# Lecture 10: Competition: trader behavior

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* Imperfect competition
* Barriers to entry
* Structure, conduct, and performance
* CR4 and HHI

*Readings*

* Timmer, C. P., W.D. Falcon, and S.R. Pearson (1983) *Food Policy Analysis*. Baltimore: Johns Hopkins University Press: chapter 4, “Marketing Functions, Markets, and Food Price Formation.” <http://www.stanford.edu/group/FRI/indonesia/documents/foodpolicy/fronttoc.fm.html>

*Supplementary Readings*

* Barrett, Christopher B. 1997. “Food Marketing Liberalization and Trader Entry: Evidence from Madagascar,” *World Development*, 25(5): 763-777. [doi:10.1016/S0305-750X(96)00132-5](http://dx.doi.org/10.1016/S0305-750X%2896%2900132-5)

Last time we discussed supply chains and the structure of the food marketing channel and how they might affect food insecurity response by external agencies. The emphasis was, in particular, on breaking down the costs of commerce to compute marketing margins for wholesalers who deliver into a target market. The fundamental assumption underlying marketing margins analysis is that competitive markets tend towards long-run competitive equilibrium, which means that firms can enter and exit freely such that over an extended period of time competitive pressures flush inefficient traders and excess profits from the system and drive intermarket price differences down to the lowest possible costs of arbitrage between those markets. In a perfectly competitive marketplace, firms cannot exert power over pricing because they would quickly be undercut by a competitor.

**The basic economics of imperfect competition**

In this lecture, we relax the assumption of perfect competition and focus on trying to identify prospective bottlenecks in the food supply chain, places where “imperfect competition” might arise. “Imperfect competition” refers to a situation in which firms can directly affect prices through their individual business decisions, either because a single monopolist is the sole seller, or because a small group of oligopolists individually control a large share of the market directly or through collusive behaviors.[[1]](#footnote-1)

In this setting, firms with market power directly affect prices through sales quantity decisions. Because firms seek to maximize profits, they choose to produce a quantity where the marginal cost is equivalent to the marginal revenue. Single firms or groups of firms face the market aggregate demand curve, which is almost surely downward sloping; that is, aggregate demand is almost surely not perfectly price elastic in the overall market. If firms are maximizing profits, then they optimally choose sales and purchase volumes so that their marginal revenues equal their marginal costs. However, if they face a downward sloping demand curve (which depicts *average* revenue, rather than marginal revenue), then in order to increase quantity sold, they need to reduce the price they charge; as a result marginal revenues decline faster than demand. The more price inelastic the demand curve, the greater is that difference between marginal and average revenue.

**The Basics of Imperfect Competition: MC=MR<AR=p\***



Because food demand tends to be relatively price inelastic, and because many interventions (e.g., food vouchers, local and regional procurement) increase the price inelasticity of demand while expanding aggregate demand, this gap can be large and increase in response to food security interventions analyzed under MIFIRA if traders exert market power. And because food markets are often segmented in remote low-income communities, especially in time of war or in the wake of natural disasters that destroy key infrastructure (e.g., bridges, ports or roads), and financial market imperfections often make it relatively more difficult for new firms to secure the capital necessary to enter into large-scale trading, local market power may arise more commonly in poor, remote communities than in higher-income and urban markets.

The economics of imperfect competition becomes very technical very quickly, in a way that may prove counterproductive for the MIFIRA analyst. While we need to tackle a few basics of the economics of imperfect competition, we avoid the more technical digressions here. But the core findings and intuition of the empirical literature on imperfect competition can be productively used to help address a few key questions in the MIFIRA decision tree sequence:

*1d. Do local traders behave competitively?*

If traders compete, food prices for food insecure households should increase only as much as costs for traders increase. If traders can exercise market power, however, then they can extract added profits from increased demand by boosting prices faster than costs increase. By determining whether markets are or are not “workably competitive,” we can establish whether retail prices are likely to rise faster than costs in markets where there are demand side interventions (e.g., cash or voucher distribution).

*2b. Will agency purchases drive up food prices excessively in source markets?*

The logic here is exactly the same as in question 1d, but with the demand side intervention being local or regional procurement. If local or regional purchases will significantly bid up food prices in source markets, perhaps due to anti-competitive behavior, these actions can harm food insecure households within the source market. The tools we discuss in this lecture can help the analyst narrow the range of prospective source markets being considered.

**Barriers to entry**

Monopolies exist because other firms find it unprofitable or impossible to enter the market for some reason, in spite of the fact that the incumbent firm(s) earn(s) positive profits from trade. The existence of a monopoly implies the existence of entry and mobility barriers. An entry barrier keeps new firms from entering the business at all. Mobility barriers keep incumbent firms from expanding either the scale (i.e., volume) or scope (i.e., functions or products) of their existing business.

When marketing margins are much higher than the costs faced by a firm, it may be due to an imperfectly competitive market. Barriers to entry likely enable firms to charge much higher prices than warranted and, potentially, to earn much higher marketing margins.

Barriers arise from any of several sources:

1. *Technical barriers* arise when a significant minimum efficient scale (MES) of operation exists due to declining marginal costs of operation. For example, in small markets, a single firm may be a lower-cost provider than multiple smaller firms, creating a natural monopoly. The smaller the local market – due to market segmentation from other locations – the more likely that MES (e.g., for motorized transport) leads to local monopoly.
2. *Legal barriers* arise from state protections. In food value chains, the primary restrictions relate to (i) parastatal organizations that may have the sole legal authority to hold buffer stocks of grains, (ii) licensing requirements for traders that limit their number (e.g., periodic market entrance permits, import licenses), and, (iii) patent protections and other intellectual property rights that apply only to a very narrow domain of processed foods (e.g., therapeutic foods such as PlumpyNut or whole grain genetically modified seed/food).
3. *Informal barriers* arise due to sociocultural restrictions that limit physical access to certain areas or information access that may be essential to arbitrage or to contract enforcement.[[2]](#footnote-2) For example, where local leaders erect road barriers to physically bar outsiders from entering a region, or when the absence of formal trade credit from financial institutions effectively limits entry to those who can use social networks to raise capital and enforce agreements, pockets of market power easily emerge (and are commonly correlated with proprietors’ sociocultural characteristics, such as ethnicity, religion and gender).
4. *Firm-created barriers* emerge where firms actively work to exclude others from the market through costly investments of their own, especially investments that are effectively irreversible (so-called “sunk costs”). In the context of low-income food marketing channels, common methods for creating entry and mobility barriers include contract interlinkage (especially tying credit to forward sales), relationship-or-function-specific capital (e.g., extruders for groundnut processing), predatory pricing (i.e., intentional “loss leaders”), manufacturing artificial price volatility, political lobbying for protection, and direct intimidation of prospective competitors.

Monopolies are relatively rare in food marketing channels; oligopolies are more common. Market equilibrium under oligopoly is hard to predict or identify as the equilibrium depends on the nature of interactions between firms.[[3]](#footnote-3) Even a single firm might not exercise market power if the market is “contestable”, i.e., another firm could enter if the incumbent firm began making significant positive profits.[[4]](#footnote-4) The practical approach to understanding whether any of the above barriers result in an imperfect market, with firms earning excessively high profits, is to explore the structure, conduct and performance of the specific marketing channel of interest.

**Market structure, conduct and performance**

The dominant tradition in empirical research on industrial organization divides market analysis into three parts[[5]](#footnote-5):

1. Market structure: are there increasing returns to scale or scope in this marketing channel? How many firms participate? What is their size distribution? How concentrated is the market? What have entry and exit patterns been like in recent years?
2. Firm conduct: how have firms responded to demand and supply shocks in the past? Is there any sign of collusion among (especially larger) firms?
3. Economic performance: what are the impacts of market structure and firm conduct on profits, prices, distributional equity and other outcome variables of interest?
4. *Market structure*

One fairly general theoretical result is that as the number of firms increases, the oligopolistic equilibrium approaches the competitive equilibrium and price distortions disappear. Because firms are rarely of equal size, a slight, and generally useful, refinement is to consider the concentration of firms in the marketplace. Thus concentration measures are the workhorse of empirical market structure analysis.

The most common measure of concentration is the percentage of total market volume (for the product in question, in the geographic market and season of interest) controlled by a specific number of the largest firms. The concentration ratio is computed as:

CR*m*  =  s1  +  s2  +  s3  +  ... ... +  s*m*

where  s*i*  =  market share of the *ith* firm and *m* is the number of firms included. This concentration ratio measure gives a rough indication of how much competition exists within the market.

The main, and simplest, measure is CR4, the share of the market controlled by the largest four firms. As a crude rule of thumb, CR4>90 is considered an effective oligopoly, while at the other end of the spectrum, CR4<40 is typically taken as a sign of a very competitive market. Values in the 40≤ CR4≤90 range may or may not signal problems with imperfect competition.

The concentration ratio ignores information about the distribution of firm size, however. If CR4=60 because one firm controls 45 percent of the market and the next three only control 5 percent each, that’s quite a different situation from a market in which each controls only 15 percent of the market. We would likely worry about noncompetitive behavior by the dominant trader in the first case and deem the market workably competitive in the latter case.

To address this concern, many industry analysts favor the Herfindahl-Hirschman Index (HHI), with which one can generate reasonable estimates of market share for each firm in the industry. Establishing market share is often difficult in low-income food marketing channels at the retail level, but is sometimes feasible, especially in large-scale procurement markets in which a modest number of wholesalers can sell to an agency looking to fill a large commodity tender.

HHI is simply the sum of squared market shares of all *n* firms in the relevant segment of the value chain, so as to place more weight on the larger firms:

HHI  =  s12  +  s22  +  s32  +  ... ... +  s*n*2 .

Note that, unlike CR*m* measures, HHI changes as the distribution of market share among largest firms shifts. Note that HHI=0 would represent perfect competition, while HHI=10000 (=1002) reflects pure monopoly. As a crude rule of thumb, HHI<1000 is typically taken to indicate a very competitive market, while HHI>2000 is generally thought to reflect a market subject to imperfect competition. A market in which the four largest firms have 45-5-5-5 shares (and making the simplifying assumption that the remaining 40% share is split evenly among 20 smaller firms) would have a rather high HHI=452+3\*52+20\*22=2180, while a market with the same CR4=60, but in which the four largest firms have equal market share, would have a non-alarming HHI=4\*152+20\*22=980. This example shows the value of having a more complete picture of the firm size distribution in a marketing channel, although to do so one needs to get a reasonably complete enumeration of the market (which may involve innocuous simplifying assumptions about the smaller half of the distribution, such as we just made).

If the CR4 or the HHI suggests the market may be oligopolistic, one then explores why. First, are there increasing returns to scale or scope in the marketing channel? In more capital-intensive market niches, such as motorized transport, mechanized milling or interseasonal storage, there is often a minimum efficient scale (MES) of operation. This can often be estimated through key informant discussions. A simple estimate of total market size/MES gives one a crude figure of the maximum number of reasonably efficient firms the market can sustain in equilibrium. When the number is low, high concentration may be explained purely by the market’s limited size (and limited integration with other markets) relative to the capital requirements of traders.

If MES does not explain apparently high concentration in the market, then it’s helpful to try to identify the entry or mobility barriers that might explain it. Some agencies may want to try to address the source of market power when it is attributable to remediable entry barriers (e.g., available transport capacity or transactional credit). The reason for limited firm entry or mobility can provide important clues as to likely price responses to demand or supply shocks associated with the distribution of cash, vouchers or food or large-scale procurement of food aid.

1. *Conduct*

If market structure analysis raises concerns about the possibility of noncompetitive behavior, the next step is to explore firm conduct. During the last demand shock, what did the largest traders do? Did they increase throughput volumes? If not, why not? In many developing country food markets, traders are tightly constrained by credit access, security concerns, or the extent of their social network and its ability to access additional product.

During the last demand shock, did new traders enter the market? Was their pricing aggressively competitive with the incumbents so as to dampen resulting inflationary pressures? Or, did the smaller, newer entrants follow larger incumbents’ price leadership, resulting in de facto coordination and limited competition in spite of entry into the market?

Especially where trader networks have strong social ties due to shared ethnicity, religion or social group membership, ample opportunities exist for collusion among (especially larger) firms. Thus it is important to gauge trader diversity; are alternative suppliers socially similar and readily able to coordinate among themselves? If so, oligopolistic behavior becomes more of a concern than in similarly concentrated markets where traders come from markedly different groups and appear less able to collude effectively and sustainably in pricing.

1. *Performance*

Ultimately, we are most concerned with how the marketing channel in question performs. What are the prices and profits? In marketing margins analysis, we looked at firm costs and tried to establish the profit margins. But a firm’s profit level is not always a good measure of its market power. A firm’s profits may not be excessive, even if the prices the firm receives are relatively high, because noncompetitive firms do not face the same cost-reducing pressures and thus exhibit what economists refer to as “X-inefficiency”. As a result, empirical studies of industrial organization routinely find a much stronger positive relationship between concentration measures and prices than between concentration measures and profits.

Whether due to higher costs associated with firm-level X-inefficiency or due to higher profit margins, the common result of imperfect competition is higher prices for consumers and faster mark-up (slower mark-down) in the face of demand expansion (contraction).

*Data requirements*

The analytics we introduce next rely on the same data as marketing margins and supply chain analysis, that is, data collected from trader and key informant interviews (e.g., bankers, transporters, importers, governmental officials). As indicated in the last lecture, a crude rule of thumb suggested by Donovan et al. (2006, p. 34) stated that 10% of traders (and a minimum of 10 traders) should be interviewed in large public (i.e., retail) markets. At the wholesale market level, at least 5 traders should be interviewed in each location (town, city-center etc.). These data are commonly noisy and benefit from triangulation with data from downstream and upstream market actors and other sources when time and other resources permit. One can nonetheless typically get a reasonably good qualitative sense of the market just from a sample of careful trader and key informant interviews within the marketing channel.

*How to interpret the analytic*

Markets with a greater number and variety of traders and with lower concentration (CR4 or HHI) measures are less likely to be collusive, because it is relatively hard for large and disparate groups to organize. In Malawi, Barrett et al. (2009 *Food Security*) found that while the maize value chain is populated by a great diversity of traders, many traders operating at the same scale (e.g., wholesalers or retailers within communities) exhibited quite similar characteristics. Although markets appeared workably competitive, and thus cash transfers appeared feasible in this context, competition in local markets could worsen rapidly if itinerant and small traders exit the market whether due to their own cash shortages, unanticipated predatory behavior by larger traders, or tightening commercial credit, transport and storage markets. Therefore, monitoring competition, for example by tracking the types and number of traders operating, would be important for any ongoing transfer project.

Use supply chain mapping to disaggregate the commodity value chain into distinct functions – e.g., farm-level collection and assembly, wholesaling, transport, milling, interseasonal storage, retailing – just as we commonly disaggregate the national market into distinct geographic locations, then to look for entry or mobility barriers that inhibit growth in marketing intermediaries’ throughput volume and specific bottlenecks associated with noncompetitive behavior.

In markets where traders can exercise significant market power, as reflected in high CR4 or HHI measures or readily identifiable entry or mobility barriers, monitor these bottlenecks for non-competitive pricing.

*Limitations of the analytic*

Traders commonly closely guard information on market share, so it can be tough to collect precise, quantitative data with which to estimate concentration and related measures of market structure. One must often rely on qualitative assessments and indirect observations (e.g., all the lorries seem to belong to the same firm; there is only one large-scale commercial mill in the area for grinding grain into flour).

Even then, it can be very difficult to extract reliable information on structure or especially conduct or performance in the value chain. The implications for expected price changes are not immediately clear, although when markets are noncompetitive, the rate of price increases is typically half again higher or double the rate under perfect competition due to oligopolistic mark-ups.

1. This discussion will treat imperfect competition purely from the supply side, referring to monopolists (single sellers) and oligopolists (small groups of sellers with collective market power). Analogous problems exist on the demand side when single buyers (monopsonists) or small groups of oligopsonist buyers exercise market power over pricing. In the interests of simplicity, we ignore these demand-side cases of imperfect competition in this lecture. [↑](#footnote-ref-1)
2. ###  Marcel Fafchamps’ excellent 2004 book, *Market Institutions in Sub-Saharan Africa*, formalizes many of these points.

 [↑](#footnote-ref-2)
3. For those interested in greater technical depth, the microeconomic theory and industrial organization literatures go into considerable detail on differences between cartels (perfect collusion), Cournot (quantity-based) competition, Bertrand (price-based) competition, conjectural variations models, and monopolistic competition. See any graduate microeconomic theory textbook for more detail. [↑](#footnote-ref-3)
4. In perfectly contestable markets, price equals average costs (so that profits are zero) and thus marginal costs (so that each firm is in equilibrium), and the number of firms in the market is determined by aggregate demand and the cost-minimizing optimal scale for each firm. This can yield any number of firms in the market. [↑](#footnote-ref-4)
5. Fred Scherer’s classic 1980 text, *Industrial Market Structure and Economic Performance*, is a reasonably accessible reference for the general theory and methods of the structure-conduct-performance paradigm. [↑](#footnote-ref-5)