Strategies in Oligopoly Markets

This note introduces the economics of interactive strategies in markets with a rival firm. Prior to class, please prepare your answers to the problem on p. 9-10. We will do this problem as a game in class; come with enough cash to cover how much you are willing to pay for the firm (whatever you decide that should be).

In MGEC 603, you studied firms' best strategies in competitive markets. Here you could ignore your competitors' behaviors because what you did had no "feedback" consequences on your competitors' behavior. You were so small that you had no effect on any of the market fundamentals—demand, technology, or prices.

Now we consider the case where you have a small number of competitors, which is known as an *oligopoly market.* Now you must consider how your strategies are likely to affect your competition, and conversely. Hence, in making decisions, managers must consider (and anticipate) the actions of others.

Theory

Characteristics of oligopoly markets include *few firms, above-normal profits,* and *high barriers to entry.*

> **Barriers to entry** include *economies of scale and scope, high capital requirements, product differentiation, patents, government regulation, cost considerations (e.g., raw materials, a unique location), and access to distribution channels.*

In the two types of market situations considered in MGEC 603—that is, monopoly and perfect competition—a firm's profit-maximizing strategy did not depend (explicitly) on the actions of other firms. In oligopoly markets, optimal strategies will depend on the actions of others. Thus, the actions of any one player affect the payoffs of all.

Because a manager can control his or her firm's actions, but not the actions of other firms, the optimal strategy will require you to make some assumptions about how the

other firms with will act (and react) to your decisions. In oligopoly markets, many behavior assumptions about how firms compete are possible. This means different market outcomes are possible, depending on their strategic decisions and those of their rivals. Still, some economic analysis shows that some strategies—if all firms in an industry are aware of them—can be vastly more profitable for the industry than other alternatives. Knowing what these different strategies are, and *why* they have such significant effects on profitability, is an important part of managing competition with a rival firm.

Let's begin the analysis by solving a strategic problem.

Example

Assume there is currently a sole supplier in a market but a new entrant comes into the market and can produce the identical product. Firms cannot product differentiate. (*In subsequent lectures we will discuss whether it is wise to adopt strategies to keep the new entrant out of the market.*) The two firms have different cost structures, however. The new firm's cost structure provides significant economies at high volume, while the old firm's costs are initially low but rise quickly. (The different cost structures of the two firms is not crucial to the analysis which follows, as you will see after doing the *Problem for Class* in a bit.) Here is the cost structure for firm 1 (new entrant) and firm 2 (older firm):

$$TC_1 = 5 * q_1 \quad \textit{and} \quad TC_2 = 0.5 * q_2^2$$

Here is the total market demand function facing the two identical-product firms:

$$P = 100 - .5 \cdot [q_1 + q_2]$$

where q_1 is the output of firm 1, q_2 is the output of firm 2, and P is the market price.

Market Outcomes with Price Competition

Let's first consider what happens if the two firms pick individually-profit maximizing prices, and then produce to meet demand. If this is a market where firms compete on price, then the firms will lower their prices to capture market share as long as the revenue from selling one more unit of the good exceed the marginal cost of producing one more unit. Under this logic, price will fall to the marginal cost of each firm: P = MC. When we do this, our solution is:

Firm 1 sets $P = MC_1$, which is the same as

$$100 - .5q_1 - .5q_2 = 5$$

so $q_1 = 190 - q_2$

Firm 2 sets $P = MC_2$, which is the same as

$100 - .5q_1 - .5q_2 = q_2$

Now, to find out how much each will produce, substitute for q_1 from above:

$100 - .5 \cdot [190 - q_2] - .5q_2 = q_2$

or $100 - 95 + .5q_2 = 1.5q_2$

so $q_2 = 5$ units. Now solve for Firm 1's production, q_1; from above,

$q_1 = 190 - 5 = 185$ units.

We can then use the market demand curve to find the market-clearing price. Solve for P:

$P = 100 - .5 \cdot [185 + 5] =$ \$5 per unit.

The profits of the firms are:

Firm 1 = $185 \cdot 5 - 5 \cdot 185 =$ \$0

Firm 2 = $5 \cdot 5 - .5 \cdot [5]^2$ or $25 - 12.5 =$ \$12.5

Note that, even though the firms compete on price and drive the market price down to each firm's marginal cost, this does not mean the firms always make zero profit. Here, firm 2 has a marginal cost function that is lower than the price until it makes its 5th unit. So it makes a little profit on the first 4.999... units that it produces, and stops producing at 5 units. Firm 1 does not make any profit here because its marginal cost curve is flat, at \$5 per unit.

Lesson: If you compete on price and do not have a lower marginal cost curve than your competitor (over the range of production you use), you are likely to be in an unprofitable situation *even if your fixed costs are zero*.

***Remark*:** If you are firm 1 (the new entrant), can you think of a better price competition strategy than the competitive price strategy above? One possibility is to differentiate your product—that is, try to change your product so that some consumers will continue to buy it even if you price it above the competition. A second possibility, which we'll cover in session 5, is price-setting leadership by a dominant firm.

For now let's continue to assume all firms in the industry make the same product, so that consumers decide whom to buy from strictly on price. This is an apt description of many real industries, where prices are commonly driven down to marginal costs and only the lowest-cost firm consistently turns a profit. For examples, think of the airlines, where only Southwest consistently makes a profit, or low-cost Wal-Mart's successful clobbering of local grocers.

Market Outcomes with Strategic Capacity Decisions

Can our two firms compete in a different way that does not drive profits down to peanuts? Augustine Cournot, a 19th Century French economist, hit upon a very clever solution to this problem. He noticed, just as we did earlier, that price competition would erode profits for the two firms—to zero if they both had flat cost structures, and below zero if they had high fixed costs. What would happen if instead they *compete by quantity*? By that, we mean each firm (1) first chooses its output level (plant capacity, effectively) and (2) then sets price to sell all its production. Cournot developed the industry strategy under this assumption and found out that profits were potentially a lot higher.

To make Cournot's analysis a little more concrete, think of industries where firms

(i) must invest in capacity before they can produce, and

(ii) make identical goods or provide identical services (or nearly so).

Many industries have these attributes. Examples include oil refining, computer memory chips, primary steel-making, glass manufacturing for flat-screen TVs, paper mills, and so on. There are also capital-intensive service industries that have these same two attributes, such as ocean container shipping and long distance telephone service. The economics of industries like these mean that firms choose capacity levels and how much to produce, but set their (wholesale) prices "at the market"—that is, at whatever price keeps unsold inventory from piling up and capacity from being idle. And that "market price" depends on market demand and the production (capacity) decisions of the *other* firms in the market.

Cournot used the behavioral assumption that the manager of each firm maximizes its profit taking the quantity produced by the rival firm as a given. That is, each firm would look at the size of production—profitable plant capacity, really—of its rival, and then maximize its profit under the reasonable assumption that their rival would use all of its profitable plant capacity. Of course, the rival would look the first firm's plant capacity and makes its own best, profit-maximizing decision. *Clearly, this is an interactive strategy game—now played out in strategies of plant capacity, not prices.* Cournot's big idea is that firms should compete by choosing production capacity (or quantity), knowing that—with identical products—prices will end up being forced down to whatever level will clear the market given industry-wide production.

Let's see what happens to industry profits when firms compete in the way Cournot thought they should. We'll use the same two firms and market demand we had previously, but now let's solve our problem using Cournot's solution. Here we'll assume a firm's capacity is the same as its output quantity to simplify the analysis (that is, we assume there are no inventories for convenience).

Firm 1: Sets $MR_1 = MC_1$ by choosing its production quantity (i.e., capacity) level, q_1.

$TR_1 = 100q_1 - .5\cdot[q_1 + q_2]\cdot q_1 = 100q_1 - 0.5\, q_1^2 - 0.5\, q_1 q_2$

$MR_1 = 100 - q_1 - .5q_2$

$MC_1 = 5$, so $100 - q_1 - .5q_2 = 5$

$q_1 = 95 - .5\, q_2$

This last equation has a special name: it is called f*irm 1's reaction function.* It expresses how much firm 1 wants to produce, as a function of how much *the other firm* decides to produce. For each additional unit of output from firm 2, here firm 1 will find it profit-maximizing to cut back its production by 0.5 units. *Why does firm 1 want to cut back production if its rival increases production?* To prevent the final market price from falling too much!

Now, if Cournot's logic holds for all firms in the industry, we can examine firm 2's decision in the same way.

Firm 2: Sets $MR_2 = MC_2$ by choosing q_2.

$TR_2 = 100q_2 - .5\cdot[q_1 + q_2]\cdot q_2 = 100\, q_2 - 0.5\, q_2^2 - 0.5\, q_1 q_2$

$MR_2 = 100 - q_2 - 0.5\, q_1$

$MC_2 = q_2$, so $100 - q_2 - .5q_1 = q_2$

$100 - .5q_1 = 2q_2$

$q_2 = 50 - .25q_1$

This last equation is *firm 2's reaction function.* It expresses how much firm 2 wants to produce, as a function of how much firm 1 produces.

Now, here's the crux of Cournot's idea. If a firm's management is strategic and diligently maximizes profit, then it should not want to change its output level after it learns its competitor's actual decision. This is called a *no regrets strategy*. It means that firm 1 chooses the best output level given what firm 2 actually does, and similarly firm 2 chooses the best output level given what firm 1 actually does. Only if this holds will Firm 1's quantity choice be profit-maximizing after-the-fact *and* Firm 2's quantity choice be profit-maximizing after-the-fact—which is to say, *each firm will have no regrets about its production (i.e., capacity) decision.*

Algebraically, it is pretty easy to find this "no regrets" outcome (Cournot's solution) when firms first choose their production levels and accept the market-clearing price. You do this by solving the two firms' reaction functions for the actual number of units each should produce. Continuing our problem, if you substitute firm 1's reaction function into that of firm 2:

$$q_2 = 50 - .25\cdot[95 - .5q_2]$$

$$q_2 = 50 - 23.75 + .125q_2$$

Solving for q_2 yields $q_2 = 30$. So firm 2 should produce 30 units. Now for firm 1, substitute this output level back into firm 1's reaction function:

$$q_1 = 95 - 0.5\cdot 30 = 80 \text{ units.}$$

So firm 1 should produce 80 units.

To complete the market outcome, we can now calculate the price that will prevail in the marketplace. Using the market demand curve when total industry production is 80 + 30 = 110 units yields

$$P = 100 - .5\cdot[q_1 + q_2] = 100 - .5\cdot[80 + 30] = \$45 \text{ per unit.}$$

Calculate the profits:

firm 1: profit = $80\cdot 45 - 5\cdot 80 = \$3200$

firm 2: profit = $30\cdot 45 - .5\cdot[30]^2 = \$900$

Total industry profit is \$4100. Now compare this to what happened when the firms competed on price: with price-competition strategies, profits were driven down to \$12.5 + \$0 = \$12.5. *Wow.*

A Key Point. At this stage, it is natural to be wondering, "OK, how in the world did the firms get $4100 in total profit out of the market when they compete by choosing quantities, yet they could only make $12.50 in this same market if they compete on price?" The answer is that when firms compete by quantities, they can attenuate the fall in the market price when a rival acts to expand its market share. That is, if one firm decides to boost its output to capture more of the market, then you can cut back your production somewhat and arrest the decline in the final market price. This allows the competitors to make more profit—sometime *much* more profit—than under pure price competition.

The Reaction Functions, Graphically. There is a graphical representation of the *no regrets* outcome that is sometimes helpful. Figure 1 has the possible quantities of firm 1 on the *y*-axis, and the possible quantities of firm 2 are on the *x*-axis. The two lines are the two reaction functions we calculated above. Where the lines cross is Cournot's solution: It is the only pair of output levels in which each firm will have no regret about its decision, given the output decision actually made by its rival.

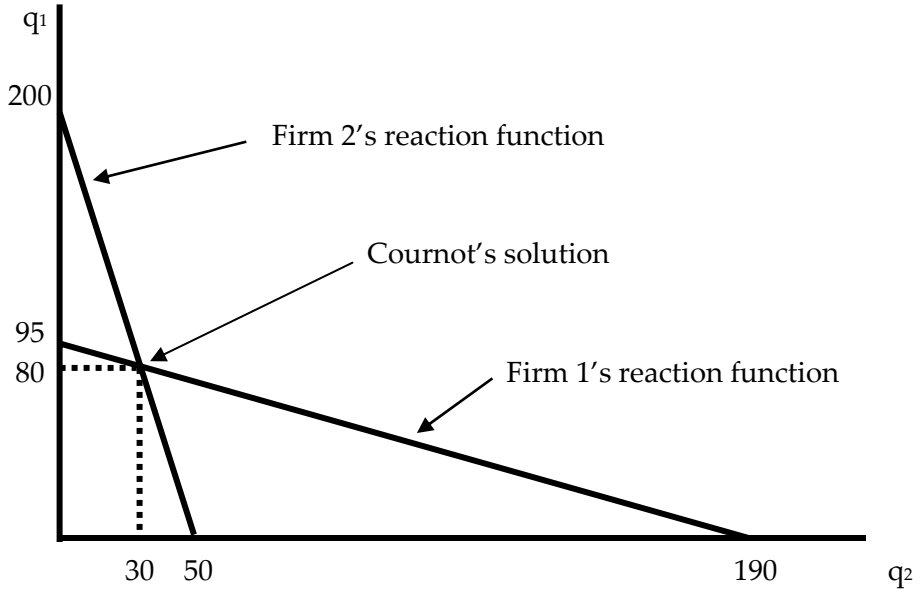


FIGURE 1. *The two reaction functions and Cournot's solution*

There are two key things to note about Figure 1. First, the output decision of firm 1 is negatively related with that of firm 2. In other words, the more output managers of firm 1 expect firm 2 to produce, the less output firm 1 will want to produce. Second, for any given output for firm 2, the corresponding point on firm 1's reaction function will maximize firm 1's profit. That is why the only point where both firms will be able to maximize profit, given what each other actually does, is where the two reaction functions cross.

And if you are maximizing your profit given what your competitors actually do, then you should have no regrets about your decision.

Time for a Reality Check

Do firms really compete by strategically choosing capacity (or output levels), and then just take whatever price the market will bear? Sure. The prototypical example is U.S. oil refining. In oil refining, the gasoline (of a given octane) produced by all the refineries in a geographic region is actually *identical*. It has to be—in the US, the gasoline produced by different refineries is actually commingled in the pipelines that carry it to distribution terminals (tank farms) in other cities. The fact that each firm's output is chemically identical forces each refinery to set pretty much the same refinery-gate price for the output it sends into the pipelines. Why? Think about it: if a refinery set a price above the market's, then gasoline buyers will just buy from someone else. And if a refinery sets its price below the market, it will sell all its production sure enough but it is leaving money on the table by not raising its price. The bottom line is that the market dictates the wholesale price of refined fuels to the oil refineries, not the other way around.

Now back to Cournot's idea and oligopoly markets in practice. What refinery owners control—and control it very well indeed—is their individual production capacity. As we have just seen, by being strategic in choosing individual capacity levels firms can avoid spiraling down to an outcome in which the industry is unprofitable for everyone. And, amazingly enough, the US refining industry has managed to avoid having a net increase in total production capacity *for more than thirty years*—despite the fact that the demand for gasoline in the US has increased several-fold over this time. The petroleum refining business is a quintessential strategic capacity game.

The one-page *Financial Page* article "All Pumped Up" at the end of this note explains this basic economic idea in laymen's terms. When firms compete on capacity—*even if they make identical products*—oligopolies can be highly profitable industries. Cournot's analysis helps us understand why.

Other Applications

Consider the short WSJ article at the end of this note titled "Capacity Boosts Take Toll on Many Firms." What strategy would you recommend to Union Camp Corporation and its fellow competitors in the container board industry?

Problem to Prepare for Class

Please come to class with your answers to the following problem. You may find it easiest to use Excel (although that is not necessary). As usual, you do not need to turn in your work on class-session problems. We will do this problem as a game in class.

The Duopoly Game

Two firms compete in a market. Both firms produce identical goods. Each firm has a constant marginal cost of $2 per unit, and each firm has a fixed cost of $60.

The two firms compete for sales to twenty-five potential customers in this market. Each potential customer will buy either one unit or zero units, depending on the market price. Customers vary in how much they are willing to pay. Specifically, there is one potential buyer who is willing to pay at most $25 for her unit; a second potential buyer willing to pay at most $24 for his unit; a third potential buyer willing to pay at most $23 for her unit; and so on down, in $1 increments, to the last potential customer who is willing to pay at most $1 for her unit. (*To check your understanding, this means that if the market clears at a price of $11, then 15 customers will buy one unit each for a price = $11, and 10 customers will not buy anything).* Both firms know all of this information about market demand.

In this market, firms must first decide how much to produce. Each firm initially makes its production decision in secret. The two firms' production decisions are then conveyed (simultaneously) to all 25 potential customers. The market clears at a price where total supply equals total demand (that is, where the total number of customers who want to buy at the market price equals the total quantity produced).

Suppose that you are thinking of acquiring one of these two firms. If you acquire it, then you and the other firm will compete as described above, and you keep all of your firm's profit. The other firm has recently changed ownership and management as well, and you know nothing about it beyond the cost information given above.

Questions: Assume here that you want to maximize your profit, of course.

(a) If you acquired one of these firms, what quantity would you produce?

(b) What is the maximum amount you would be willing to pay to acquire one of these two firms? (*That is, before they compete!*)

(c) Suppose you could observe how much the owner of the other firm was willing to pay when he or she acquired that firm. Would this information affect your quan-

tity decision in part (a)? If so, how (quantitatively)? *NB: If you find this part hard, don't worry. We'll see how it matters in class, after doing (a) and (b).*

(d) Are you sure about (a), or would you be nervous playing this game for real? Why?

Managerial Implications

1. *Inter-dependent strategies.* When payoffs are interactive, no independent optimal strategy exists; a strategy is optimal conditional on the actions of others. Hence, managers must anticipate the actions of others.

2. *Oligopoly price competition.* If firms produce similar (or identical) products and compete on the basis of price alone, then prices tend to be close to marginal costs. Unless you have a cost advantage over other firms in the market, this tends to be a money-losing business.

3. *Making capacity decisions.* Industries can often avoid this low-profit price competition scenario if the firms must first choose production levels (i.e., plant capacity), and do so mindful of their rivals' similar decisions as well. In this case, profits can be far higher than with price competition. This tends to arise in industries with three key characteristics:

    a. Production *requires* expensive investments in capacity;
    b. There are long lead times to expand capacity; and
    c. There are high barriers to entry, keeping new firms out of the industry.

4. *Knowing your competitor.* In most markets managers can form several behavioral assumptions about their competitors. Which ones are correct, in the sense of being an accurate predictor of your competitors' behaviors? That means knowing your competitor, and that knowledge typically comes from having worked with the firm, and the CEO, over many years.

5. *Knowing thyself.* There are advantages to staying with an industry "insider" when looking for someone to run your company, particularly in industries with large firms where strategic interactions are crucial to making profits. In price-competitive industries you make money by being cheaper or different, so appointing a successful "cost-cutter" or "great product manager" from the outside may make the most sense. But in strategic industries, CEO reputation as a trustworthy player may be most important.

THE FINANCIAL PAGE

PUMPED UP

At first glance, there's nothing unusual about the refinery that Marathon Oil owns in Garyville, Louisiana. Like most refineries, it is in a small town near a port. It can refine two hundred and forty-five thousand barrels of oil a day, which is around the industry median. And the people who live near it have got used to the smell of sulfur dioxide. Indeed, the only thing that's special about the Garyville facility is that it was opened in 1976. That makes it the last refinery ever built in the United States.

Until recently, this didn't seem like a problem. Gasoline was cheap, and no one was clamoring to live next to a highly combustible chemical plant. So, over the past twenty-five years, the number of refineries in the U.S. has been cut in half, and although the remaining ones have expanded, they haven't kept up with the growing demand for gasoline. But now, with voters furious about three-dollar-a-gallon gas, Washington has decided that this trend must change. Samuel Bodman, the Energy Secretary, has exhorted oil companies to use some of their hefty profits to expand refining capacity, and Congress is considering streamlining the environmental regulations that add to the expense of building new refineries. The hope is that, with a little push and pull, refiners will embark on a building spree to ease the pressure at the pump.

Unfortunately, the lack of capacity that Washington sees as a crisis looks like an ideal business model to oil refiners. There are so few refineries in the U.S. now that they are run tight to the bone, typically using about ninety per cent of their total capacity. The result is that refining—which, until recently, was a tough, low-margin business—has become tremendously lucrative. Last year, refiners' profits jumped thirty-nine per cent, to twenty-four billion dollars, and this year should be even better. In California, gasoline prices have risen forty-eight per cent since the end of last year, even though crude-oil prices are up just seventeen per cent. Most of that difference has gone straight into refiners' pockets.

In a normal marketplace, of course, high prices and profits would drive companies to expand, in an attempt to capture more of the market, or else new players would emerge, hoping to outmaneuver a risk-averse establishment. But the refining industry isn't a normal marketplace. For one thing, refineries are huge investments—a new one costs at least two billion dollars—and they take a long time to open. This means that although refiners might make more money by opening new facilities and thus serving more customers, they'd rather take the sure money than gamble. It also means it's hard for new competitors to raise enough capital to enter the market at all.

What's more, over the past fifteen years

refiners have been buying each other up, creating an industry that's highly consolidated. In 1993, the five biggest refiners in the U.S. controlled thirty-five per cent of the market. By 2004, they controlled fifty-six per cent. And refining is primarily a regional business. The government allows different states to use different formulations of gasoline—some formulations burn cleaner than others—and in some urban areas a federal requirement determines what formula can be used, depending on the quality of their air. That makes it hard to ship gas across state lines, and shrinks the number of refiners that provide a particular blend of gas, giving each refiner more power. As a result, in many areas the refinery business is more like an oligopoly than like a competitive market. In 2002, a Senate report identified "tight oligopolies" operating in twenty-eight states; in California in 2003, ninety-five per cent of the refining market was in the hands of just seven companies.

Markets with few players selling a product as necessary as gasoline have unusual dynamics. In most businesses, there is no upside to having a plant or a store shut down: you lose sales, your stock goes bad, and your customers leave. In refining, though, you can sometimes make more money by selling less gas, or vice versa. Far from needing to add capacity, refiners can flourish even when they subtract it. When Hurricanes Katrina and Rita hit the Gulf Coast, for instance, Marathon Oil had to shut down two of its refineries, including Garyville. But the price spike that followed was so big that Marathon made twice as much from its refining operations in the third quarter of 2005 as it had a year earlier. There has never been evidence of refineries' deliberately taking themselves offline, but it's not unthinkable. During the California electricity crisis of 2001, after all, energy producers like Williams Energy found that it made economic sense to withhold power from the California market—to turn down sales—because doing so sent prices way up.

Some have suggested that the lack of new refineries points to collusion on the part of refiners—an agreement to reduce capacity and divvy up the market, much as OPEC does for crude oil. But in refining today there's no need for a cartel; the investment decisions that the companies make have such a direct impact on prices that it's rational for each of them individually to limit capacity. And if Washington wants a scapegoat it might take a look at itself. By not vetting mergers more carefully, government regulators allowed many refiners to achieve "market power" (the ability to influence the market price of what they sell), and other regulators enhanced that power by mandating gasoline standards without considering competition. High gas prices usually provoke one of two explanations: either they're evidence of a conspiracy or they're just the result of the free market at work. The good news is that there's no conspiracy. The bad news is that there's also no free market.

—James Surowiecki

CHRISTOPH NIEMANN

ECONOMY

Capacity Boosts Take Toll on Many Firms

Supply-Demand Mismatch Exerts Pressure on Prices Across Several Industries

By FRED R. BLEAKLEY
Staff Reporter of THE WALL STREET JOURNAL

The economy was perking along and paper prices were hitting record highs early last year as Union Camp Corp. began reaping the benefits of a grand expansion plan. Four years earlier it had installed some of the biggest, newest machines to increase its capacity by one third. The orders were rolling in.

There was only one problem: Other paper companies had the same idea. As the supply of containerboard—the basic material for packaging crates — overwhelmed demand, prices plummeted to $350 a ton from $520.

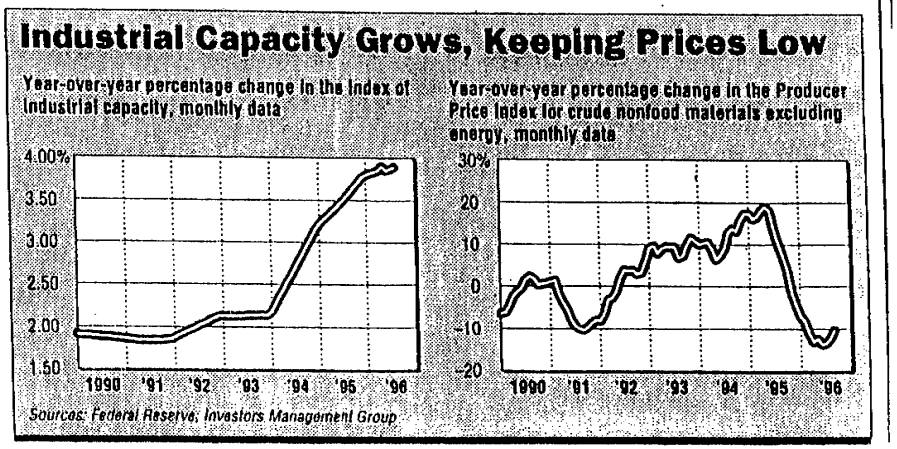
"Everyone wanted to maximize their new investments," says Stuart Howell, Union Camp's head of strategic planning. "There were too many big dogs at the same dish." He is hoping the pricing trend will reverse with the Oct. 1 posting of a $30-a-ton increase. But, he adds, "it's too early to tell if it will stick."

Spreading Problem

Far from unique, the supply-and-demand mismatch that has pushed down prices in the paper industry has become a problem for a number of American industries as evidence grows that companies have invested too heavily in new plant and equipment. The trend already has thrust some companies into cutthroat pricing battles to keep their own production lines running at a good clip. Others in such areas as steel and rubber are bracing for more competition from new plants due to be fired up next year and beyond.

While such pricing pressure is good news for consumers, it is likely to eat into the heady profits many companies are currently enjoying. And if the economy weakens, the capacity growth in many other industries could prompt another round of belt tightening.

"We have too many products chasing too few buyers," says James Paulsen, an economist and chief investment officer of Investors Management Group, Des Moines, Iowa. He adds that the pressure to lower prices is rising in many industries because growth in total U.S. industrial capacity has risen sharply over the past two years.



Since the second quarter of 1991, the annual rate of business spending for capital equipment in the manufacturing sector jumped from $368 billion after inflation to $563 billion in the second quarter of this year. The Federal Reserve reported last week that the nation's factories, mines and utilities operated at 83.3% of capacity in September, down slightly from 83.4% in August and July. In late 1994, the rate topped 85%. Economists say the recent declines were due to a combination of slower production and continued buildups in capacity. Lower utilization rates are believed to hold down the inflation rate.

In the steel industry, USX's Corp.'s U.S. Steel Group is bracing for more competition from new minimills that will go into production next year. Encouraged by the pickup in demand for steel in recent years and the recovery in prices over the past year, steel companies are planning to add 10 million tons of capacity next year, an 8% leap from present levels and the largest increase in a decade. U.S. Steel President Paul Wilhelm expects demand to remain strong next year, enough to keep a floor under present prices. But, he concedes, the question is how disciplined "the new minimill producers will be."

Not as much as the steel industry would like. Analysts expect a 3% decline in the prices of the most popular steel. "It's going to be a tough year for steel producers," one Wall Street analyst predicts.

Rubber and Plastics Industry

The same is in store for the $30 billion rubber and plastics industry. "The economy won't grow fast enough to absorb new capacity due to be added in 1997 and 1998," says Merrill Lynch & Co. analyst John Roberts. "It's unlikely that this late in the economic cycle demand will outpace capacity."

The combination of weaker sales and new additions to capacity add up to lower utilization rates and eventually more pressure to delay or forestall price increases. In the automotive sector, the motor vehicle and parts capacity utilization rate fell the most in last Thursday's government re-

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port — to 79.8% from 82% — largely due to sluggish sales.

But capacity buildup played a part too. Since late 1994, when the capacity utilization rate for the group was nearly 89%, capacity in the industry has increased four times as fast as the 3.7% rise in production. Capacity in the overall durable manufacturing category, which includes autos, appliances, furniture and other industries, is now 7% higher than a year ago — a pace not matched by demand.

To be sure, the prospect of stronger international sales, especially from the developing countries of the world, has spurred much of the capacity additions by U.S. industry. In computers and semiconductors, the prospect of millions of middle-class consumers in the developing world eagerly embracing technology in coming years has many industry officials believing many more plants than now on the drawing board will be needed.

Although Texas Instruments Inc. was one company that suffered from a rapid buildup in semiconductor capacity in 1996, the company sees that capacity being rapidly absorbed by customer demand. Vladi Catto, chief economist of Texas Instruments, figures demand for semiconductor chips will grow at a 20% clip over the next few years and that within 10 years the developing world will be spending more money on them annually than current world-wide sales of $150 billion.

Impact on Inflation

Overcapacity can lead to downward price spirals within industry and product groups. However, it can be "good news for inflation," says Gail Fosler, chief economist of the Conference Board, a nonprofit business research group, in New York. She thinks the excess is unlikely to get out of hand, yet notes that the excess capacity that does exist tends to keep prices in check.

Even so, there is a ripple effect to overcapacity that has some capital-equipment suppliers worried. Unless they are part of the buildup, truck, forklift and machinery suppliers may see orders slow as their customers grapple with how to make full use of what they already have on hand. "My clients in heavy manufacturing hope they can keep prices constant next year; they're worried about deflation," says Kurt Karl, head of the U.S. forecasting for Wefa Group, an Eddystone, Pa., economic consulting firm.

Mr. Paulsen, the economist, says his industrial clients share those concerns. He adds that the reason inflation didn't climb in recent years, as is customary during economic expansions, was due to slower-than-average sales growth and above-average capacity growth. Now, with added capacity still coming on stream, his prediction is that overall inflation will decline more than usual during the next sharp economic slowdown or recession.