PRICES AND PRICE STRATEGIES

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Abstract: *There is a world of difference between a (static) price, like $4 apiece or $3.99 a minute, and a (dynamic) price strategy such as "we will not be undersold," or "our prices are competitive." Yet orthodox price theory all but ignores the distinction. Its nature and (far-reaching) consequences will be explored in unusual detail. Differential Game Theory can furnish an effective (though laborious) method of constructing viable price strategies.*

What follows will consist mainly of excerpts from my recent book *COMPETITION: The Birth of a New Science* (Hill & Wang, July 2007). The greater part of that book (Chapters 8-17) is devoted to economic competition. The story begins with a pair of supply and demand curves, of the sort shown in Figure 1. The third (darkened) curve is called the "transaction quantity" curve, to reflect the fact that the quantity Q(P) exchanged at a given price P can exceed neither the quantity S(P) suppliers are prepared to supply at that price, nor the quantity D(P) buyers demand at that price, it is defined by the relation: Q(P) = MIN [S(P), D(P)]. If the buyers compete as assiduously to get all the goods they can for their money as the sellers do to get all the money they can for their wares, an equilibrium will in theory be established at the price, P* for which S(P) = D(P), since unrequited buyers seem likely to bid up any lower price, while

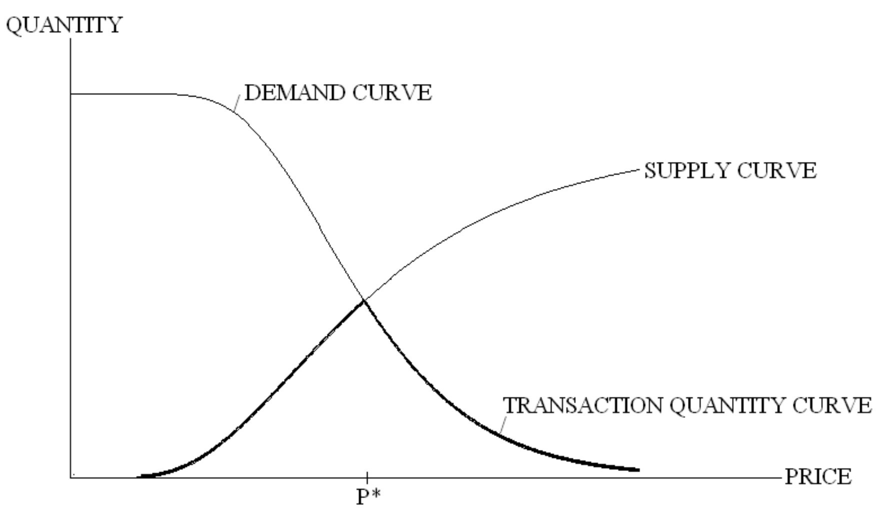

FIGURE 1: ORDINARY SUPPLY AND DEMAND CURVES

suppliers with unsold goods figure to bid down any higher one. Notice that the point at which the supply[*] and demand curves intersect is—of necessity—the highest one on the transaction quantity curve. As a result, single-product markets exhibit a strong tendency to transfer the largest possible quantity of goods from buyers to sellers. This is an early indication of the following

> Efficiency Principle: Under *perfect competition*[1], and with no market failures, free markets will squeeze as many useful goods and services out of the available resources as possible.

Usually attributed[2] to Adam Smith, this exceedingly pregnant principle encapsulates much of conventional economic wisdom. It asserts that a purely voluntary price system—ever and always the active ingredient of "competitive" free markets—may be trusted to coax from the farms and factories, harbors and highways, Indians, chiefs, and other "available resources" to be found in any full-service economy, *maximal output at minimal prices*. Furthermore, anything that interferes with the price system's ability to do this is, almost by definition, detrimental to "the common good."

If it were clear on the one hand that extraction of the largest possible flow of goods and services from "available resources" is the only legitimate goal of economic activity, and on the other that "competitive free markets" automatically achieve that goal, there would be very little need for heterodox economic policy or thought. Traditional *laissez faire* policy would achieve everything possible, leaving no room for improvement via economic pluralism. In truth, both are far from clear.

For one thing, the maximal flow of goods and services from available resources seems to entail the rapidest possible extinction of commercial species of fish in rivers, streams, and oceans; the clear-cutting of forested hillsides; the erosion of topsoil from cropland; the pollution of land, sea, and air; not to mention the relaxation of pure food and drug standards, the exploitation of child/slave labor, the exhaustion of fossil fuels, and other concomitant evils. For another, it is far from clear that such markets are as "allocatively efficient" as conventional economic wisdom insists.

Figure 2 displays three auxiliary curves, derivable from the previous three. The quantity $E(P) = P \times D(P)$ represents the amount buyers are prepared to *expend* on a day when P is the prevailing price, while $R(P) = P \times S(P)$ represents the *revenue* suppliers may expect to realize on such a day, and $V(P) = P \times Q(P)$ denotes the dollar value of the transactions that will actually take place at price P. The price $P°$ for which $E(P) = R(P)$ is evidently the same as the market-clearing price P^* at which $S(P) = D(P)$.

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[*] It was harmless enough, in Marshall's day, to indicate quantity in the horizontal axis, and price on the vertical one. Today, however, with everyone studying calculus, the practice is fraught with danger since it tends to perpetuate the fiction that quantity is an independent variable upon which price depends. In truth, the opposite is more nearly the case.

Because the point at which the revenue and expenditure curves intersect is also the highest one on the transaction value curve, the price P* that maximizes the quantity of goods transferred from sellers to buyers serves also to maximize the revenues realized by the sellers. There is a harmony of interests in such a market, in that the best way for the sellers to make money is to sell the consumers as many goods as they can. Even if allowed to conspire, the sellers in such a market would have nothing to gain by charging more than P*. But such is hardly the usual case. In most markets, conspiracy pays rather well, which is why price-fixing is considered a "restraint of trade," in violation of antitrust law.

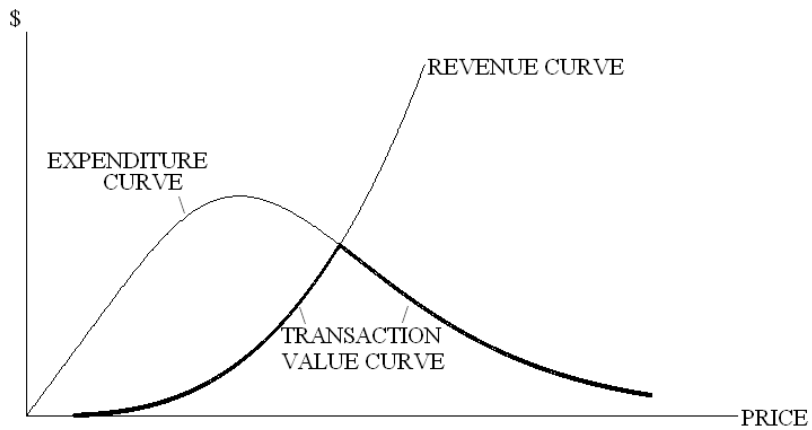

Figure 2: Revenue, Expenditure, and Transaction Value curves

Figure 3 shows the expenditure curve of figure 2, derived as it was from the demand curve of figure 1, intersected by a different revenue curve—one derived from a more abundant supply curve—as would obtain if additional suppliers were to enter the market, making more goods available at every potential price. In it the point of intersection lies well to the left of the highest point on the expenditure curve, which is also the highest point on the transaction value curve, indicating that the sellers can earn significantly more money by charging a significantly higher price P** than the market-clearing one P* for which S(P) = D(P) *and* E(P) = R(P). They can do so because the highest point on the transaction value curve now lies above and to the right of the intersection of the revenue and expenditure curves. The suppliers in such a market have every reason to conspire to raise the price to the revenue-maximizing level P**, while exploring ways to maintain it at that level without overt (criminal) conspiracy.

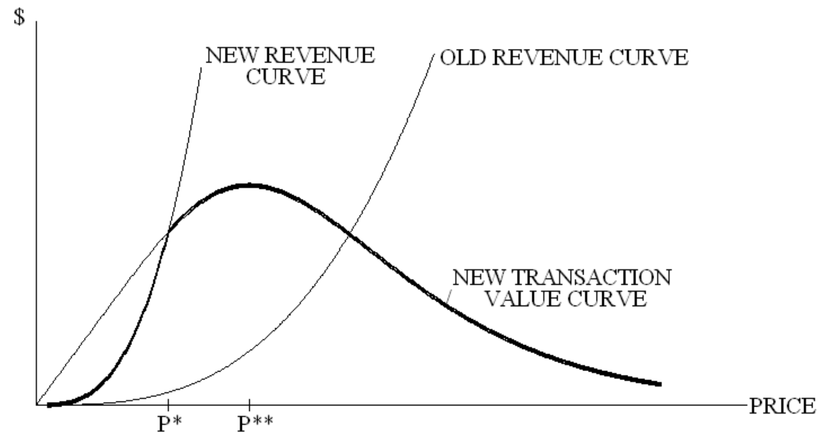

Figure 3: Old and New Revenue, Expenditure, and Transaction Curves

The conspiracy-friendly situation of figure 3 differs from the conspiracy-proof one depicted in figure 2 in that the modified revenue curve intersects the expenditure curve well to the left of its highest point—a reflection of the fact that improved methods of production serve to elevate the entire supply curve, along with the entire revenue curve. The transition from the conspiracy-proof situation depicted in figure 2 to the conspiracy-friendly one on figure 3 appears to occur quite naturally, as technological progress permits markets to be ever more deeply penetrated. Market penetration is an almost taboo subject among orthodox (neoclassical) writers.

Ignored though it typically is in the orthodox literature, the distinction between the conspiracy-proof situation depicted in figure 2, and the conspiracy-friendly one depicted in figure 3, is fundamental. In the first, there is no conflict of interest between buyers and sellers with regard to price. The figure P* at which S(P) = D(P) then suits both camps better than any other. In the second, however, sellers prefer to sell at the (higher) price P** at which E(P) is maximized, since they can then exchange fewer goods for more money. An axiom of the neoclassical faith declares that sellers preferences are of no consequence, because free markets automatically resolve all such disputes in favor of buyers/consumers. Without explaining precisely why, orthodox (neoclassical) price theory simply postulates that the sellers' premium to be had by charging P** instead of P* *naturally goes unclaimed*. No matter how anxious suppliers may be to realize the gains obviously to be had by overt price fixing—and possibly by subtler means as well—something about the market mechanism is thought to prevent competitive suppliers from harvesting the fruits of collusion.

To believe this, it is necessary to accept George Stigler's word that the world's largest corporations know perfectly well that a substantial sellers' premium is there for the taking, yet can't for the life of them figure out how to obtain more than a tiny fraction of it! Few would believe that Willie Mays—perhaps the greatest natural athlete the world has ever known—was too clumsy to walk and chew gum at the same time. Everyone knows that gifted athletes do such things effortlessly, typically without realizing they are doing anything remarkable. Yet economists have convinced themselves (and some few others) that giant corporations are too clumsy to capitalize on an opportunity to earn more money by selling fewer goods. In reality, they capitalize on such opportunities effortlessly, by executing some remarkably simple strategies.

A.A. Cournot, the apparent originator of supply and demand curves, was the first to explain how monopoly prices are chosen. The process is best illustrated with the aid of an auxiliary diagram, such as the one in Figure 4. The curve depicted plots a monopolist's profit against her price. The shape of the curve suggests—as does common sense—that she will lose money if she charges too much or too little, but will prosper mightily if she prices her wares appropriately.

The coordinates of the highest point on the curve in question—call them PRICE* and PROFIT*—represent the profit maximizing price and maximum obtainable profit for the monopolist in question. Before Cournot, economic writers had been so vague about the evils of monopoly as to leave the impression that the laws of supply and demand

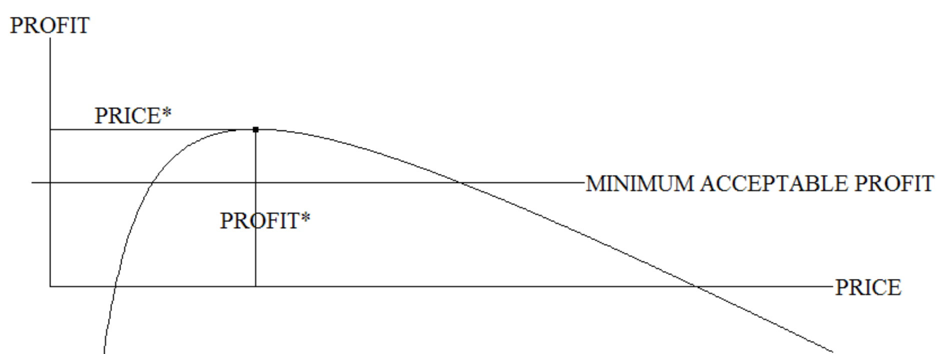

Figure 4: A Monopolist's Price/Profit Curve

don't apply to monopolists. If nothing else, Cournot established that such laws do indeed apply to even the most secure monopolist, who can price herself out of the market as easily as any competitor.

E. H. Chamberlin noticed in or about 1933, as others apparently had not, that Figure 4 also depicts the conditions under which two, three, and possibly more identical firms—selling products as indistinguishable and "undifferentiated" as the eggs, fruits, and vegetables one buys at a farmer's market—necessarily operate. Because they all sell identical products, they are all bound by the "law of one price" to charge the same amount. If they also command equal market shares, the profit curve in Figure 4 again depicts the relationship between their *common* price and *common* profit.

Whereas no firm has any incentive to charge less than PRICE*, firm #1 has every incentive to underbid any higher price. So each firm's profit is maximized by charging PRICE*. Once the firms have discovered as much by bidding an excessive starting price down to the point at which no firm stands to gain from further price reductions, the bidding will cease. Should one of them blunder by driving the common price lower than PRICE*, the rest will be obliged to match the unwelcome cut, harming the initiator no less that the rest. This was the simple argument by which Chamberlin shook the economic establishment to its very roots in 1933. It demonstrated for the first time that—at least in some circumstances—enlightened competition need not diminish an established monopoly price. Independent though they are, the firms involved wield as much pricing power as would a cartel or monopoly. PRICE* remains, with or without competition, the natural market price.

Although Chamberlin seems never to have published a diagram akin to 4, he described its contents with pristine clarity. Had he pursued his train of thought even a trifle longer, he would surely have noticed that similar arguments apply to non-identical firms. As long as the sellers' wares are "perfect substitutes" for one another—meaning that they cannot sell simultaneously at different prices—the natural market price can be identified from a diagram not unlike figure 4. Figure 5, for instance, contains three different price/profit curves, each of which peaks above a different point on the (horizontal) price axis. Firm #1 is the natural price leader because, while it has every incentive to undersell any price higher than P′, no firm has any incentive to undersell that. Given a choice between accepting P′ or accepting less, none has any better option than P′.

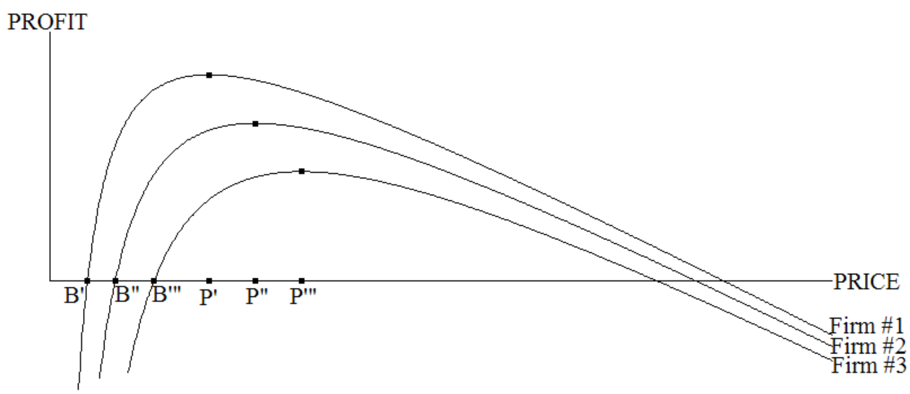

Figure 5: Nonidentical Firms Can Obtain Almost Identical Results

The prices P″ and P‴ preferred by firms #2 and #3 are of little consequence here, since firm #1—merely by pricing its wares at P′—can prevent #2 and #3 from selling for more. Since neither has anything to gain by selling for less, firm #1 emerges as the natural price leader. Price leadership is a common real-world phenomenon. Here at last is a simple explanation for its ubiquity.

The price strategies by which the foregoing result is obtained are simple in the extreme. Noting that firm #1 has nothing to gain by selling for more than P', or for less than B', but a fair bit to gain by selling at any intermediate price, that firm's pricing committee should resolve to accept (aka match) any market price P between B' and P', to underbid any market price in excess of P', and to reject any price lower than B'. Likewise firm #2's pricing committee should resolve to accept (match) any market price P between B'' and P'', while firm #3 should accept only those prices P which lie between B''' and P'''. By following the foregoing "interval matching strategies," all three firms will be led to charge P' unless that figure fails to lie in each of the intervals $B'' \le P \le P''$ and $B''' \le P \le P'''$. Moreover the strategies in question are in approximate Nash equilibrium, since no one of the three firms can earn more money by departing from its assigned strategy while the remaining two adhere to theirs.

It is to be emphasized that it is the *strategies* that are in Nash equilibrium here, rather than the prices they happen to determine. They are "adaptive" in the sense that they direct the firm employing them to adjust its own price to "changing market conditions" in the form of ups and downs in the prevailing market price. Most attempts to analyze price competition between small numbers of sellers—including the so-called Bertrand equilibrium analysis—ignore this point completely. As a result, they constitute wild goose chases: searches for things that don't exist, namely prices and lists of prices to which firms may adhere regardless of what their opponents are asking.

The magnitudes of the preferred prices P', P'', and P''' relative to the break-even prices B', B'', and B''' are significant. Other things being equal, firm #3 is the most vulnerable to attack, because its break-even price B''' is the highest in the industry. If P' were only a little larger than B''', #1 could put #3 out of business simply by charging less than B''' until #3 shuts down. It seems natural, therefore, to describe the gap between the largest break-even price (in this case B''') and the smallest preferred price (here P') as the "vulnerability gap" for the industry. It measures the difficulty (cost) of putting the least fit rival out of business. Marketing warriors seldom seek to eliminate rivals until the vulnerability gap narrows. Only when the expected benefits promise to overwhelm the attendant cost do they consider aggressive action.

Because firms in an industry tend to resemble one another in cost structure and mode of operation, the preferred prices P', P'', and P''' seem likelier than not to form a tight cluster well to the right of the (equally tight) cluster B', B'', B''' of break-even prices. Any technological effort by firm #3 to close the gap between B' and B''' will tend to close the one between P' and P''' as well, without narrowing that between B' and P'. Like the court-confirmed gap[3] between the $49 Microsoft believed it could afford to charge for its Windows software, and the $89 it eventually did charge, the gap between a firm's break-even price and its preferred price will ordinarily exceed the one between one firm's preferred price and that of another.

A moment's reflection confirms that a monopolist (trust) owning all three firms would prefer to charge a price P* intermediate between P' and P''', since the price that maximizes total industry profit cannot lie elsewhere. The monopoly price P* would then exceed the competitive price P', as predicted by traditional economic theory. Yet the difference would be small unless the gap between P′ and P″′ were large. When that gap is narrow, as it presumably is in most industries, P′ closely resembles P*, the monopoly price for the industry in question. Contrary to conventional wisdom, oligopoly prices tend to resemble monopoly prices rather closely, while differing as night and day from the "perfectly competitive" prices with which traditional theory is exclusively concerned.

The critical difference between oligopolies and secure monopolies lies not in the prices they are able to charge their customers, but in the freedom the latter enjoy to dispose of their earnings as they will. Whereas an oligopolist or insecure monopolist must reinvest all or most of its profit in the business—merely to maintain market share—a secure monopolist is by definition relieved of any such requirement. His or her profits can be used to acquire other businesses, to fund philanthropies, or to ape the lifestyles of the rich and famous.

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[1] Italics added.

[2] P.A. Samuelson and Wm. Nordhaus, *Economics: An Introductory Analysis, 16th ed.* (Boston: Irwin/McGraw Hill, 1998) page 29.

[3] Ken Auletta, *World War 3.0: Microsoft and its Enemies*, (New York: Random House, 2001), p.297.