quantity demanded depends on its price, which in turn depends on the specific tax, $Q(p(t))$, and the tax revenue is $R = p(t)Q(p(t))$.]