UCEMA – MBA – 2010
COMPETITIVE STRATEGY AND MARKET REGULATION

Problem Set

1. Monopoly and dominant position

1.1. Monopoly

A firm that produces a single good (Q) is the only supplier of such good in certain market. Its demand function has the following form:

$Q = 120 – P$;

where "P" is the market price. The firm's total cost is given by this function:

$TC = 30·Q + 0,25·Q^2$.

a) Find the value of "Q" that maximizes the firm's profit. Find as well the equilibrium price, the profit and the consumers' surplus (Remember that in this case the marginal revenue is "$120 – 2·Q$" and the marginal cost is "$30 + 0,5·Q$").
b) Find the profit margin with respect to the marginal cost [(p-Cmg)/p] that this monopolists obtains, and show its relationship with the own-price elasticity of demand.
c) Which would be the quantity, the price the firm's profit and the consumers' surplus if the firm behaved as a price-taker?

1.2. Price leadership

In the market of a certain good there are two firms: a leader (EL) and a follower (EF). They both have an average and marginal cost for supplying the product which is equal to $10, but the follower has a maximum installed capacity of 10 units (that uses completely) and the leader, conversely, has an installed capacity that is larger than the market's total demand. Such a demand is the following:

$Q = 100 – P$;

where "P" is the price and "Q" is the total demanded quantity (which has to be equal to the sum of the quantities supplied by EL and EF).
a) Find the equilibrium values for P and Q, knowing that the leader's demand is equal to "$QL = 100 – QF – P$" (where "QL" is the leader's quantity and "QF" is the follower's quantity), and therefore the leader's marginal revenue is "$MR_L = 100 – QF – 2·QL$". Also find the leader's and the follower's profits (BL, BF).
b) Now assume that the leader acquires the follower, and becomes a monopolist (which implies that his demand is now equal to the market's total demand, and his marginal revenue becomes "$MR_L = 100 – 2·Q$"). Find the new values for P, Q and BL.

2. Competition and oligopoly

2.1. Symmetric oligopoly

The market of certain homogeneous good (Q) is an oligopoly with two identical firms (1 and 2), each of which with a constant average cost of $2. The demand price function of that good is “$p = 14 - Q_1 - Q_2$”. Assume that each firm has only three possible production levels: 3, 4 or 6 units of output, and therefore the market prices for the 9 possible combinations of “Q_1” and “Q_2” are the following:

Price	$Q_2 = 3$	$Q_2 = 4$	$Q_2 = 6$
$Q_1 = 3$	8	7	5
$Q_1 = 4$	7	6	4
$Q_1 = 6$	5	4	2

a) Analyze the interaction of these two firms as non-cooperative game, and write the corresponding payoff matrix.
b) Find the best response of each player to each action of the other player, and find the unique Nash equilibrium (in pure strategies) of the static version of this game.
c) Now assume that firm 1 acts as a quantity leader, and therefore decides its production level first. Find the subgame perfect Nash equilibrium (Stackelberg equilibrium) of this new version of the game, and draw the corresponding “tree diagram”.

2.2. Asymmetric oligopoly

The market of a homogeneous good (Q) is supplied by two different firms. One is larger and has higher fixed costs but lower variable costs. The other one is smaller and has lower fixed costs but its variables costs are higher. The demand price (p) is a function of total quantity, defined as the sum of the output supplied by the large firm (Q_L) and the output supplied by the small firm (Q_S). The corresponding demand and total cost functions are the following:

$p = 192 - (Q_L + Q_S)$; $CT_L = 1000 + Q_L^2$; $CT_S = 500 + 2 \cdot Q_S^2$.

a) Find the equilibrium price and quantities, assuming that each firm maximizes its own profit taking into account the other firm’s output (Cournot solution). Remember that the large firm’s marginal revenue is “$MR_L = 192 - 2 \cdot Q_L - Q_S$”, that the small firm’s marginal revenue is “$MR_S = 192 - 2 \cdot Q_S - Q_L$”, that the large firm’s marginal cost is “$MC_L = 2 \cdot Q_L$”, and that the small firm’s marginal cost is “$MC_S = 4 \cdot Q_S$”.
b) How would those equilibrium values change if the large firm behaved as a price leader and the small firm were a price-taker?

3. Horizontal and vertical agreements

3.1. Collusion and deviation

In a certain market there are two firms (1 and 2). The market’s demand function and the firms’ total cost function are, respectively:

$P = 150 - Q$; $TC_i = 30 \cdot q_i$;

where “P” is the price, “Q” is the total traded quantity and “q_i” is the quantity produced and sold by each individual firm.
a) Show that if both firms collude to maximize their joint profits, the price that maximizes those profits is “$P = 90$”. Find the amount of those profits, assuming that each firm captures half of the total profits, and remembering that in this case the marginal revenue of each firm is equal to “$150 - 2 \cdot (q_1+q_2)$”.

b) Which would be firm 1's profit if it lowered the price to "P = 89" and captured the whole market?
c) Now calculate the profits of both firms in a competitive situation in which price is equal to marginal cost.
d) Which would be the minimum weighting factor of future profits (β) for which a price agreement between firms 1 and 2 were sustainable? Assume that such agreement generates permanent profits equal to the ones found in part "a" and deviating from the agreement implies obtaining a present profit equal to the one found in part "b" (but it also implies reverting in the future to a situation like the one described in part "c").

3.2. Resale price maintenance

The market of good Q is supplied by a single producer (firm A), whose average and marginal cost is constant and equal to \$40. That firm sells its product to a single retailer (firm B) at a price of "r" per unit. The retailer, in turn, sells the product to consumers at a price of "p" per unit, and the demand function of consumers is the following:

$$Q = 100 - p \quad .$$

Firm B does not have any other variable costs but the ones that come from buying the product to firm A, and its fixed costs are equal to \$75.
a) Analyze the equilibrium of this market as a situation in which firm A decides first the value of "r", firm B decides afterwards the value of "p" (taking "r" as given), and each of them seeks to maximize its own profit. Find the values of "r", "p" and "Q", and both firms' profits. Remember that the marginal revenue of firm B is "$MR_B = 100 - 2.Q$", and the marginal revenue of firm A is "$MR_A = 100 - 4.Q$".
b) Now assume that firms A and B merge, and that as a consequence they integrate vertically. Show that when the new integrated firm maximizes profits, "p" becomes smaller and "Q" becomes larger in comparison with the values found in part "a".
c) Imagine now that both firms remain separate, but that firm A decides both "r" and "p" (resale price maintenance). If "p" were the same value found in part "b", which value of "r" would leave firm B with the same profit than it had in part "a"?

4. Exclusionary practices

4.1. Entry deterrence

The market for certain good has the following demand function:

$$Q = 100 - P \quad .$$

Currently there exists a single incumbent firm (I) in that market, whose total cost function is:

$$TC_I = 40 \cdot Q_I \quad .$$

Out of the market, there is a potential competitor (C), who would have the following total cost function if he entered the market:

$$TC_C = 40 \cdot Q_C + 150 \quad .$$

a) Find the market equilibrium in the initial moment, in which the incumbent acts as a monopolist. Find the profits of that firm, remembering that its marginal cost is equal to \$40 and that its marginal revenue, when acting as a monopolist, is "$MR_I = 100 – 2·Q$".
b) Now assume that the potential competitor enters the market, and suppose that the market becomes a Cournot oligopoly. Find the new equilibrium and the profits of both firms, remembering that now the marginal revenue of each firm is "$MR_i = 100 – 2·Q_i – Q_j$", and that they both have a marginal cost equal to \$40.
c) Now suppose that the incumbent firm can make an investment aimed at deterring the potential competitor's entry. Such investment reduces its own profit in \$300, but it also lowers the competitor's profit in \$300 (if he decides to enter the market). Represent the situation as a sequential game in which the incumbent first decides whether to invest or not to invest, and the potential competitor then decides whether to enter or not the market. Find the corresponding subgame perfect Nash equilibrium.
d) Now redo the previous part, assuming that the investment reduces the incumbent's profit in \$100 and lowers the potential competitor's profit in \$200.

4.2. Deterrence and collusion

The demand price function of certain good is "$P = 80 – Q$" and, therefore, the marginal revenue function of a firm that monopolized the market for that good would be equal to "$MR = 80 – 2·Q$". Currently there is a single firm (I) operating in that market, whose total cost function is "$TC_I = 100 + 20·Q_I$". Out of the market there is another firm (C) that is evaluating the possibility of entering the market. If it did that, it would have a total cost function equal to "$TC_C = 300 + 20·Q_C$".
a) Find the equilibrium values of "P" and "Q" when I is the only firm in the market, and the profit that it obtains in such situation (remembering that its marginal cost is equal to \$20).
b) Now assume that, if C enters the market, "P" reduces to \$30, and both I and C capture a 50% market share each. Would it be profitable for I to make any kind of entry-deterring expenditure?
c) Now suppose that, if C enters the market, "P" remains in the same value that it had in part "a" (perfect collusion solution), and both I and C capture a 50% market share each. Could it now be possible that I found profitable to make an entry-deterring investment? How much should C's profit diminish so that deterrence was effective? How large should the investment be so that deterrence was profitable for I?

5. Price discrimination

5.1. Third-degree price discrimination

A monopolist supplies two markets (1 and 2), whose demand functions are the following:

$Q_1 = 80 – P_1$; $Q_2 = 100 – P_2$.

Its average and marginal cost is equal to \$20. Given that, you should:
a) Find the values for P_1, P_2, Q_1 and Q_2 that maximize this monopolist's profit, supposing that it can practice third-degree price discrimination (and remembering that its marginal revenue functions are respectively equal to "$MR_1 = 80 – 2·Q_1$" and "$MR_2 =$

$100 – 2 \cdot Q_2$”).

b) Now assume that the monopolist cannot discriminate between the two markets and must charge a single price “P”. Which values of P, Q_1 and Q_2 maximize its profits? (Remember that its total demand now becomes “$Q_1+Q_2 = Q = 180 – 2 \cdot P$”, and that its marginal revenue becomes “$MR = 90 – Q$”).

c) How smaller is now the monopolist’s profit because of moving from the solution of part “a” to the solution of part “b”? What happened with total surplus and with the surpluses of each of the groups of consumers?

5.2. Two-part tariffs and voluntary market segmentation

A monopolist supplies two markets (1 and 2). In each of them, consumers are identical and have the following supluses:

$CS_1 = 120 \cdot Q_1 – 0,5 \cdot Q_1^2 – T_1$; $CS_2 = 100 \cdot Q_2 – 0,5 \cdot Q_2^2 – T_2$;

where “T_1” and “T_2” are the total amounts of money that consumers pay for buying “Q_1” and “Q_2”. Average and marginal costs of the monopolist are constant an equal to $10.

a) Find the values of “T_1”, “T_2”, “Q_1” and “Q_2” that maximize the monopolist’s profits if it can perfectly discriminate among its customers. Remember that their implicit demand price functions are “$p_1 = 120 – Q_1$” and “$p_2 = 100 – Q_2$”.

b) Show that, if they can choose, market 1’s consumers will prefer to pay “T_2” and to consume “Q_2” rather than to pay “T_1” and to consume “Q_1”.

c) Now compare these two alternative schemes:

Scheme 1: “$T_1 = 5349$”, “$Q_1 = 110$”, “$T_2 = 4950$”, “$Q_2 = 90$”;

Scheme 2: “$T_1 = 5749$”, “$Q_1 = 110$”, “$T_2 = 4550$”, “$Q_2 = 70$”;

and show that in both cases market 1’s consumers prefer “T_1, Q_1” rather than “T_2, Q_2”. Show that these schemes both imply situations in which the monopolist offers quantity discounts, and find the implicit average prices for “Q_1” y “Q_2”. Which of the two schemes is more profitable for the monopolist?

6. Single-equation regression methods

6.1. Structure-conduct-performance

The following data correspond to the US manufacturing industry during the period 1947-1951.

Industry	Profit	C4	Barriers
Automobiles	23,9	90	High
Cigarettes	12,6	90	High
Liquor	18,6	75	High
Typewriters	18,0	79	High
Fountain pens	21,8	57	High
Copper	14,6	92	Moderate
Steel	11,2	45	Moderate
Farm machines	13,4	36	Moderate
Petroleum refining	12,9	37	Moderate
Soap	15,8	79	Moderate
Men’s Shoes	13,4	28	Moderate
Fertilizers	15,4	85	Moderate

Metal containers	10,7	78	Moderate
Canned vegetables	9,8	27	Low
Cement	14,3	30	Low
Flour	10,1	29	Low
Meat packing	5,1	41	Low
Rayon	18,0	78	Low
Women's shoes	11,0	28	Low
Tyres	12,7	77	Low

The corresponding concepts are: Profit = average profit rate on equity (in percentage); C4 = sum of the market shares of the four largest firms (in percentage); Barriers = importance of entry barriers.

a) Estimate an equation that explains profitability as a function of the available structural variables. First include only C4 and a constant, and then add dummy variables corresponding to high and moderate entry barriers. Finally, try a regression in which there only appear a constant, a dummy variable for high entry barriers, and another dummy variable for the observations with "C4 > 50".

b) Analyze the results obtained, and make some comments about the relative importance of supply concentration and entry barriers as determinants of firms' profitability.

6.2. Demand estimations

The following data correspond to the Argentine beer market (2002-2006).

Month	Quantity	Price	Income
200201	126.676	1,4551	87,18
200202	108.092	1,4772	91,29
200203	113.035	1,5161	106,08
200204	77.087	1,5554	121,50
200205	77.262	1,6619	132,21
200206	56.646	1,7861	129,98
200207	67.006	1,8416	135,07
200208	82.528	1,8380	133,98
200209	87.253	1,8604	134,63
200210	119.530	1,8532	135,49
200211	130.206	1,8625	139,98
200212	175.652	1,8561	142,75
200301	145.427	1,8540	127,48
200302	126.985	1,8856	131,19
200303	109.682	1,9591	147,91
200304	86.654	1,9991	155,22
200305	73.824	2,0262	162,22
200306	69.572	2,0428	156,10
200307	79.500	2,0482	158,84
200308	86.908	2,0643	152,99
200309	90.974	2,1657	156,17
200310	121.809	2,2131	158,49
200311	124.043	2,2256	160,77
200312	177.050	2,2304	165,46
200401	160.532	2,2279	144,18
200402	121.221	2,3726	147,88

200403	118.879	2,4130	171,25
200404	98.425	2,4076	170,87
200405	66.950	2,4269	178,83
200406	69.098	2,4369	178,25
200407	78.307	2,4525	178,85
200408	86.814	2,4712	177,30
200409	106.857	2,4637	180,11
200410	116.804	2,4608	179,91
200411	127.293	2,4788	187,91
200412	181.488	2,5301	192,32
200501	162.509	2,5685	167,34
200502	129.001	2,6200	172,84
200503	128.915	2,6262	201,17
200504	88.256	2,6442	207,05
200505	79.726	2,6800	216,83
200506	78.258	2,6949	210,38
200507	83.386	2,7272	210,87
200508	95.444	2,7923	215,09
200509	98.162	2,8019	217,38
200510	123.095	2,7999	218,21
200511	140.411	2,9020	230,41
200512	182.265	2,9715	233,43
200601	164.191	2,9864	204,10
200602	151.743	3,0324	210,10
200603	129.171	3,0639	242,60
200604	96.894	3,1000	245,13
200605	83.982	3,1350	262,02
200606	80.370	3,1664	254,11
200607	93.478	3,1753	254,98
200608	98.273	3,1930	258,20
200609	111.854	3,1920	260,48
200610	143.954	3,1909	264,51
200611	146.888	3,1979	275,80
200612	195.909	3,2096	275,52

The corresponding concepts are: Price = Average sale price of beer without taxes (in Arg$ per liter); Quantity = Total quantity sold of beer (in hectoliters); Income = nominal income index of the population (EMAE*IPC/100).

a) Estimate the following logarithmic demand for beer:

$$\text{Ln(Quantity)} = c(1) + c(2)\cdot \text{Wint} + c(3)\cdot \text{Summ} + c(4)\cdot \text{Ln(Price)} + c(5)\cdot \text{Ln(Income)} \;;$$

where “Summ” is a dummy variable for the Argentine Summer (1 for December and January; 0 for the rest of the year) and “Wint” is a dummy variable for the Argentine Winter (1 for the months of April, May, June, July, August and September; 0 for the rest of the year).

b) Now estimate this alternative demand function, adding a lagged quantity variable:

$$\text{Ln(Quantity)} = c(1) + c(2)\cdot \text{Wint} + c(3)\cdot \text{Summ} + c(4)\cdot \text{Ln(Price)} + c(5)\cdot \text{Ln(Income)} + c(6)\cdot \text{Ln(Quantity(t-1))} \quad .$$

c) Now estimate a new logarithmic demand function, adding the lagged quantity but also imposing a zero-degree homogeneity condition (which in this case simply implies that "c(4) = -c(5)"):

$$\text{Ln(Quantity)} = c(1) + c(2)\cdot\text{Wint} + c(3)\cdot\text{Summ} + c(4)\cdot\text{Ln(Price/Income)}$$

$$+ c(6)\cdot\text{Ln(Quantity(t-1))} \quad .$$

d) Compare the results obtained under the different specifications, regarding its goodness of fit and significance of the estimated coefficients. Also compare the estimated values for the implicit short-run and long-run elasticities.

7. Systems of equations

7.1. Demand systems for differentiated products

The following data correspond to the Argentine biscuit market (2003-2005).

Month	Qcrack	Qsweet	Qsandw	Pcrack	Psweet	Psandw	Income
200301	7.685.027	7.736.551	1.658.298	5,6882	5,5019	9,9443	127,42
200302	7.874.269	8.346.418	1.620.967	5,8400	5,4325	10,0592	131,29
200303	8.809.514	9.452.242	1.994.685	5,8690	5,4717	9,9627	147,87
200304	8.568.980	9.155.965	2.110.060	5,8915	5,5536	10,0399	155,23
200305	8.704.635	9.138.419	2.154.874	5,8640	5,6191	10,0575	162,58
200306	8.404.632	9.228.057	2.160.121	5,9005	5,5880	10,1267	155,73
200307	9.022.836	9.813.290	2.305.710	5,8253	5,5352	10,1061	159,22
200308	8.822.943	9.931.011	2.255.863	5,8635	5,5291	10,1601	152,90
200309	9.000.484	9.812.654	2.218.456	5,8814	5,5852	10,2189	155,87
200310	9.254.461	9.910.201	2.238.813	5,8619	5,5378	10,1945	158,82
200311	9.254.223	9.889.925	2.224.019	5,8541	5,5823	10,1547	160,74
200312	9.431.283	9.698.279	2.198.518	5,8927	5,6600	10,2126	165,16
200401	9.080.383	9.359.311	2.077.314	5,9439	5,7287	10,3214	144,50
200402	9.510.947	9.962.377	2.196.872	5,9603	5,7306	10,2718	147,99
200403	10.723.006	11.080.465	2.674.395	5,9751	5,7752	10,1912	170,82
200404	9.790.465	9.956.438	2.457.144	6,0268	5,8293	10,3323	170,87
200405	10.606.491	11.022.337	2.572.569	5,9805	5,8389	10,4781	178,99
200406	10.687.253	10.814.016	2.549.516	5,9593	5,8863	10,4848	178,09
200407	10.986.669	11.065.483	2.618.444	5,9237	5,8840	10,5218	179,41
200408	11.027.523	10.965.389	2.584.367	5,9218	5,8837	10,4635	177,10
200409	11.312.328	10.874.152	2.600.436	5,9027	5,9061	10,3715	179,74
200410	11.580.683	11.073.477	2.678.847	5,8827	5,8940	10,2876	180,24
200411	11.722.437	11.081.185	2.686.420	5,9205	5,8730	10,2601	187,71
200412	11.608.825	10.787.466	2.551.500	5,9785	5,8754	10,3177	192,18
200501	11.320.362	10.552.010	2.419.048	6,0307	5,9333	10,3617	169,97
200502	11.041.487	10.342.355	2.326.829	5,9912	5,8831	10,3916	172,83
200503	12.125.659	11.437.341	2.865.759	6,0251	5,9208	10,2945	198,31
200504	11.633.078	10.823.657	2.641.320	5,9971	5,9041	10,3490	207,19
200505	12.166.393	11.757.453	2.815.457	5,9982	5,9287	10,3770	215,91
200506	11.368.927	10.977.907	2.706.264	5,9882	5,9514	10,3435	209,70
200507	11.744.319	11.642.506	2.840.806	6,0026	5,9810	10,3913	212,13
200508	12.055.862	12.063.125	3.008.280	6,0479	6,0021	10,4061	211,76
200509	12.063.539	11.945.021	2.877.751	6,0713	6,0386	10,5215	216,53
200510	12.519.170	12.353.441	2.932.964	6,1540	6,0863	10,5060	217,88
200511	12.386.130	11.947.893	2.849.053	6,2272	6,1160	10,5503	230,27
200512	12.494.820	12.073.225	2.808.009	6,2701	6,1318	10,6260	233,85

The corresponding concepts are: Qcrack = quantity sold of cracker biscuits (in kg); Qsweet = quantity sold of plain sweet biscuits (in kg); Qsandw = quantity sold of sandwich sweet biscuits (in kg); Pcrack = average price of cracker biscuits (in Arg$/kg); Psweet = average price of plain sweet biscuits (in Arg$/kg); Psandw = average price of sandwich sweet biscuits (in Arg$/kg); Income = nominal income index of the population (EMAE*IPC/100).

a) Estimate the demand for the different types of biscuits through the following equations:

$$Ln(Qcrack) = c(1) + c(2)\cdot Ln(Pcrack/Income) + c(3)\cdot Ln(Psweet/Income) + c(4)\cdot Ln(Psandw/Income) + c(5)\cdot Ln(Qcrack(t-1)) \quad ;$$

$$Ln(Qsweet) = c(11) + c(12)\cdot Ln(Psweet/Income) + c(13)\cdot Ln(Pcrack/Income) + c(14)\cdot Ln(Psandw/Income) + c(15)\cdot Ln(Qsweet(t-1)) \; ;$$

$$Ln(Qsandw) = c(21) + c(22)\cdot Ln(Psandw/Income) + c(23)\cdot Ln(Pcrack/Income) + c(24)\cdot Ln(Psweet/Income) + c(25)\cdot Ln(Qsandw(t-1)) \; .$$

b) Observe the results obtained and re-write the equations, eliminating the variables whose signs are not the expected ones (for example, price of substitute goods whose estimated coefficients are negative). Re-estimate the corresponding demand functions.

c) Now estimate a single demand function for biscuits, through the following equation:

$$Ln(Qtotal) = c(1) + c(2)\cdot Ln(Ptotal/Income) + c(3)\cdot Ln(Qtotal(t-1)) \; .$$

where “Qtotal” is the sum of Qcrack, Qsweet and Qsandw, and “Ptotal” it the weighted average price of Pcrack, Psweet and Psandw (that is, “(Pcrack*Qcrack +Psweet*Qsweet +Psandw*Qsandw)/Qtotal”).

d) Calculate the implicit short-run and long-run price elasticities corresponding to the estimations made in parts “b” and “c”.

7.2. Supply and demand estimations

The following data correspond to the Argentine gasoline market during 1999.

Mon	Province	Pn	Tax	Qpc	HHI	SYPF	WTI	GDPpc
1	Cap Fed	0,3467	0,4865	17,0648	0,2146	0,3256	0,0785	1802,34
2	Cap Fed	0,3467	0,4865	16,1316	0,2241	0,3276	0,0755	1752,10
3	Cap Fed	0,3467	0,4865	20,5090	0,2217	0,3223	0,0923	1782,27
4	Cap Fed	0,3467	0,4865	17,8038	0,2472	0,3499	0,1090	1812,44
5	Cap Fed	0,3467	0,4865	17,9681	0,2527	0,3483	0,1116	1842,61
6	Cap Fed	0,3467	0,4865	17,1590	0,2549	0,3495	0,1126	1845,70
7	Cap Fed	0,3467	0,4865	17,2896	0,2683	0,3549	0,1260	1848,78
8	Cap Fed	0,3467	0,4865	18,2607	0,2338	0,3354	0,1338	1851,86
9	Cap Fed	0,3798	0,4865	17,9533	0,2664	0,3833	0,1502	1861,22
10	Cap Fed	0,4236	0,4865	18,1050	0,2809	0,3953	0,1427	1870,59
11	Cap Fed	0,4351	0,4865	17,5770	0,2792	0,3834	0,1565	1879,95
12	Cap Fed	0,4607	0,4865	19,2943	0,2861	0,3869	0,1642	1846,58
1	Córdoba	0,3541	0,4865	13,1306	0,3142	0,4915	0,0785	599,61

2	Córdoba	0,3541	0,4865	11,9273	0,3060	0,4798	0,0755	582,89
3	Córdoba	0,3541	0,4865	12,6936	0,2838	0,4520	0,0923	592,93
4	Córdoba	0,3541	0,4865	11,3021	0,2989	0,4693	0,1090	602,97
5	Córdoba	0,3541	0,4865	10,3620	0,3192	0,4962	0,1116	613,01
6	Córdoba	0,3541	0,4865	10,9859	0,3052	0,4680	0,1126	614,03
7	Córdoba	0,3541	0,4865	11,4763	0,3146	0,4856	0,1260	615,06
8	Córdoba	0,3541	0,4865	11,1254	0,3087	0,4830	0,1338	616,08
9	Córdoba	0,3921	0,4865	10,8553	0,3563	0,5326	0,1502	619,20
10	Córdoba	0,4236	0,4865	11,0141	0,3561	0,5349	0,1427	622,31
11	Córdoba	0,4351	0,4865	10,7522	0,3403	0,5186	0,1565	625,43
12	Córdoba	0,4517	0,4865	12,4468	0,3634	0,5444	0,1642	614,33
1	Mendoza	0,3558	0,4865	9,7111	0,4850	0,6649	0,0785	590,09
2	Mendoza	0,3558	0,4865	9,2200	0,5291	0,6995	0,0755	573,64
3	Mendoza	0,3558	0,4865	11,1643	0,4951	0,6736	0,0923	583,52
4	Mendoza	0,3558	0,4865	10,0459	0,5190	0,6897	0,1090	593,40
5	Mendoza	0,3558	0,4865	10,3699	0,4054	0,5958	0,1116	603,28
6	Mendoza	0,3558	0,4865	10,2911	0,4564	0,6424	0,1126	604,29
7	Mendoza	0,3558	0,4865	10,6750	0,5111	0,6846	0,1260	605,29
8	Mendoza	0,3558	0,4865	9,8593	0,5016	0,6776	0,1338	606,30
9	Mendoza	0,3971	0,4865	9,5535	0,5598	0,7202	0,1502	609,37
10	Mendoza	0,4318	0,4865	9,8139	0,5170	0,6872	0,1427	612,43
11	Mendoza	0,4450	0,4865	9,1204	0,5033	0,6755	0,1565	615,50
12	Mendoza	0,4616	0,4865	10,2123	0,5020	0,6754	0,1642	604,57
1	Sta Cruz	0,3876	0,0000	39,1272	0,5209	0,6540	0,0785	1153,98
2	Sta Cruz	0,3876	0,0000	37,8139	0,5310	0,6713	0,0755	1121,82
3	Sta Cruz	0,3876	0,0000	38,2351	0,4805	0,6070	0,0923	1141,13
4	Sta Cruz	0,3876	0,0000	38,3640	0,4928	0,6271	0,1090	1160,45
5	Sta Cruz	0,3876	0,0000	35,9207	0,4818	0,6214	0,1116	1179,77
6	Sta Cruz	0,3876	0,0000	34,9593	0,4677	0,6012	0,1126	1181,74
7	Sta Cruz	0,3876	0,0000	32,3970	0,5087	0,6235	0,1260	1183,72
8	Sta Cruz	0,3876	0,0000	34,1613	0,4794	0,6218	0,1338	1185,69
9	Sta Cruz	0,4041	0,0000	34,2704	0,7893	0,8832	0,1502	1191,68
10	Sta Cruz	0,4322	0,0000	36,1735	0,8400	0,9148	0,1427	1197,68
11	Sta Cruz	0,4463	0,0000	34,7015	0,8427	0,9163	0,1565	1203,67
12	Sta Cruz	0,4653	0,0000	39,8756	0,8481	0,9195	0,1642	1182,31

The corresponding concepts are: Pn = price of premium gasoline without taxes (in Arg$/lt); Tax = Gasoline excise tax (in Arg$/lt); Qpc = quantity of gasoline consumed per capita (in liters per month); HHI = Herfindahl and Hirschman concentration index; SYPF = YPF's market share; WTI = international crude oil price (in Arg$/lt); GDPpc = gross domestic product per capita (in Arg$ per month).

a) Estimate the gasoline demand function through the following regression:

$$Qpc = c(1) + c(2)\cdot Summ + c(3)\cdot Wint + c(4)\cdot GDPpc + c(5)\cdot (Pn+Tax) \quad ;$$

where "Summ" is a dummy variable for the Argentine Summer months (1 for December, January, February and March; 0 for the rest of the year) and "Wint" is a dummy variable for the Argentine Winter months (1 for June, July, August and September; 0 for the rest of the year).

b) Calculate the marginal revenue of a cartel (MRt), the marginal revenue that YPF would have if it were a price leader and the other firms had a completely inelastic supply (MRl), and the average marginal revenue of the firms if this market was a Cournot oligopoly (MRo), through the following equations:

$MRt = Pn + Qpc/c(5)$; $MRl = Pn + SYPF \cdot Qpc/c(5)$; $MRo = Pn + HHI \cdot Qpc/c(5)$;

where "c(5)" is the coefficient estimated in part "a".
c) Now perform four marginal cost function regressions following this formula:

$$MC = c(1) + c(2) \cdot Cba + c(3) \cdot Mza + c(4) \cdot SCr + c(5) \cdot WTI \quad ;$$

where "Cba", "Mza" and "SCr" are dummy variables corresponding to the provinces of Córdoba, Mendoza and Santa Cruz (1 for the observations that belong to those provinces; 0 otherwise). Make "MC" be alternatively equal to "Pn" (perfect competition hypothesis), "MRo" (Cournot hypothesis), "MRl" (price-leadership hypothesis) and "MRt" (collusion hypothesis). Find which of those regressions has a larger coefficient of determination (R^2).

8. Monopoly regulation

8.1. Regulation and firms' profits

The demand function of a certain good (Q) and the total cost function of the firm that supplies that good are the following:

$$Q = 160 - p \quad ; \qquad TC = 40 \cdot Q + 2000 \quad ;$$

where "p" is the price paid by consumers.
a) Find the values of "p" and "Q" that an unregulated profit-maximizing monopolist would choose, and the total amount of the profits of such a firm. Remember that, in this case, the monopolist's marginal revenue function is "$MR = 160 - 2 \cdot Q$", and its marginal cost is $40.
b) Find the values of "p" and "Q" that a welfare-maximizing regulator would choose, and show that in this case the monopolist's profit becomes negative (provided that welfare is defined as the sum of consumers' surplus plus firm's profit).
c) Show that, if the regulator sets a price "$p = 60$", then the monopolist's profit becomes zero. Find the value of "Q" in that case.
d) Calculate the consumers' surpluses and the total surpluses generated in the solutions to the three previous parts.

8.2. Regulation and price discrimination

A regulated firm sells its services in two markets (A and B), whose demand price functions are the following:

$$p_A = 100 - 2 \cdot q_A \quad ; \qquad p_B = 70 - q_B \quad .$$

The total cost of this firm is:

$$TC = 40 \cdot (q_A + q_B) + 450 \quad .$$

a) Show that, if "$p_A = p_B = MC = 40$", then total surplus becomes maximal but the firm obtains negative profits.

b) Show that, if "$p_A = p_B = AC = 50$", then the firm's profit is equal to zero. Which are the corresponding values of "q_A" and "q_B" in this case? Which is now the value of total surplus?
c) Now show that, setting "$p_A = 52{,}80$" and "$p_B = 46{,}40$", it is possible to increase the value of total surplus while keeping the restriction that the firm's profit is non-negative. Find the values of "q_A" and "q_B" that correspond to this last case, and show that total quantity is larger than the one obtained in part "b".

11. Merger control

11.1. Horizontal mergers

In the market of a homogeneous product, there are four identical firms (E1, E2, E3 and E4), whose average and marginal cost of supplying the good is equal to \$30. The market is a Cournot oligopoly, and total demand is:

$Q = 150 – P$.

a) Find the equilibrium values of "P" and "Q", and the consumers' surplus.
b) Show that, if E1 merges with E2, E3 merges with E4, and the market goes on behaving as a Cournot oligopoly, then the new equilibrium generates an increase in price and a reduction in consumers' surplus.
c) Which reduction in the average and marginal cost of the merging firms is necessary to induce an increase in consumers' surplus?

11.2. Leader/follower merger

In the market of a homogeneous product there are three firms (1, 2 and 3). Firm 1 is the price leader, and firms 2 and 3 are followers. Firm 1 has an installed capacity of production of 40 units, while firms 2 and 3 have an installed capacity of production of 15 units each. The followers' supply function is completely vertical (inelastic) for the quantity that coincides with their installed capacity. The three firms have constant marginal costs, equal to \$8, while total market demand is:

$Q = 100 – P$;

wher "Q" is quantity and "P" is price. Given all that, you should:
a) Find the residual demand for firm 1, and its corresponding marginal revenue function.
b) Find the equilibrium values for "P" and "Q" in the initial market situation.
c) Now suppose that firms 1 and 2 merge, and find the new equilibrium (in which the new firm "1+2" is the price leader, and firm 3 is the follower).
d) What would the equilibrium be if the merger were between firms 2 and 3 (and firm 1 went on being the price leader)?