Analysis of the competitive environment

1) Seller concentration measures

Introduction

Key elements of the industry structure, affecting a firm's competition context, are:

- a) Seller concentration
- b) Barriers to entry
- c) Degree of product differentiation

Seller concentration

- It refers to the number and size distribution of firms.
- It is the most widely used indicators of industry structure.





Market definition

Before measuring the concentration it is necessary to identify the **market**:

- "the entire territory of which parts are so united by the relations of unrestricted commerce that prices there take the same level throughout, with ease and rapidity" (Cournot, 1938)
- an area in which "prices of the same goods tend to equality with due allowance for transportation costs" (Marshall, 1920)

We can have a **product** and a **geographic** definition of the market.

Product market definition

• A market includes all products that are **close substitutes** for one another, both in consumption (ex. Coke and Pepsi) and in production (ex. corn or soybeans).



Are these close substitutes?





Are these close substitutes?





Are these close substitutes?



Substitution measurement

The degree of substitution in consumption is measured using the cross-price elasticity of demand (CED)

$$CED = \left(\frac{\Delta Q_1}{\Delta p_2}\right) \times \left(\frac{p_2}{Q_1}\right) \qquad \frac{\Delta Q_1}{Q_1} / \frac{\Delta p_2}{p_2}$$

• The degree of substitution in **production** is measured using the cross-price elasticity of supply (CES)

$$\text{CES} = \left(\frac{\Delta Q_1^{S}}{\Delta P_2}\right) \times \left(\frac{P_2}{Q_1^{S}}\right)$$

Examples

$\frac{\Delta Q_1}{Q_1} / \frac{\Delta p_2}{p_2}$

CED (CROSS ELASTICITY OF DEMAND)

$p_{bread} = 10$	$q_{bread} = 100$
p _{nutella} =20	$q_{nutella} = 50$
p _{crackers} = 15	$q_{crackers} = 70$

There is an increase in the price of bread, which passes from 10 to 13

$p_{bread} = 13$	$q_{bread} = 80$
p _{nutella} =20	$q_{nutella} = 45$
p _{crackers} = 15	$q_{crackers} = 91$

 $CED_{bread,nutella} = (45-50):50 / (13-10):10 = -0.1/0.3 = -0.33 (COMPLEMENTS)$

 $CED_{bread,crackers} = (91-70): 70 / (13-10):10 = 0.3/0.3 = 1 (SUBSTITUTES)$

If CED is large and positive the two goods are **close substitute in consumption**, if large and negative, they are **close complements**.

Examples

CES (CROSS ELASTICITY OF SUPPLY) $p_{tractors} = 1000$ $q^{D}_{tractors_firm_A} = 100$ $q^{S}_{cars_firm_B} = 50$ $q^{S}_{tractors_firm_B} = 1$

$$\frac{\Delta Q_1}{Q_1} / \frac{\Delta p_2}{p_2}$$

There is an increase in the price of tractors, which passes from 1000 to 1500

 $p_{tractors} = 1500$ $q^{D}_{tractors_firm_A} = 130$ $q^{S}_{cars_firm_B} = 10$ $q^{S}_{tractors_firm_B} = 30$

 $\label{eq:ces_cars,tractors} \begin{array}{l} \mbox{CES}_{cars,tractors} = (10 - 50):50 \ / \ (1500 - 1000):1000 \ = \ -0.8 / 0.5 = \ -1.6 \\ \mbox{(SUBSTITUTES)} \end{array}$

If CES is large and negative the two goods are **substitute in production**.

Geographic market definition

We are in the same geographic market if an increase in the price of a product in one geographic location significantly affects either the demand or supply (and therefore the price) in another geographic location.

Both definitions depend from the features of the product and from the supply localisation (highway, internet, etc...).

Market boundaries

- Substitution in consumption or production is always a matter of degree, but it is necessary to identify specific boundaries, both in production and in geographic space
- The antitrust authorities use the SSNIP (*small but significant non-transitory increase in price*) test: would an hypothetical monopolist producing good 1 (or located in area X) find it profitable to increase price by between 5 and 10%? If so, good 1 is a market by itself (area X is a geographic market). If not, the market definition should include the related goods 2 and 3 (or other areas).

Measures of seller concentration

Concentration can be measured at two levels:

- 1. Aggregate: for all firms that form part of an economy, located within some specific geographical boundary. It reflects the importance of the largest firms in the <u>economy as a whole (that could have opportunities to exert a disproportionate influence over regulators or politicians).</u>
 - share of the *n* largest firms in the total sales (or assets, employment, etc.)
- 2. Industry or market: reflects the importance of the largest firms in some <u>particular industry/market</u>. This is particularly important because the measures of industry seller concentration may reflect the implications of the number and size distribution of firms for the nature of competition.

Some measures of INDUSTRY seller concentration

- ▶ **n-firm concentration ratio (CR_n)**: share of the n largest firms of the industry in some measure of total industry size (sales, assets, employment).
 - Mostly used with n=3, 4, 5 or 8.
 - It only requires data on the top n firms and the corresponding aggregate industry size.
 - No account taken for the firms outside the top n or for the size distribution within the top n.
- **2. Herfindahl-Hirschman (HH) index**: sum of the squared market shares of all firms in the industry
- **3.** Lorenz curve and Gini coefficient: the <u>Lorenz curve</u> shows the variation in the cumulative size of the n largest firms in an industry, as n varies from 1 to N. The Gini coefficient is:

 $G = \frac{\text{area of the crescent between OBA and OCA}}{\text{area of the triangle ODA}}$

Max G=1 there is one dominant firm, Min G=N-1 whene there are very small firms each with a negligible market share

$\mathbf{G} = \frac{\text{area of the crescent between OBA and OCA}}{1}$

area of the triangle ODA

The Lorenz curve

D A Cumulative size of firms up to firm nB 3/4OD N.B. 1/2**OD** The Gini coefficient C varies from 0 to 1 1/2N0 1 N

Firms $(n = 1 \dots N)$ arranged from largest to smallest

Examples

Sector 1	Sector 2	Secto	Sector 3		
Firms % sales	Firms % sales	Firms	% sales		
1 50%	1 50%	1	50%		
2 25%	2 25%	2	25%		
3 15%	3 IU%	3	1%		
4 10%	5 5%	4	1%		
1 10/0	6 5%	5	1%		
		6	1%		
	$CR_{2} = 50\% + 25\% = 75\%$				
$CR_2 = 50\% + 25\% = 75\%$		26	1%		
HH = 50 ² + 25 ² + 15 ² +	HH = 50 ² + 25 ² + 10 ² +	27	1%		
$10^2 = 3450$	$3^*5^2 = 3300$	CR₂ = 50% + 25% = 75%			
		HH = 50 3100) ² + 25 ² + 25*5 ² =		

=

Serva Italiana INDICI DI CONCENTRAZIONE DI UN SETTORE Esempi di calcolo INDICE DI CONCENTRAZIONE DELLE 4 IMPRESE INDUSTRIA DELLE LAMPADINE TINDUSTRIA DELLE LAMPADINE



Interpretation of concentration measures

Some caution is needed while interpreting the results of concentration measurements:

- a) Choice of appropriate industry definition: all substitute products have to be included. With tight limits, almost any firm could be considered as a monopolist.
- b) **Definition of market boundaries**: of course, local concentration measures are higher than national or international ones.
- c) **Treatment of imports and exports**: by excluding imported goods (or including exported goods) from the calculation of a concentration measure for an industry in the national economy, measured concentration might either overstate or understate the importance of the largest firm.
- Multi-product operations: many larger firms sell goods or services across a wide range of separate markets, while firms are classified according to their main product.

Same product? The «cellophane fallacy»



United Stated Supreme Courte sentence, United States v. E.I. DuPont de Nemours and Co., 351 US 377 (1956)

The United States Supreme Court failed to detect the du Pont market power because it gave an overly broad definition to the relevant market, considering paper packaging as substitute of plastic wrapping. In reality du Pont held a virtual monopoly on cellophane.





Same territory = same market?









UK (CR₅) 2004:

- Sugar: 99%
- Tobacco products: 99%
- Gas distribution: 82%
- Oils and fats: 88%
- Confectionery: 81%
- Man-made fibres: 79%
- Coal extraction: 79%
- Soft drinks and mineral waters: 75%
- Pesticides: 75%
- Weapons and ammunitions: 77%

UK industries with the lowest CR_{5:}

- Metal forging, pressing etc.: 4%
- Plastic products: 4%
- Furniture: 5%
- Construction: 5%
- Structural metal products: 6%
- Wholesale distributions: 6%
- General purpose machinery: 8%
- Wood and wood products: 9%

		1958	1963	<u>1967</u>	1972	1974	1975	1976	1977
Asset S	ize Group								
Тор	50	35.5%	35.9%	36.2%	34.5%	35.6%	35.7%	36.1%	35.7%
Тор	100	45.5	46.0	47.0	45.3	46.1	46.0	46.1	45.6
Тор	150	50.9	52.0	53.6	52.0	52.9	52.7	52.7	52.2
Top	200	54.8	56.1	58.3	56.5	57.6	57.3	57.3	56.6

TABLE 2.--Concentration in Assets for the Manufacturing Sector

Sources: Bureau of Economics, based on data from Compustat, Moody's Industrial Manual, and Internal Revenue Service Service Statistics of Income.

Table 2. Share of Value of Shipments Accounted for by the 4, 8, 20, and 50 Largest Companies in Each of the 3-, 4-, 5-, and 6-Digit NAICS Industries: 1997

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

NACIS	Industry group and industry			Percent of value of shipments accounted for by the-				Herfindahl- Herschmann
code		Companies ¹	Value of shipments ² (\$1000)	4 largest companies	8 largest companies	20 largest companies	50 largest companies	index for 50 largest companies ³
311	Food mfg	21 958	421 737 017	14.3	22.0	34.8	50.8	91.0
3111 31111 311111 311111 311119	Animal food mfg Animal food mfg Dog & cat food mfg Other animal food mfg	1 077 1 077 129 962	27 732 347 27 732 347 8 688 239 19 044 108	23.1 23.1 58.4 23.7	34.7 34.7 80.2 36.3	56.1 56.1 92.4 54.5	73.1 73.1 98.3 71.2	238.8 238.8 1 266.5 240.6
3112 31121 311211 311212 311212 311213	Grain & oilseed milling. Flour milling & malt mfg. Flour milling Rice milling Malt mfg.	534 324 254 56 19	52 075 763 11 141 876 8 001 978 2 364 582 775 316	45.3 38.7 48.4 51.8 69.0	59.1 51.8 62.5 75.3 94.5	77.1 71.4 79.2 92.5 100.0	89.1 89.2 93.4 99.8 N	711.4 485.7 699.6 894.2 1 458.7
31122 311221 311222 311223 311223 311225	Starch & vegetable fats & oils mfg Wet corn milling Soybean processing Other oilseed processing Fats & oils refining & blending	179 30 43 32 91	31 835 054 8 455 172 14 036 271 1 720 738 7 622 873	57.7 71.7 79.6 66.6 36.7	73.0 90.3 94.5 81.9 63.0	88.3 99.8 99.5 98.9 89.5	96.9 100.0 100.0 100.0 98.8	1 213.5 1 507.4 2 035.4 2 149.2 602.8
31123 311230	Breakfast cereal mfg Breakfast cereal mfg	48 48	9 098 833 9 098 833	82.9 82.9	93.5 93.5	99.2 99.2	100.0 100.0	2 445.9 2 445.9
3113 31131 311311 311312 311312 311313	Sugar & confectionery product mfg Sugar mfg Sugarcane mills Cane sugar refining Beet sugar mfg.	1 556 49 34 12 8	24 114 454 7 399 171 1 457 482 3 209 186 2 732 503	41.9 64.4 56.6 98.7 85.0	56.4 84.0 71.4 99.9 100.0	75.0 95.9 94.3 100.0 N	86.3 100.0 100.0 N N	580.3 1 452.2 1 158.7 D 1 997.6
31132 311320	Chocolate & confectionery mfg from cacao beans Chocolate & confectionery mfg from cacao beans	152	3 755 268	79.5 79.5	92.5	97.6 97.6	99.0 99.0	2 567.1
31133 311330	Confectionery mfg from purchased chocolate Confectionery mfg from purchased chocolate	796 796	7 879 752 7 879 752	65.2 65.2	75.3 75.3	84.2 84.2	92.0	1 600.6 1 600.6
31134 311340	Nonchocolate confectionery mfg	578 578	5 080 263 5 080 263	40.7 40.7	60.1 60.1	78.0 78.0	91.0 91.0	623.0 623.0
3114 31141 311411 311412	Fruit & vegetable preserving & specialty food mfg Frozen food mfg Frozen fruit, juice, & vegetable mfg Frozen specialty food mfg	1 394 531 177 363	46 618 107 19 691 664 9 549 256 10 142 408	26.6 31.3 34.3 40.2	35.6 44.6 47.4 56.9	51.8 62.8 70.6 74.9	69.2 79.8 90.5 88.6	253.3 349.5 443.7 530.5
31142 311421 311422 311423	Fruit & vegetable canning, pickling, & drying Fruit & vegetable canning Specialty canning Dried & dehydrated food mfg	887 661 122 125	26 926 443 15 801 279 8 051 059 3 074 105	27.9 24.9 67.2 30.3	39.3 38.0 83.5 51.1	58.3 59.7 96.1 80.2	76.7 77.1 99.5 96.9	342.0 259.3 2 165.1 440.8
3115 31151 311511 311512 311513 311513 311514	Dairy product mfg . Dairy product (except frozen) mfg . Filuid milk mfg . Creamery butter mfg . Cheese mfg . Dry, condensed, & evaporated dairy product	1 329 948 402 32 399	58 670 293 52 812 384 21 995 148 1 367 548 20 232 146	16.5 18.1 21.3 52.4 34.6	26.0 28.4 31.0 73.2 50.9	45.4 48.6 50.5 97.3 70.6	64.2 66.7 72.2 100.0 85.1	147.0 169.8 204.6 889.8 524.6
01150	mig	169	9 217 542	47.1	58.6	78.1	94.0	816.9
311520	ice cream & trozen dessert mtg ice cream & frozen dessert mfg	409 409	5 857 909 5 857 909	32.3 32.3	48.7 48.7	71.1 71.1	88.3 88.3	444.7 444.7
3116 31161 311611 311612 311612 311613 311615	Meat product mfg . Animal slaughtering & processing . Animal (except poultry) slaughtering . Meat processed from carcasses . Rendering & meat byproduct processing . Poultry processing .	2 794 2 794 1 307 1 163 137 257	112 979 006 112 979 006 54 284 253 24 260 511 2 556 547 31 877 695	35.0 35.0 57.0 20.4 37.4 40.6	47.5 47.5 70.8 30.3 54.1 54.0	61.3 61.3 81.5 45.0 75.5 72.6	72.1 72.1 89.7 62.0 92.6 90.0	392.6 392.6 1 069.1 171.6 569.4 667.7

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The determinants of seller concentration

- 1) Economies of scale
- 2) Barriers to entry
- 3) Sunk cost expenditures
- 4) Regulation
- 5) Distinctive capabilities and core competences
- 6) Industry life cycle



Analysis of the competitive environment

2) Barriers to entry and exit

Key elements of an industrial structure affecting a firm's competition context:

- a) Seller concentration
- **b)** Barriers to entry
- c) Product differentiation

Barriers to entry: definition

- Conditions that allow established firms or incumbents to earn abnormal profits without attracting entry (Bain, 1956);
- A cost of producing (at some or every rate of output) which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry (Stigler, 1968);
- Any competitive advantage that established firms have over potential entrants (Spulber, 2003).

They can be:

- a) Linked to product or technology characteristics
- b) Legal
- c) Strategic

a) Barriers to entry linked to product or technology

1. Economies of scale

- a) The nature of technology may be such that firms must claim a large market share in order to produce at the MES (natural monopoly);
- b) The penalty for producing below the MES can be very high



a) Barriers to entry linked to product or technology (cont.)

2. Absolute cost advantage

This could happen because:

- a) Incumbent may have access to a superior production process, hold patents or be party to trade secrets;
- b) Incumbents may have exclusive ownership of factor inputs forcing entrants to rely on more expensive, less efficient or lower-quality alternatives;
- c) Incumbents may have access to cheaper sources of finance:
- d) Vertically integrated incumbent may force an entrant to operate at more than one stage of production to overcome incumbents' cost advantage.



a) Barriers to entry linked to product or technology (cont.)

- 3. **Product differentiation**: customers are loyal to the established brands. To overcome existing brand loyalties or customer inertia high advertising costs are required to entrants;
- 4. Switching costs: faced by customers deciding to change the supplier of a good/service (search and how-to-use costs). Further switching costs arise when a good/service is tied to an aftermarket (refills/components): bargain-then-ripoff pricing.
- 5. Network externalities: the value of a product/service to a consumer depends upon the number of other consumers using the same product/service. When an incumbent has already established a wide user network, entry is more difficult. Success in establishing a network depends on users' expectations as to which network will achieve dominance.
- 6. **Geographic barriers**: physical (frontier control), technical (technical standards), fiscal (tariffs), preferential public procurement policies, language and cultural barriers.

b) Legal barriers

Erected by the government and enforced by law.

- registration, certification and licensing of businesses and products (ex. official permission to trade);
- Monopoly rights;
- Patents;
- Government patents.

c) Strategic barriers: barriers to exit

Intentionally planned and implemented actions aimed at excluding or making it more difficult for entrants to access the market.

The aggressiveness of incumbents depends on the existence of **exit barriers**, i.e. high costs that incumbent firms have to face in order to exit the market. The main exit barriers are:

- **Sunk costs**: highly specialised machinery that are difficult to transfer;
- High **fixed exit costs** (ex. Labour costs);
- **Strategic interdependence** with other activities;
- Emotional barriers;
- Political and social barriers.

The presence of exit barriers can be considered a <u>typology of entry</u> <u>barrier</u>, because they induce incumbents to be more aggressive.



c) Strategic barriers: barriers to exit

The main strategic barriers are the following:

- a) Limit pricing: the incumbent might try to prevent entry by charging a limit price, i.e. the highest price the incumbent believes it can charge without inviting entry (lower than monopoly price, above incumbent's average cost: abnormal profit). It is effective only if the incumbent enjoys some form of cost advantage over the potential entrants.
- **b)** <u>Predatory pricing:</u> incumbents cut prices in an attempt to force a rival firm out of business. When this happens, the incumbent raises its price (the boundary between illegal anti-competitive practice and legitimate strategy is very fuzzy).
- c) <u>Brand proliferation</u>: the incumbent crowds the market with similar brands in order to deny an entrant the opportunity to establish a distinctive identity for its own brand (risk: cannibalisation). Similar strategies: loyalty discounts, exclusive dealing and refusal to supply.

Limit pricing

The highest price the incumbent believes it can charge without inviting entry: lower than monopoly price, above incumbent's average cost: abnormal profit. It is effective only if the incumbent enjoys some form of **cost advantage** over the potential entrants.



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It is effective only if the incumbent enjoys some form of **cost advantage** over the potential entrants.



"I became confused after realizing that we only sold our products up to a certain price, but my boss explained that we could produce them cheaper than anyone else and could control the market in the long term through <u>limit pricing</u>."

Wal-Mart Charged With Predatory Pricing

Stacy Mitchell 0 Comments Nov 1, 2000

In September, Wal-Mart was hit with three separate charges of predatory pricing. Government officials in Wisconsin and Germany accused the retailer of pricing goods below cost with an intent to drive competitors out of the market. In Oklahoma, Wal-Mart faces a private lawsuit alleging similar illegal pricing practices.

The Wisconsin Department of Agriculture, Trade and Consumer Protection filed a complaint with an administrative law judge accusing the retailer of violating the state's antitrust law. The complaint savs Wal-Mart sold butter, milk, laundry detergent, and other staple goods below cost in stores in Beloit, Oshkosh, Racine, Tomah, and West Bend. The company intended to force other stores out of business, gain a monopoly in local markets, and ultimately recoup its losses through higher prices.

State officials filed the complaint after Wal-Mart failed to take corrective action following several warning letters sent as early as 1993. The administrative law judge will review the charges and recommend further action to the department's secretary. The complaint carries a total of 352 violations, each of which could incur a fine of \$500.

In Germany, Wal-Mart was charged with similar predatory tactics. The federal Cartel Office accused Wal-Mart and two other large supermarket chains of selling goods below cost and ordered the companies to raise prices immediately. Wal-Mart could face fines of DM1 million (\$434,000) if it fails to comply.

The items in question include about a dozen staple products like milk and vegetable oil. A common Wal-Mart strategy is to price such staples, known as "corner products," very low. Corner products are items for which consumers know the going price. By setting prices on these items very low, Wal-Mart creates an overall impression of having very low prices, when in fact much of its merchandise may not be such a good deal.

German law prohibits below cost pricing, because of its impact on small businesses. In this case, authorities feared a price war among the country's three largest food retailers would decimate independent shops, ultimately leaving consumers with fewer options and higher prices. "The material benefit [of below cost pricing] to consumers is marginal and temporary, but the restriction of competition by placing unfair obstacles before medium-sized retailers is clear and lasting." said the Cartel Office.

Microsoft accused of predatory pricing of security software

The <u>SunBelt security blog</u> has accused Microsoft of "predatory pricing" which it defines from Wikipedia: "the practice of a dominant firm selling a product at a loss in order to drive some or all competitors out of the market, or create a barrier to entry into the market for potential new competitors."

The first problem is that Microsoft OneCare costs \$49.95 for three PCs, versus Symantec and McAfee. "Both of these companies have AV products that retail for <u>\$39.99," says Sunbelt, "but they also have three-user offerings, at \$69.99</u> (McAfee) and \$89.99 (Symantec). Incredibly, Microsoft has priced themselves <u>almost 50% below the market leader, and no one has said a peep." Second is</u> Antigen, which competes with Trend ScanMail for <u>Microsoft</u> Exchange, Symantec Mail Security for Exchange and McAfee GroupShield. Miicrosoft is 53% to 63% cheaper over two years. The ready-to-eat (RTE) breakfast cereal industry provides an excellent illustration of the basic principles of brand proliferation.²¹ Despite relatively low production scale economies, the industry has been highly concentrated and has earned high profits. The minimum efficient firm size is estimated to be between 3% and 5% of market. Yet the market share of each of the largest firms exceeds 15%, and the industry has experienced relatively little entry.

According to the Federal Trade Commission (FTC), a key strategy used to forestall entry in the RTE cereal industry has been brand proliferation. In 1972, a formal complaint was filed against the four largest manufacturers: Kellogg, General Mills, General Foods, and Quaker Oats. The complaint charged that these firms behaved as a shared monopoly and that their "practices of proliferating brands, differentiating similar products, and promoting trademarks through intensive advertising resulted in high barriers to entry into the RTE cereal market."

- 1950-1960: 23 new brands;
- 1961-70: **41** new brands;
- 2000-2010: **77** new brands.



Source: Tremblay V.J. and Tremblay C.H., *New perspectives on industrial organization*, Springer, 2012

BARRIERS TO EXIT Low High Low Low and stable profitability High Low and stable profitability Low and risky profitability High High and stable profitability Low and risky profitability

<u>Barriers to entry</u> impact on the **profit** level: if high, they allow incumbents to earn abnormal profits. <u>Barriers to exit</u> impact on **riskiness**: if high, they force incumbents to stay and may determine a persistent situation of losses or low profits.

Market structure and market contestability

Barriers to entry vary across time for type and size. They have an impact on **market contestability**

1 seller = monopoly?

100 sellers = perfect competition?

Summary

Analysis of the competitive environment

- 1. Seller concentration
 - Definition on market
 - Substitution measures
 - Market boundaries
 - Measures
 - Determinants
- 2. Barriers to entry and exit
 - entry
 - Definition
 - Typologies
 - Exit

Reading list - Chapters 9, 10 (exl. 10.3, 10.4), 11 (exl. 11.4, 11.7), Lipczynski et al., 2013