Industrial Organization - VI

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- Review of class material
- 2 minutes presentations on your case studies + feedback from your colleagues.

Rules for the 2 mins presentations

- Each group selects a presenter.
- The presenter introduces the case, and motivates the choice.
- The presenter briefly mentions the major points of interest.
- A quick discussion with the class follows.

Today's class

- Entry and exit (not for exam)
- TA session
- Preview of presentations

Introducing entry and exit: market concentration

Market concentration is remarkably similar across countries.

How do we measure market concentration?

- We call C_m the sum of the market shares of the m largest firms:

$$C_m = \sum_{i=1}^{m} s_i$$

  This measure ranges between 0 (*minimum concentration*) and 1 (*maximum concentration*).

- The Herfindahl index:

$$H = \sum_{i=1}^{n} s_i^2 \tag{1}$$

  This measure ranges between 0 and 1, but it can be one only under monopoly.

Example : France vs. Germany

The next figure reports the market concentration of multiple sectors in France and Germany, considering the top 4 largest firms.

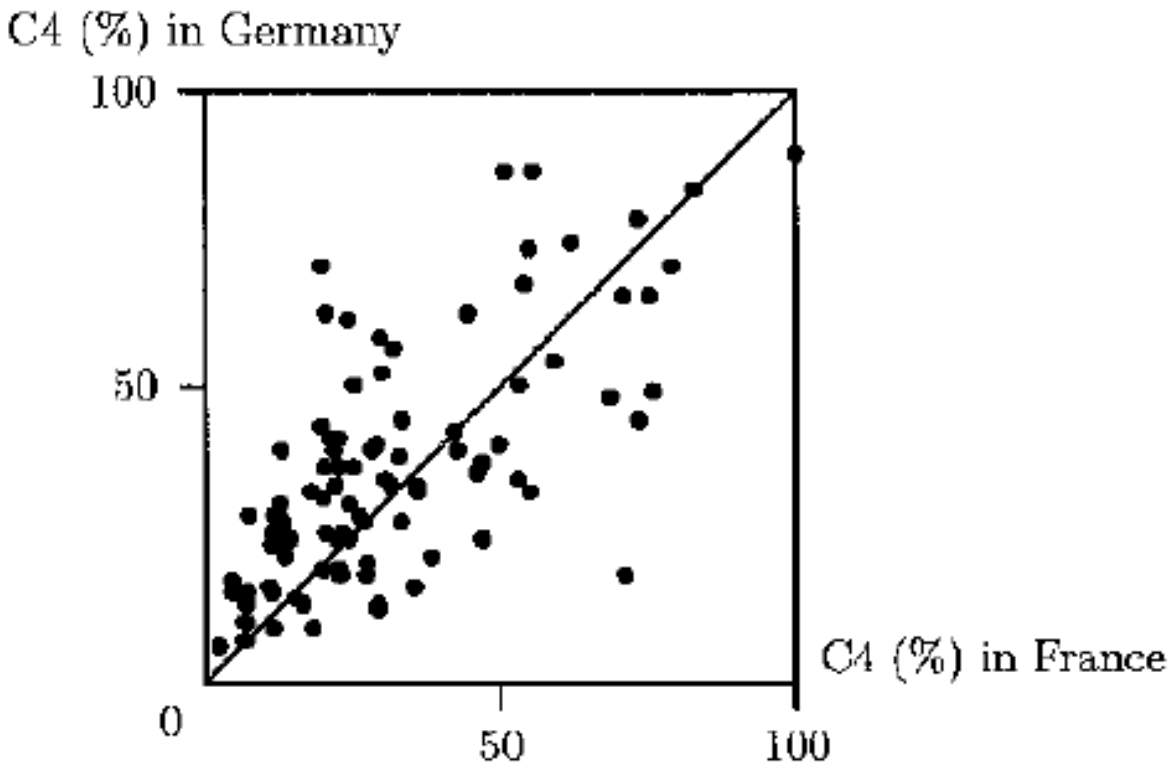

FIGURE 14.1 INDUSTRY CONCENTRATION IN FRANCE AND IN GERMANY.[173]

Concentration and the number of firms

- In the previous figure we have seen data for the C_4 measure of concentration. If we assume that firms are all of the same size, this measure is equivalent to $4/n$.
- If firms are of the same size, we can study the equilibrium in a market and how it depends on n, the number of firms in the market.
- In this context, a variation in n can be interpreted as **entry of firms** (n increases) or the **exit of firms** (n decreases).

Free entry equilibrium

Suppose n firms compete a la Cournot.

- Cost function: $C = F + cq_i$
- Demand: $Q = (a - P)S$, where S is a measure of market size
- Equilibrium profit level (from Cournot): $\Pi(n) = S\left(\frac{a-c}{n+1}\right)^2 - F$

Free entry equilibrium

$$\Pi(\hat{n}) \geq 0 \geq \Pi(\hat{n})$$

$$\Pi(\hat{n}) = 0 \Rightarrow n = (a - c)\sqrt{\frac{S}{F}} - 1$$

Free entry equilibrium - cont.

Given the demand and the cost functions, we can calculate the equilibrium profit level of firms, in a market with n firms.

$\Rightarrow$ Remember that we learned that in the Cournot model **every firm produces a positive quantity**.

Here the profits are 0 because of the free entry condition. If profits were positive, new firms would enter the market and get some profits too.

Firms enter until the point profits are exactly 0.

Moreover, We derived the equilibrium number of firms, given by the following:

$$\hat{n} = \left[(a - c)\sqrt{\frac{S}{F}} - 1 \right]$$

Market structure and market size

Since we obtained the equilibrium number of firms in the market $\hat{n}$, we can study how it depends on S, the market size, and F, c, the fixed and marginal cost, respectively.

$\hat{n}$ and the market features

- The number of firms is increasing in S. If demand increases, **firms will enter the market**.
- The number of firms is decreasing in F, c. If costs increase, **firms will exit the market**.

An important consideration

Entrants and market size

The equilibrium number of firms is increasing in market size. However the number of firms increases less than proportionally: if market size increases by 1 unit, there will be less than 1 firm entering the market.
Why?

Intuition

Higher S leads to higher n, but higher n leads to lower p. If there are more competitors price decreases, so the profits for each firm are slightly smaller when a firm enters the market. This effect on prices limits the number of entrants.

Free entry and social welfare

- Back to perfect competition: we learned that perfect competition leads to social efficiency.
- If there were barriers to entry, perfect competition is no longer socially efficient (remember the short-run vs. long-run outcomes of perfect competition).
- What can we say about barriers to entry when the (other) conditions of perfect competition are not satisfied?

Free entry and social welfare - cont.

- We consider a market where all firms have the same constant marginal cost: $MC = c$.
- (Total) Demand is given by $D(p)$.
- The total output of firms is given by: nq_n, and the price is $p_n = D(nq_n)$.
- We now suppose that one extra firm enters the market.
  - Output becomes $(n+1)q_{n+1}$, and price is p_{n+1}

In the next slide we report the graphic of what happens when a new entrant arrives.

Graphical representation of effects on welfare

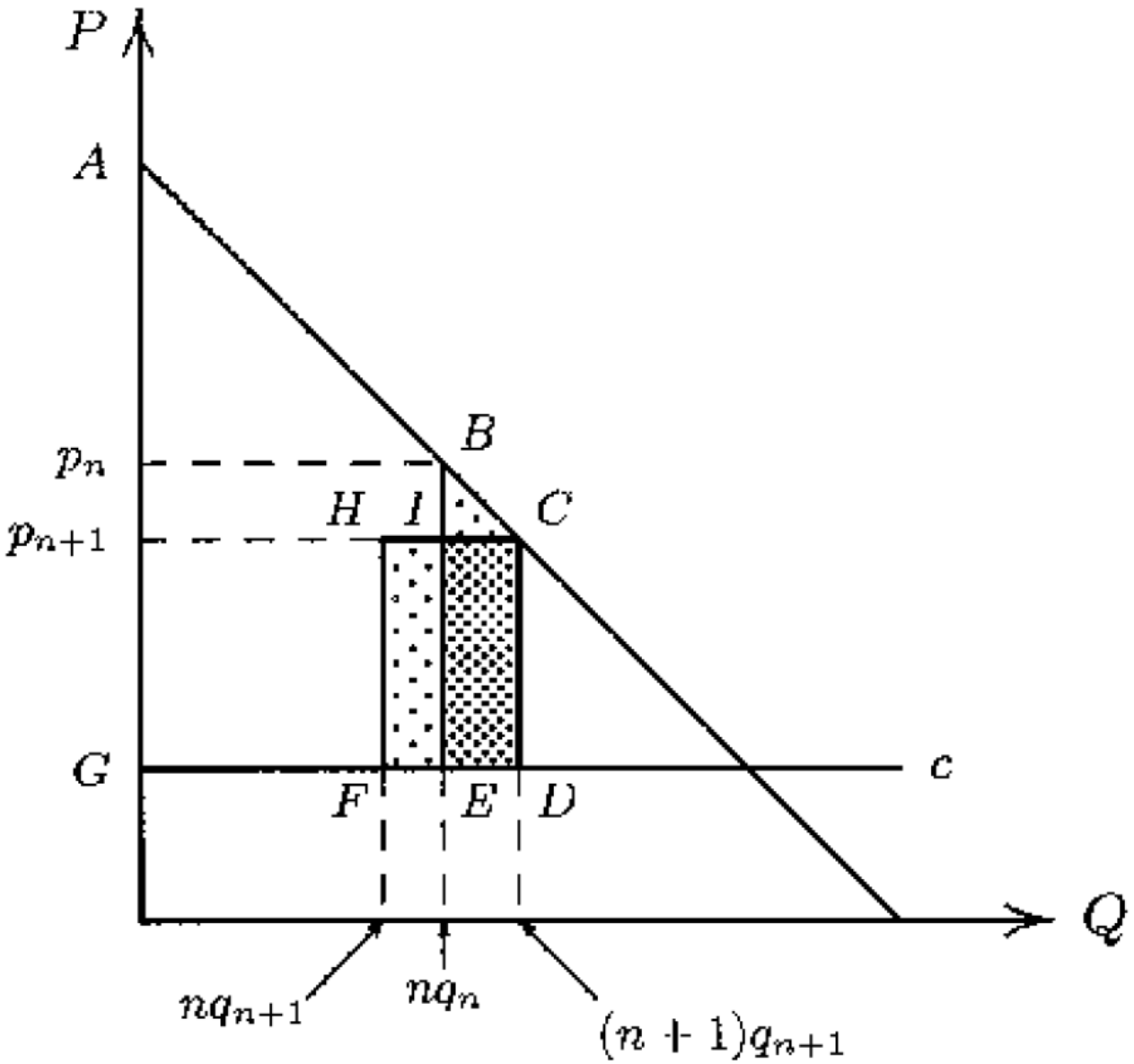

Figure 14.5 Free Entry and Welfare.

Explanation of effects of a new entrant

- The gross surplus for the society (excluding entry costs) is the area BCDE.
- The gross profit for the new entrant is CDFH, because $(p_{n+1} - c)q_{n+1} = (p_{n+1} - c)((n+1)q_{n+1} - nq_{n+1})$
- We notice that the social gross benefit is smaller than the gross profit for the entrant!
- If the entry cost k is $BCI + CDEI < k < CDFH$ then entry is profitable for the firm, but not for the society.
- Free entry is not always desired!

Business stealing effect

- The area $IEFH = (q_n - q_{n+1})(p_{n+1} - c)$ measures the so called business stealing effect.
- These profits are stolen from the incumbent firms

Important thought:

If product differentiation is very important, free entry implies insufficient entry from a social perspective (the new entrant fixes a price, but the *new* product is very attractive for the consumers, who would pay more than the fixed price for it).
If product differentiation is not very important, the business stealing effect dominates, so the free-entry equilibrium leads to excessive entry.

About questions for the exam

Following this slide you can find some sample questions for the exam.
After each question I provide you an example of answer. These are examples of complete answers, but there is always the possibility to say something more. You should try to do that if you aim for the best grade.

Being an example, you should focus on trying to answer yourself.
As an exercise, you should also try to formulate different questions, using a similar format of the questions provided below.
The questions in this sample are not excluded from the exam, so you should not disregard them (if a question is in this document, it can still appear in the exam)!

If you learn graphical derivation and can explain what is going on, you should do well in the exam.
However, you are free to follow your style, because no question will ask you explicitly to draw a graph.

Question 1

1. How does the elasticity of the demand affect the monopoly power?

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2. Why in perfect competition $MC = p$?

Answer 1.1

- The elasticity of demand measures how reactive consumers are in purchasing a good when the price varies. When the demand is highly elastic (i.e. the consumers change the quantity a lot when facing variation in prices), if the price is too high no consumer would buy the product. Therefore, the price has to be closer to marginal costs when the elasticity of demand is high (compared to a situation where the elasticity is low). The closer the prices are to marginal costs, the closer we are to perfect competition. Thus, if the demand were completely elastic, the monopolist would make zero profits. We can conclude that the greater the elasticity, the lower the monopoly power.

  Alternatively you can show the following graph, and discuss how the profits of the monopolist change with a different elasticity:

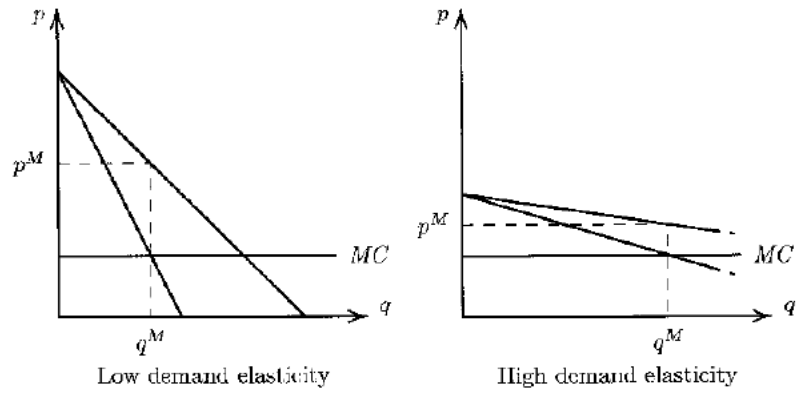

FIGURE 5.1 DEMAND ELASTICITY AND OPTIMAL MONOPOLY MARGIN.

Answer 1.1 - cont.

Alternatively, you can show the following. The rule for profit maximization is $MR = MC$. Moreover, $MR = p(1 - \frac{1}{\varepsilon})$, therefore we obtain:

$$p(1 - \frac{1}{\varepsilon}) = MC \tag{2}$$

Rearranging we can obtain:

$$\frac{p - MC}{p} = \frac{1}{\varepsilon} \tag{3}$$

If you notice the left hand side of equation 3 is the difference between price and marginal cost, or in other words the profit per unit sold. By the rule of profit maximization, the greater the elasticity, the lower is the right hand side of equation 3. Therefore, the profit margin has to be lower when the elasticity is higher.

Answer 1.1 - cont.

As you can see, I provided **as an example** 3 different answers to the first question. By providing either of these answer, shows that you understood the relation between elasticity and profit margins.

I want to stress that, every question will be such that you can answer in different ways. It is important that the answer is correct, and that it is complete.

The following examples of answers will be less detailed. But you should keep in mind that you'll have several ways to answer each question correctly.

Answer 1.2

The rule of profit maximization is given by

$$p(1 - \frac{1}{\varepsilon}) = MC \tag{4}$$

In perfect competition, the firms are price-takers. They cannot fix the price, but it is the demand that drives the price. In fact, since there are an infinity of firms, the quantity will always be able to match the demand (unless we are in the short-run). Because of this specific feature, the elasticity of demand the firms face in perfect competition is perfectly elastic (a horizontal line). Since the elasticity for the firms is infinity, we can see from the formula of profit maximization that $MR = MC$ is equivalent to $p = MC$ in perfect competition.

Question 2

Discuss the following statement:

"The monopolist extracts most, but not all the consumer surplus. It is not socially efficient."

You can use graphic support.

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Discuss the following statement:

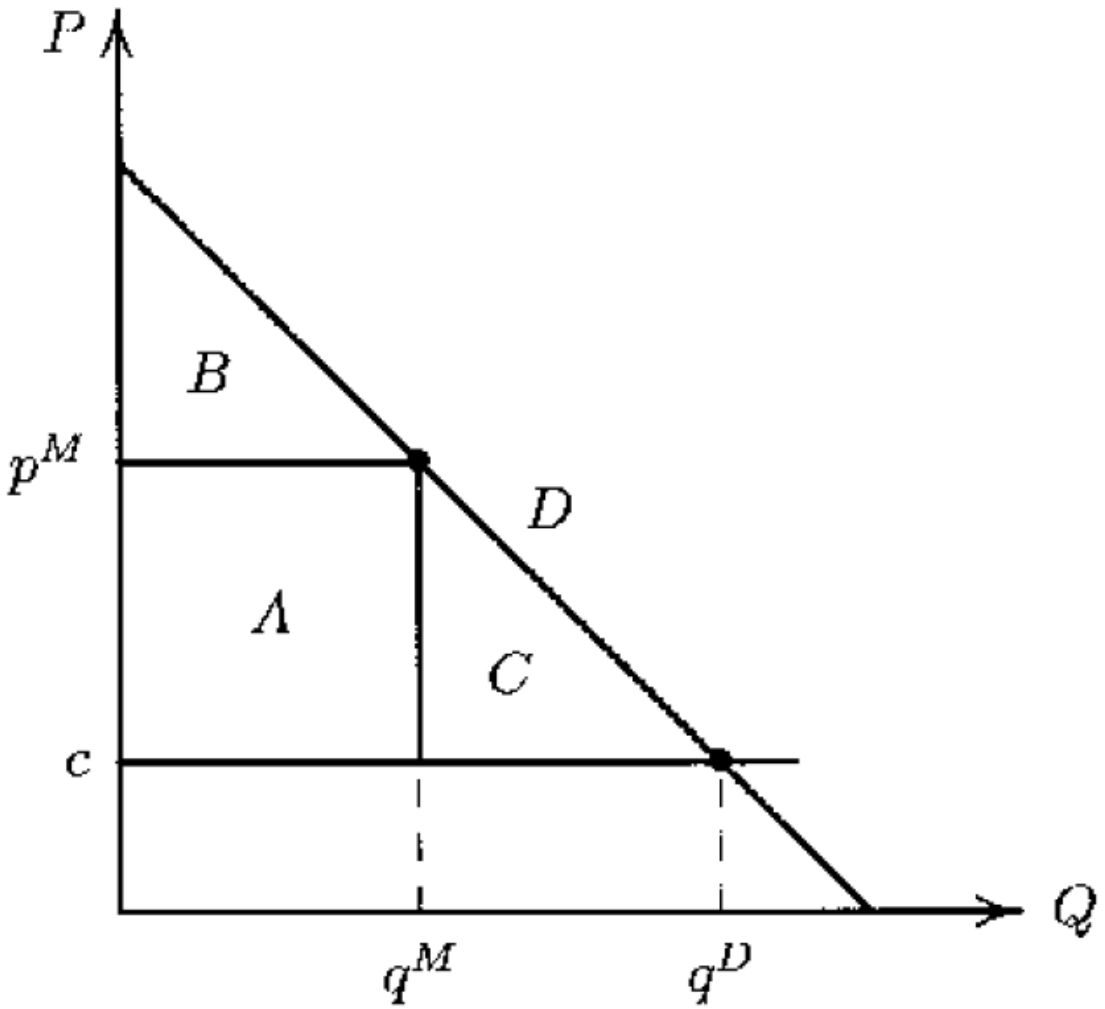
"The monopolist extracts most, but not all the consumer surplus. It is not socially efficient."

You can use graphic support.

In which situations we obtain social efficiency?

Answer 2.1

One possible way to answer by drawing a graph as follows:



Answer 2.1 - cont.

The area B is the consumer surplus under monopoly. This surplus is much smaller then the case of perfect competition, where the consumer surplus would be the whole area between the demand curve D and the marginal cost c. The monopolist extracts part of this surplus by converting it into profits (the area A).
This is not socially efficient, because there is a dead weight loss equal to the area C. In fact there would be more transactions to make that would both generate profits and consumer surplus, but do not take place, because profit maximization under monopoly implies under-production (with respect to the case of perfect competition).
Finally, we see that there is still some consumer surplus, because few consumers are willing to pay more than the monopoly price, so this area is not zero.

Answer 2.2

We observed that it is possible to obtain social efficiency (it is socially efficient when there is no dead-weight loss) in two cases

- perfect competition
- two-part tariffs

In the first case the profits are zero, so consumer surplus is maximum.
In the second case, the firm extracts ALL the surplus, so profits are maximum.
Remember: social efficiency is not about how things are shared between firms and consumers, but whether or not there is a loss for the society as a whole.

Question 3

The ascending price auction is strategically equivalent to a sealed second price auction. Why?

Answer 3

The outcome of the ascending price auction is that the buyer with the highest valuation of the good wins the auction, and he/she will pay an amount equal to the second-highest valuation.
The outcome of a second price auction is identical.
In these auctions, the best thing to do for buyers is to bid an amount exactly equal to their valuation, and hope that they will be those with the highest valuation to win the auction.
In this sense, these two types of auctions are inducing the buyers to be truthful about their valuation, because there would be no interest for the buyers to bid anything lower than their valuation (they risk of losing the auction to someone with a lower valuation then theirs), nor anything higher (they risk to win the auction paying a price higher than their valuation, which would be a loss!)

Question 4

- Show graphically or using your words the implications of two-part tariffs.

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- Show graphically or using your words the implications of two-part tariffs.
- There are two types A and B of consumers: one category (A) has greater surplus than B users from the same quantity of the good. What is the best thing to do for the firm? (BONUS) Why?

Answer 4.1

Optimal two-part tariffs imply that the subscription fee is set equal to the MAXIMUM consumer surplus (i.e. the consumer surplus that would be obtained under perfect competition), and the price that depend on the quantity consumed set equal to the marginal cost. By doing so, the firm is able to extract ALL the consumer surplus and obtain greater profit than in monopoly pricing. Moreover, optimal two part-tariff imply that there is no dead-weight loss, so the outcome is socially efficient. However, there is an imbalance, because consumers have zero surplus, and all the surplus is in the firm's hands.

Answer 4.2

The best thing to do for the firm is to set two two-part tariffs. In fact, we know that by setting one two part tariff, the firm would make greater profits than the case with no price-discrimination. So one two-part tariff is better than uniform pricing (uniform pricing is: same price per unit for all consumers, no subscription fees). However, setting one two-part tariffs not advisable because:

- if the fee is set according to the users of type A, the firm extracts all the surplus of A users, but no B user would buy the subscription (the subscription fee is set to a value greater than their consumer surplus under perfect competition).
- if the fee is set according to the users of type B, both B and A users buy the product, but the A users retain consumer surplus (they get the subscription plan for less than they are willing to pay)

The optimal two part-tariff is such that A consumers buy plan A, and consumers B buy plan B (incentive compatibility), and at the same time the firm wants to make sure that both A and B actually buy the plan (participation constraint).

Question 5

- What are the main similarities and differences between the Cournot model and the Bertrand model?

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- What are the main similarities and differences between the Cournot model and the Bertrand model?
- We referred to the *Bertrand trap* as the situation where firms, when competing on prices, make zero profits despite the fact that they operate in oligopoly. What are the conditions that allow firms not to be in this trap?

Answer 5.1

The Cournot model applies when firms cannot easily adjust quantities, and so they have to decide the optimal quantity. In the Bertrand model firms can adjust easily the quantity, and so they compete on prices. Both are models of oligopolistic competition. Further differences are in the outcomes: in the Cournot model all firms make positive profit, and they share the market by producing a positive quantity. In Bertrand, firms actually make zero profits (as in perfect competition!), because the equilibrium price is equal to marginal cost.

Answer 5.2

Firms can escape the Bertrand trap by:

- colluding
- if suddenly there are capacity constraints (i.e. they cannot adjust the quantity at ease), and the model of reference becomes Cournot
- by differentiating their product: Hotelling model, where we interpret locations as product differentiation.

Question 6

- Under which conditions collusion can be sustained?

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- Under which conditions collusion can be sustained?
- How can price wars be sustained in a collusive agreement?

Answer 6.1

The conditions necessary to sustain collusion are: i) repeated competition. we need a dynamic environment for the firm to "cooperate" and set a price higher than the Bertrand price. ii) firms need to be patient enough. If firms are impatient (low discount factor), the profit deriving from a deviation (which are equal to the monopoly profits for one period, and 0 profits for the future because we are back in Bertrand) are higher, and therefore more attractive. When this happens it is more likely that one firm breaks the deal and ends the collusive agreement. On the other hand, if firms are patient, the stream of profits deriving from the agreement are higher than the profits deriving from one deviation, so collusion can be sustained.

Answer 6.2

Price wars occur when action of competitors are not observable.
When a firm observes a reduction in revenues, they cannot distinguish between a negative shock in demand and a price cut from the competitor (because they cannot observe it).
In such cases, the best thing to do is to lower the price temporarily (the price war) and get back to collusion prices after a while.
In fact if it is a demand shock, it will be absorbed in the future, and if it was a deviation from an opponent, the firm is still able to punish them by reducing their price.
The key is that no firm will ever know if it was indeed a demand shock or a deviation, so price wars are sustained in a collusive agreement.