

Bernardo Mendes Vasco Santos November 13, 2021 Time: 2:00

## INDUSTRIAL ORGANIZATION (B.S. in Economics and B.S. in Management)

## Midterm exam

Answer each question on a separate sheet of paper. Good luck!

**1.** [15 minutes; 4 points] The following statement was recently made by a former student of this course:

"When the Herfindahl-Hirschman index equals 1, the single producer will charge its monopoly price."

Comment in no more than ten lines (graphs, if any, excluded) while agreeing or disagreeing.

**2.** [15 minutes; 4 points] Jane Theory, the best student in her class, said:

"Differentiating its product *may* or *may not* lead a firm to earn an economic profit in the long run."

Comment in no more than ten lines (graphs, if any, excluded) while agreeing or disagreeing.

**3.** [45 minutes; 6 points] An importer, *I*, and a domestic firm, *D*, supply a market for an homogeneous good whose (lifetime) demand is q = 10 - p. Both firms produce the good at a constant marginal and average cost of 2. These firms compete in prices, which they choose simultaneously and independently.

(i) What price will each firm choose? What will each firm's profit be? Quantify and explain.

The domestic firm lobbied the domestic government to control imports. The domestic government obliged by imposing a Voluntary Export Restraint (VER) whereby the importer "voluntarily" commits not to import more than a certain number of units of the good. In this case, the importer accepts to import at most 1 unit. Suppose now that the domestic firm becomes the leader, i.e., announces its quoted price first, whereas the importer becomes the follower, i.e., announces its price after having observed the leader's price.

(ii) What is the *residual* demand of the domestic firm when the importer sells 1 in accordance with its VER?

(iii) What price will the domestic firm set? Quantify and explain.

(iv) What price will the importer set? Quantify and explain.

(v) What profit will each firm attain? Quantify.

(vi) Who gains and who loses with the imposition of the VER?

(vii) Can the VER be seen as a collusion (competition reducing) mechanism?

**4.** [45 minutes; 6 points] A pharmaceutical firm, *Alpha*, has embarked on an R&D project aimed at producing a new medicine whose *yearly* demand is given by q = 10 - p. This new medicine is produced at a constant marginal and average cost of 2. The R&D project leading to its discovery costs 160.

The government allows any pharmaceutical firms that discover a new medicine to obtain a patent allowing them to sell it without facing competitors. After the patent expires, competition is restored, i.e., other pharmaceutical firms are allowed to produce and sell the medicine. In fact, after the patent for this

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new medicine expires another firm, *Beta*, is willing to produce it, doing so at the same constant marginal and average cost, 2. *Alpha* and *Beta* compete in prices, which they set simultaneously and independently. [Simplifying assumption: do not discount profits.]

(i) At what price will *Alpha* sell the new medicine while the patent lasts? Quantify.

(ii) How many years should the patent last is order for *Alpha* to embark on the R&D project? Quantify.

(iii) What is the optimal duration of the patent from society's viewpoint? Quantify and explain.

(iv) Suppose now that after the patent expires, the two firms compete in quantities (rather than in prices). Does that alter the optimal duration of the patent, namely, does it increase or decrease it? Explain verbally.

Suppose that after the patent expires all (high-valuation) consumers whose valuation of the new medicine is 6 or more insist on buying from the pharmaceutical firm that invented it, regardless of price. The remaining consumers regard the two firms as producing an homogeneous product.

(v) What price will *Alpha* quote after the patent expires? Quantify and explain.

(vi) And *Beta*? Quantify and explain.

(vii) How many units will each firm sell?