Market concentration in agriculture

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Lecture notes for Econ 235

Introduction

- Recall that the assumptions of perfect competition are:
    - i) Firms sell an identical product;
    - ii) Full information about prices;
    - iii) The market contains a large number of firms;
    - iv) There is no transaction cost;
    - v) Firms are free to enter and to exit.
- These assumptions do not always hold in agriculture.
- In this section, we will look at the consequences of a market with a few buyers and/or a few sellers.

Definitions

- The strength of the assumptions for perfect competition depends greatly on how a market is defined.
- When defining a market, one must be careful of geography and product definition.
- For example, what is the relevant market when studying concentration of beef packing plants?
    - Is it the domestic market for US beef only?
    - Should it include beef imported from Canada and US exports of beef?
    - Beef competes with chicken and pork. Thus, should the market be defined with respect to all types of meat?
    - What about other food products?
- There is no "correct" way of defining a market.

Definitions

Table : Models of competition

Characteristics	Perfect competition	Monopolistic competition	Oligopoly (seller) Oligopsony (buyer)	Monopoly (seller) Monopsony (buyer)
Nature of product	Homogeneous	Differentiated	Homogeneous/ differentiated	Differentiated
Number of firms	Many	Many	Few	One
Ease of entry for new firms	Easy	Fairly easy	Difficult	Very difficult to impossible
Market strategies	Timing of sales	Set price, brand, names, promotion, product design and packing	Set price; if differentiated, then establish brand name, promotion, product design and packaging	Set price based on marginal cost equal to marginal revenue

Definitions

- Monopoly: there is one seller of a product.
- Oligopoly: there are a few sellers of a product.
- Monopsony: there is one buyer of a product.
- Oligopsony: there are a few buyers of a product.

What are agribusiness?

- Any firm involved in the production, transportation, transformation or sale of food and fiber (e.g. cotton).

- Firms that produce inputs for farms are also agribusiness (e.g. production of seeds, fertilizer or machinery).

- We can find all types of competitive conduct in agribusiness.

Large agribusiness firms

- The tables below are from Fortune 500 for 2016 available at
  http://beta.fortune.com/fortune500.
- You can use the filter at the top right corner of the page to select
  rankings by industries.

Large agribusiness firms (2016)

Table : Category: food production

Company	Fortune 500 rank	Revenues ($ b)	Profits ($ M)
Archer Daniels Midland (ADM)	45	62.3	1,279
Tyson Foods	82	36.9	1,768
CHS	93	30.3	424
Ingredion	456	5.7	485
Seaboard	486	5.4	312

Source: Fortune 500.

Large agribusiness firms (2016)

Table : Category: food services

Company	Fortune 500 rank	Revenues ($ b)	Profits ($ M)
McDonald's	112	24.6	4,687
Starbucks	131	21.3	2,818
Darden Restaurants	385	6.9	375
Yum China Holdings	399	6.4	502

Source: Fortune 500.

Large agribusiness firms (2016)

Table : Category: beverages

Company	Fortune 500 rank	Revenues ($ b)	Profits ($ M)
Coca-Cola	64	41.9	6,527
Constellation Brands	408	6.5	1,055
Dr Pepper Snapple Group	416	6.4	847
Molson Coors Brewing	522	4.9	1,976
Coca-Cola Bottling	701	3.1	50

Where is PepsiCo? In the food consumer products category.
Source: Fortune 500.

Large agribusiness firms (2016)

Table : Category: food consumer products

Company	Fortune 500 rank	Revenues ($ b)	Profits ($ M)
PepsiCo	44	62.8	6,329
Kraft Heinz	106	26.5	3,632
Mondelēz International	109	25.9	1,659
General Mills	165	16.6	1,697
ConAgra Brands	197	14.1	-677
Land O'Lakes	209	13.2	245

Source: Fortune 500.

- Once a market is defined, we may want to measure concentration.
- Measure the total revenue of a firm i as $R_i = pq_i$.
- The market share of a firm i is equal to its revenue divided by the total revenue of all the firms within a market:

$$s_i = \frac{R_i}{\sum_i^N R_i}$$

  where N is the total number of firms within a market.
- Possibly the most common method of measuring concentration in market is to use concentration ratio.
- Concentration ratios are the sum of market shares of the m largest firms

$$Cm = \sum_{i=1}^{m} s_i,$$

- Often denoted by C or CR followed by the number of firms m.

- For example, $C4$ is the sum of the market share for the four largest firms in a market.

- A small value indicates a low level of concentration.

Measuring concentration: Herfindahl index

- Another measure of concentration is the Herfindahl-Hirschman index (HHI or simply Herfindahl index).
- The Herfindahl index is the sum of the square of market shares of all firms

$$HHI = 10,000 \sum_{i=1}^{N} s_i^2,$$

  where N is the number of firms.
- It is standard practice to multiply by $10,000$ because shares are reported in percentage.
- A small value indicates a low level of concentration.
- The Herfindahl index adjusts for dispersion in firms' size.
- If there are many small firms, then the smallest firms can be ignored without much effect on HHI.

- Consider the following revenues and market shares:

Firm	A	B	C	D	E	F	G	H	Total
Revenue	11,250	750	750	450	450	450	450	450	15,000
Market share	0.75	0.05	0.05	0.03	0.03	0.03	0.03	0.03	1
Market share^2	0.5625	0.0025	25e-4	9e-4	9e-4	9e-4	9e-4	9e-4	0.5720

where 1e-4 = 0.0001.

- Calculate $C4$, $C8$ and the Herfindahl index.

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where 1e-4 = 0.0001.

- Calculate $C4$, $C8$ and the Herfindahl index.
- $C4 = 0.88$, $C8 = 1.00$ and $HHI = 5,720$

Measuring concentration: example (2)

- Consider the following revenues and market shares:

Firm	A	B	C	D	E	F	G	H	Total
Revenue	3,750	3,750	3,750	1,950	450	450	450	450	15,000
Market share	0.25	0.25	0.25	0.13	0.03	0.03	0.03	0.03	1
Market share^2	0.0625	0.0625	0.0625	0.0169	9e-4	9e-4	9e-4	9e-4	0.208

- Calculate $C4$, $C8$ and the Herfindahl index.

- Consider the following revenues and market shares:

Firm	A	B	C	D	E	F	G	H	Total
Revenue	3,750	3,750	3,750	1,950	450	450	450	450	15,000
Market share	0.25	0.25	0.25	0.13	0.03	0.03	0.03	0.03	1
Market share^2	0.0625	0.0625	0.0625	0.0169	9e-4	9e-4	9e-4	9e-4	0.208

- Calculate $C4$, $C8$ and the Herfindahl index.
- $C4 = 0.88$, $C8 = 1.00$ and $HHI = 2,080$

Food manufacturing

Table : Concentration in food manufacturing (NAICS 311)

	Concentration ratio	Herfinfal index
4 largest	16.3	NA
8 largest	24.2	NA
20 largest	38.4	NA
50 largest	50.9	110.7

Source: 2012 Economic Census of Manufactures.

Concentration in US grocery

Table : Concentration in supermarkets and other grocery (NAICS 445110)

	Concentration ratio	Herfinfal index
4 largest	31.1	NA
8 largest	44.4	NA
20 largest	58.6	NA
50 largest	70.6	NA

Source: 2012 Economic Census of Manufactures.

Concentration in meat processed from carcass

Table : Concentration in meat processing (NAICS 311612)

	Concentration ratio	Herfinfal index
4 largest	32.8	NA
8 largest	42.3	NA
20 largest	55.4	NA
50 largest	71.2	332.1

Source: 2012 Economic Census of Manufactures.

Why more concentration in some sectors?

- There is concentration in sectors where there are barriers to entry.
- These barriers prevent entry by competing firms, effectively protecting incumbents from new competition.
- What are barriers to entry?
    - Regulatory (e.g. government controls the number of firms);
    - Legal (e.g. patent);
    - Fixed cost (e.g. capital investments such as buildings and land).
- In most sectors, it is the fixed cost that constitutes the largest barrier to entry.
- Should observe more concentration in sectors with large fixed costs.

Cooperatives in agriculture

- In the United States, the *Sherman Antitrust Act of 1890* (Sherman Act) makes illegal business practices that reduce competition.
- Monopolies and cartels are illegal in the United States.
- For example, see the recent antitrust case with eggs (http://www.eggproductssettlement.com/).
- Another example is recent case about canned tuna (e.g. Wal-Mart joins lawsuit).
- The *Capper-Volstead Act of 1922* provides agricultural producers certain exemption from antitrust laws.
- Capper-Volstead allows for the formation of cooperatives under specific rules (e.g. one vote per member).
- Cooperatives provide a way for farmers to join their force to increase their market power.

Federal marketing orders

- Marketing orders and marketing agreements are designed to stabilize market conditions for certain agricultural commodities. (Consider this a claim rather than an actual fact.)

- A marketing order covers all firms within an industry (e.g. Milk marketing order - Got milk?).

- A marketing agreements cover participating firms within an industry (e.g. California Leafy-Green Marketing Agreement).

- A few marketing orders limit production quantity, effectively giving market power to producers through the creation of a cartel (milk, fruits, vegetables and nuts).

- In Canada, production quotas in dairy, chicken, eggs and maple syrup (Quebec only) effectively give producers market power.

Concentration and market power

- Concentration is a signal that firms may be exercising market power.
- Concentration is however not a sufficient condition for market power.
- Threats of entry and regulation may prevent firms from excising market power.
- That is, a firm might be in a position to exercise market power but chooses not to by keeping its prices low to prevent entry by competing firms.
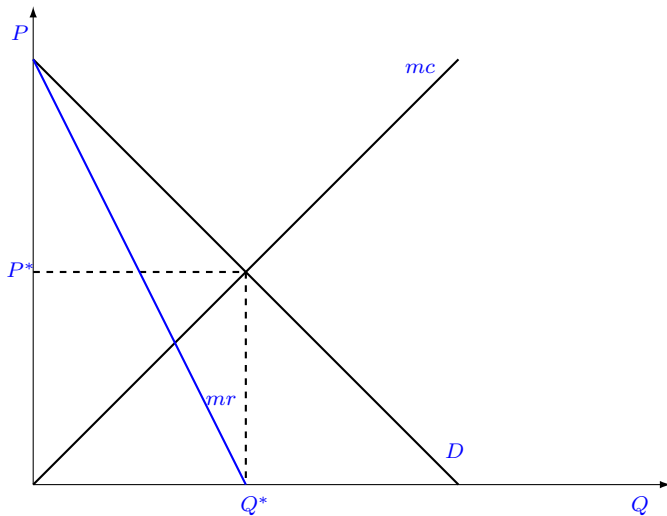
What are the consequences of market power by sellers?

- For competitive sellers, the price equals the marginal cost ($p = mc$).
- Sellers with market power choose output quantities such that marginal revenue equals marginal cost ($mr = mc$) and the price is given along the demand curve. This yields an output price that is greater than the marginal cost ($p > mc$).
- Market power by sellers causes a decline in the quantity and an increase in the prices compared to the case with competitive firms.
- Market power causes a welfare loss compare to the case with perfect competition.
- Transfer of surplus from buyers to the sellers.
- The deadweight loss triangle (dwl) is a loss of surplus (welfare) to society.

Market power by a seller
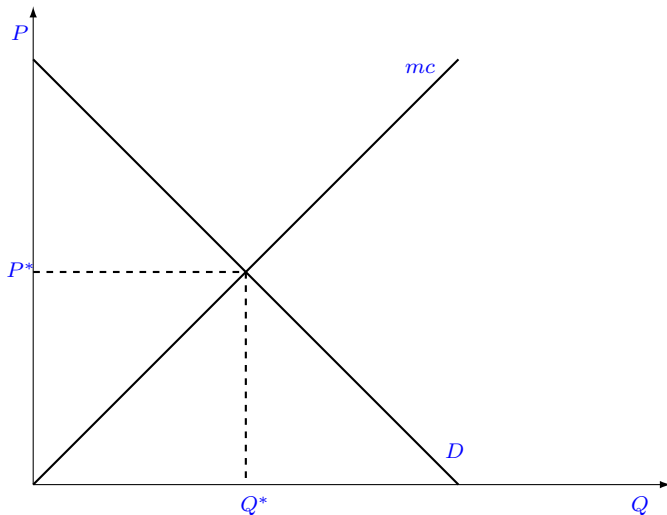
Market power by a seller
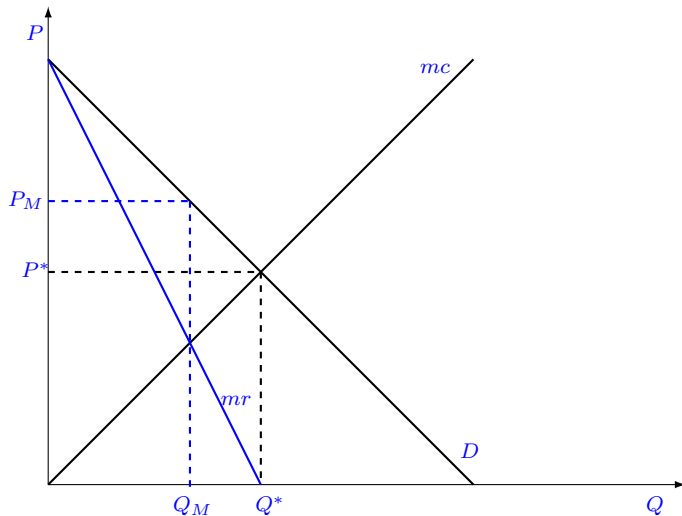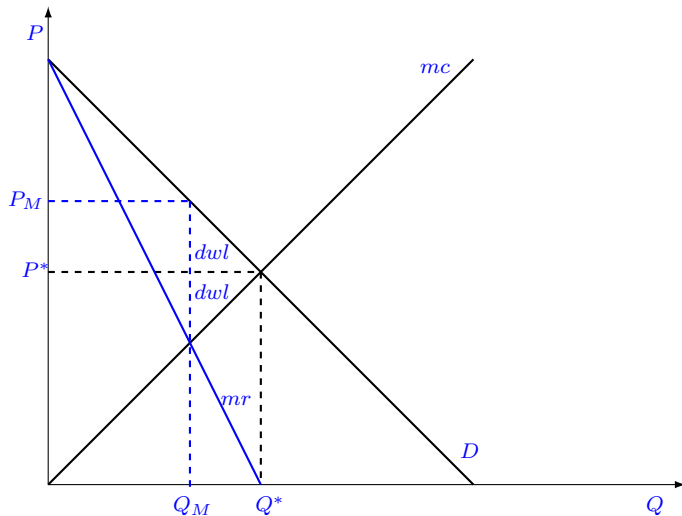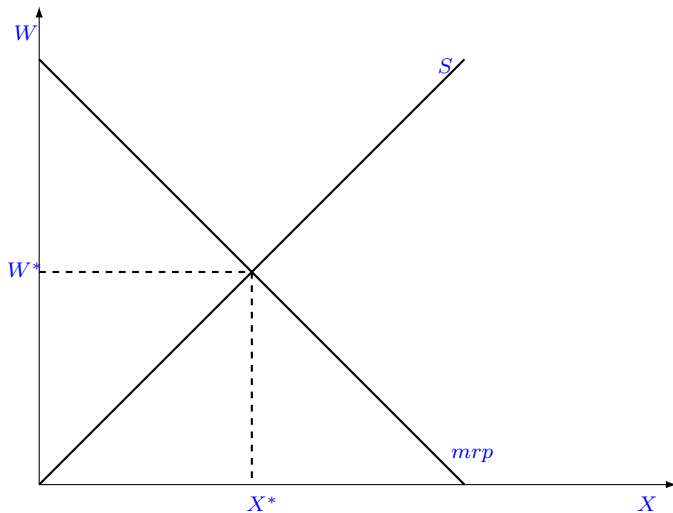
Market power by a seller

Figure : Market power by a seller

# What are the consequences of market power by buyers?

- The consequences are very similar to the case with market power by sellers
- For competitive buyers, the price of an input w equals the marginal marginal revenue product ($w = mrp$), which is the demand for that input.
- The marginal revenue product is how much an additional unit of product increases revenue.
- A buyer with market power chooses input quantities such that its marginal expenditure equals its marginal revenue product ($me = mrp$) and the price is given along the supply curve. This yields an input price that is smaller than the marginal value product ($w < mrp$).
- Market power by buyers causes a decline in the quantity and a decline in the prices of input compared to the case with competitive firms.
- Transfer of surplus from sellers to buyers.
- Welfare deadweight loss triangle (dwl).
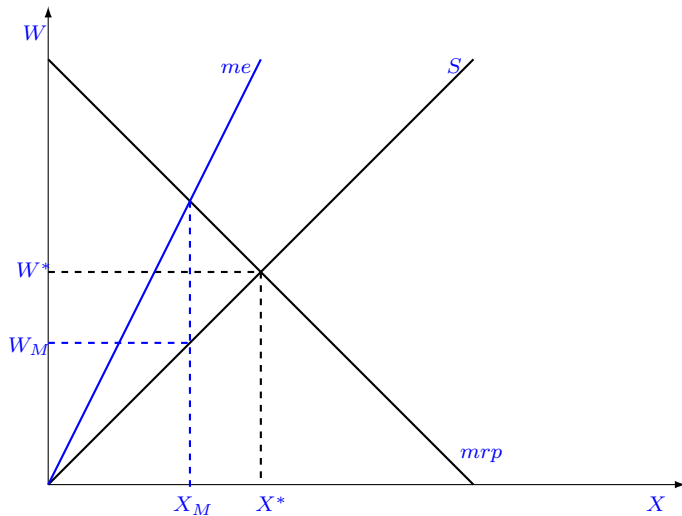
Market power by a buyer

Market power by a buyer
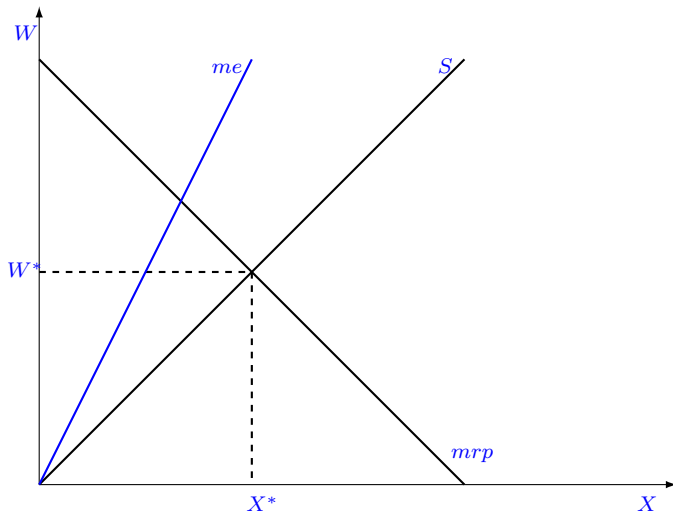
Market power by a buyer

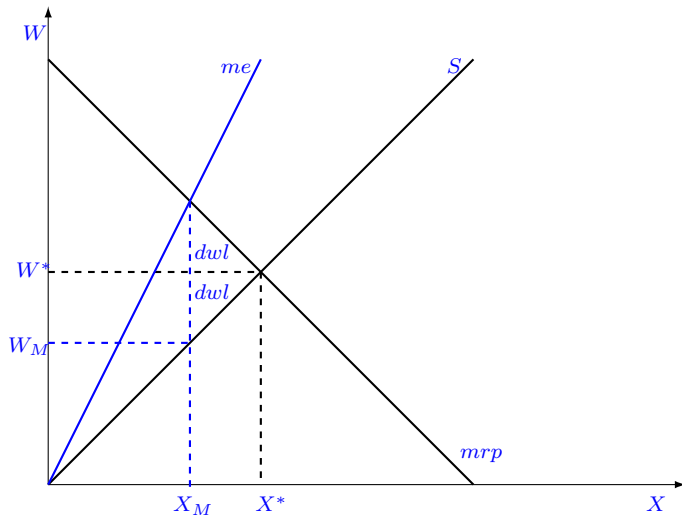# Market power by a buyer

Figure : Market power by a buyer

Economies of scales and scopes

- Large fixed costs are associated with economies of scales.
- *Economies of scales* mean that the average cost of a product declines as the quantity of product increases.
- This means that when there are economies of scales, larger firms can sell a product at a lower price.
- *Economies of scopes* arise when a firm can produce many products at a lower cost than many firms.
- For example, a grocery store can sell thousand of different products at a lower cost than thousand stores each selling one product.

Are concentration and market power by agribusiness firms big problems?

- Farm sector sometimes complain about market power by buyers:
    - Vertical integration in poultry - see NPR stories here and here;
    - Vertical integration is also more and more common in hogs;
    - Several litigation cases in cattle.

- At retail, concerns about increased concentration with the growth of large surface stores:
    - Fear that Walmart would increase prices after driving out the small stores never materialized;
    - Large retailers tend to exercise market power more as buyers than sellers.

Are concentration and market power by agribusiness firms big problems?

- By itself, concentration is not a problem.
- The problem is firms exercising market power because it causes a loss in welfare.
- If market power is associated with economies of scales or scopes, then market power might yield a larger total welfare than perfect competition.
- Most agribusiness firms are unable to exercise significant market power:
    - Threat of entry by competing firms;
    - Threat of antitrust litigation.
- Thus, concentration and market power are not such a big deal in agribusiness.

- In the United States, the Sherman Antitrust Act of 1890 has been quite effective at protecting consumers against "abusive" exercise of market power.

- Other steps to favor competitions include mechanisms to relay information about prices, which facilitates arbitrage between market and thus contribute to limit the exercise of market power:
  - The USDA through several of its agencies (e.g. ERS, NASS, FAS) report prices for agricultural commodities.
  - The US government requires mandatory price reporting for several commodities (see for example the *Mandatory Price Reporting Act* of 2010). The objective is to improve transparency and favor competition.

- International trade increases competitions within a market.

- However, the Trump administration recently removed an interim GIPSA rule about fair pricing in the livestock industry.