MERGER ANTITRUST LAW

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Tuesdays and Thursdays, 3:30-4:55 pm
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Class 12 (October 4): Foundations of Competition Economics (Unit 8)

On Thursday we continue the unit on basic competition economics.

Merger Typology, Substitutes and Complements, and Elasticities. Mergers historically have been classified into three categories: *horizontal mergers* are mergers between competitors, *vertical mergers* are mergers between two firms at adjacent levels in the chain of manufacture and distribution, and *conglomerate mergers* are mergers two firms that are neither competitors nor adjacent to one another in the chain of manufacture and distribution (slide 4). This classification is widely used, but it misses an important economic detail. To see why, we need to examine demand substitutes and complements (slides 6-8).

Two products or services are *substitutes* if, when consumer demand increases for one product, it will decrease for the other product. This captures in a more formal sense what it means for two products to compete with one another. Two products are *complements* if, when a consumer demand increases for one product, consumer demand also will increase for the other product. This is what happens when two products are in the chain of manufacture and distribution, and so capture more formally the notion of a vertical merger. But products can be complements without being in the same chain of manufacture and distribution, such as razors and razor blades or printers and printer ink cartridges. We will see later in the course that the same techniques used to assess vertical mergers can be used to analyze conglomerate mergers involving complementary products.

The last topic is this section is the notion of elasticity (slides 9-23). The notion of a downward sloping demand curve is central to antitrust analysis because it, together with the assumption that firms maximize profits, to analyze market equilibria of prices and quantities, which in turns allows us to predict how prices and quantities (and hence consumer welfare) may be affected by a structural change in the market (i.e., a merger). In this analysis, the slope of the demand curve is critical, since it tells us how responsive consumer demand is for the product in question with changes in price. The slope of the demand curve, however, depends on the unit of measure of quantity (slide 9). The slope of the demand curve when razor blades are measure in units will be different than the slope of the demand cuvee when razor blades are measures in ounces. Likewise, the slope will differ depending on whether prices are measured in dollars or pound sterling. To get around this dependency on the units of measurement, economists created the notion of *elasticity of demand*, which measures the *percentage* change in the quantity demand for a given percentage change in price. Percentages are independent on the unit of measure of either quantities or prices.

Own-elasticities (or simply *elasticities*) measure the percentage change in the quantity demanded for a given percentage change in the price of the product (slide 10). So if ε (the Greek letter “epsilon”) is the own-elasticity q and p are the current quantity and price, and Δq and Δp the changes in price and quantity of interest, then

$$\varepsilon = \frac{\text{Percentage chane in } q}{\text{Percentage change in } p} = \frac{\frac{\Delta q}{q}}{\frac{\Delta p}{p}} = \frac{\Delta q}{\Delta p}\frac{p}{q}.$$

When the change in price and quantity are finite, these are called *arc elasticizes*. But elasticities are really more like tangents at a point on the demand curve (see the $\Delta q/\Delta p$ term on the right-hand side—this is the slope of the demand curve), and unless elasticity is constant along the demand curve arc elasticities will misspecify the actual elasticity at the point ($p.q$) on the demand curve. For that reason, calculate elasticities at a point on the demand curve using an infinitesimally small Δp, which will accurately determine the slope of the demand curve and hence the elasticity. This is written

$$\varepsilon = \frac{\frac{dq}{q}}{\frac{dp}{p}} = \frac{dq}{dp}\frac{p}{q},$$

Where dp is an infinitesimally small change in price and dq is the associated change in quantity. Not that you need to know this (unless you want to impress your friends), the terms dp and dq are called differentials, and the term dq/dp is called the derivative. Welcome to calculus!

Given the downward-sloping property of demand curves, note that the slope dq/dp is a negative number, so that the own-elasticity of demand is also a negative number. For reasons I do not know, when speaking of own-elasticities economists often drop the negative sign. So when the own-elasticity is -2, for example, they will often say that is just 2. The number 2 is the absolute value of -2, and is denoted |-2| (= 2).

Assume that the firm in considering increasing price (i.e., $dp > 0$). In the equation above, if dq and dp are small enough so that they do not affect q and p, then $dq \times p$ on the top represents (loosely speaking) the loss in revenue resulting from the change in quantity. Conversely, $dp \times q$ is the gain in revenue resulting from the change in price. In this sense, the elasticity tells us whether net revenue will increase or decrease with a change in price. So, for example, $|\varepsilon| < 1$, then the decrease in revenue from lost sales (the term on the top) is less than the increase in revenue from increased price (the term on the bottom), making marginal revenue positive. In this case, demand is not particular sensitive to changes in price and is called *inelastic*. Conversely, if $|\varepsilon| > 1$, the marginal revenue is negative and revenue will decrease if the firm increases price. Demand in this range is called *elastic*. If $|\varepsilon| = 1$, demand is called *unit elastic*. (See slides 11-12.) These terms are part of the vocabulary of antitrust and you should become familiar with them. The demand curve diagrams on slides 11 and 15 should help tune your intuitions. Try also to get a good sense of how elasticity changes along a linear demand curve (slides 16-18).

Cross-elasticity is like own elasticity except that it measures the percentage change in demand for one good resulting from a percentage change in price of another good (slides 10. 13), that is,

$$\varepsilon_{ij} = \frac{\frac{dq_j}{q_j}}{\frac{dp_i}{p_i}} = \frac{dq_j}{dp_i}\frac{p_i}{q_j},$$

which gives the cross-elasticity ε_{ij} of a percentage change in the quantity demand of product *j* for an infinitesimally small change in the price of product *i*. Cross-elasticities are central to antitrust analysis because they indicate the how close two products compete. If the cross-elasticity of product 1 and product 2 is high, then small percentage increases in the price of product 1 will cause significant percentage changes in the quantity demanded of product 2. In this case, the two products will be close substitutes. Conversely, if a price percentage increase in product 1 causes very little percentage change in product 2, then the two products do not significantly compete against one another.

The notes discuss more properties of elasticities (slides 19-23), but these are not nearly as important as the earlier material. You may just skim the highlights if you like and feel free to skip the proofs unless you are really into the economics.

Perfect market equilibria.[1] A market model contains a number of firms, each producing a product and setting some control variable such as price or quantity. The products may be physically identical (homogeneous) or differentiated. The model will make assumptions about how firms interact with one another. The model posits that, within this market environment, all firms act to maximize their profits. A *market equilibrium* is the set of control variables selected by each firm with the property that each firm is maximizes its profits given the selection of the control variables of all of the other firms. In other words, in equilibrium no firm has an incentive to deviate from its choice of its control variable.

In this section, we examine two "perfect" markets: perfectly competitive markets and perfectly monopolized markets. To further simply matters, we assume that quantity is the firm's control variable and that all products are homogeneous.

In a perfectly competitive market (slides 25-26), no firm perceives that its choice of output can affect the market-clearing price. In this case, marginal revenue is equal to the market price, since (the firm perceives) that any increase in its level of production will not require the market price to fall in order to clear the market.[2] The price that clears the market is called the *competitive price*. Perfectly competitive markets maximize aggregate output in the market, minimize prices, and create the maximum consumer surplus.

On the other pole is a perfect monopoly (slides 27-29). In economic terms, a perfect monopoly is a market with only a single producer. In this case, the aggregate demand curve is also the firm's demand curve. The profit-maximizing condition is that the firm acts so that is marginal revenue is equal to its marginal cost. In the context of the model, the firm choses its production level so that its marginal revenue is equal to its marginal cost, and the aggregate demand curve then determines the market-clearing price. The price at each the market clears for a monopoly level of

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[1] I have reorganized the deck so that this section now appears in the second half. If you read the slides on perfect markets in the Class 11 deck, you do not need to read them again in this deck.

[2] Importantly, the aggregate demand curve is still downward sloping. It is only that no firm perceives that its level of production can affect the market price. If you see some tension here, you would be right.

production is called the *monopoly price*. The perfect monopoly model produces the highest level of profits available in the market and exhibits the highest price a profit-maximizing firm can charge in the market.[3] Although not shown in the notes, if we build a perfect monopoly model where the control variable is price, we will obtain the same monopoly output and monopoly price as we do when quantity is the control variable.

Imperfectly competitive market equilibria. In between perfectly competitive markets and perfect monopoly are imperfectly competitively markets. These are markets that exhibit a degree of competition, but no to the extent of a perfectly competitive market, and a degree of market power, but not to the extent of a perfect monopoly. Almost all mergers of interest occur in markets that are imperfectly competitive.

An important notion in all markets is the extent to which the firms are exercising market power in equilibrium. The cases provide definitions of market power and monopoly power (slide 32-33), but we are more concerned here with the economic definition of market power. Remember, the competitive equilibrium produces the lowest price of any type of market, and economists use this price as the benchmark in measuring market power. The competitive price is equal to marginal cost, so we can create a metric—called the *Lerner index*—that measures the deviation of the market equilibrium price to the competitive benchmark:

$$L = \frac{p - mc}{p},$$

where L is the Lerner index, p is the market-clearing price, and mc is the competitive price (slide 36). Note that in a perfectly competitive market $L = 0$. L has its maximum at the monopoly price for the market.

The remainder of the deck can be a bit challenging for the initiated. Try to wade through it, but here are the highlights.

In markets where firms produce identical products (called *homogenous markets*), only a single price can exit in the market.[4] In these markets, if firm 1 charges a higher price than firm 2, firm one makes not sales. Firms can only chose their production levels, and the aggregate demand for the product will determine the market-clearing price given the production levels for each of the firms.

The usual model for analyzing homogenous imperfect markets is the *Cournot oligopoly model*. Unlike the monopoly model, the Cournot model has more than one firm, but unlike the perfectly competitive model the firms are large enough relative to the size of the market that they appreciate that their individual production level decisions can affect the market-clearing price. There are three important takeaways of the court model: (1) when there is a single firm in the market, the market-clearing price is the monopoly price; (2) when there are a large number of firms in the market, the market-clearing price is close to the competitive price; and (3) a merger of two firms in a Cournot market (which necessarily decreases the number of independent firms)

[3] This belies a common notion that a profit-maximizing monopolist can charge whatever price its wants. There is a profit-maximizing price, and if the monopolist charges above that price it will lose profits.

[4] This assumes everyone has perfect information and that there are no search costs.

will also result in an increase in the market-clearing price.[5] (See slide 43.) The simple example shows how production levels are determined in a Cournot equilibrium (see slides 40-42), but if you are not that much into the economics you should just skim this. The summary on slide 43, however, is worth some attention.

Next, we look at Bertrand models. In Bertrand models, the control variable is price. In a homogeneous goods market, the Bertrand price equilibrium with two or more firms is the competitive price, since customers will always buy the undifferentiated good from the lowest price supplier (see slide 44). Bertrand models are seldom used for homogeneous products. Bertrand models are used in differentiated product markets, however, since each differentiated product can have its own individual market-clearing price (see slide 45). The notes examine a simple two-firm differentiated product market with a form of linear demand that depends on the prices of both products (see slides 46-47). The main takeaway from Bertrand models is that the degree of substitutability between the products matters to the equilibrium prices. The greater the substitutability (or equivalently, the greater the cross-elasticity of demand), the more the competitive the performance of the market.

The final model is that of a *dominant firm with a competitive fringe* (sometimes call a *dominant firm model*) (slides 48-53). While the math and the diagrams can be a little daunting, the underlying idea is simple. Think of a market with one large firm and numerous smaller firms (for example, a market where the dominant firm has a 70% share and 30 small firms each have a 1% share). The dominant firm appreciates that the competitive fringe will supply the market's demand at the level where the market-clearing price equals the competitive fringe's marginal cost. The dominant firm then maximizes its profit by choosing a price *p*—or perhaps more accurately an output level that produces a price *p*—such that its profits are maximized given its residual demand (that is, aggregate market demand at price *p* minus competitive fringe's supply at price *p*). The model can be expanded to accommodate a "dominant oligopoly" rather than a single monopoly firm using a Cournot or Bertrand model to handle the equilibrium characteristics of the oligopoly. In looking at the class notes, concentrate on slide 48 (slide 49 is a duplicate) and the setup for the simple example on slide 50 up to the specification of the dominant firm's profit maximization problem. You may skim or just skip the derivation of the solution of the problem. Likewise, you can skip the diagrams on slide 52 (which, I must confess, still confuse me every time I look at them).

As you can imagine, dominant firm models can be used in merger antitrust analysis when there are a number of competitive fringe firm collectively accounting for a significant share of the market and two of the more dominant firms are merging.

Enjoy the reading! Email me if you have any questions.

Dale

[5] Also, since a merger increases the HHI, a merger will also result in a higher weighted Lerner index, indicating that the exercise of market power in the market has increased (see slide 38).