

Appendix 2: Porter's Five Forces

Chapter 1 is an introduction to Part I of the book, explaining why we begin with a subject that is usually consigned to the end of texts on microeconomics if discussed at all, namely the economics of relationships. The explanation refers to one of the foundational frameworks of modern strategic management, *Michael Porter's Five Forces*.

If you have studied strategic management, you may have encountered the Five Forces already, or one of the variants that authors other than Michael Porter employ for the same purpose. But if you have not become acquainted with the Five Forces, it is good “general education” for you to do so, and I offer in this appendix a brief introduction, a bit more detailed than is given in the text.

Michael Porter's *Five Forces* is a scheme or framework for organizing facts about a particular industry to answer the question, How profitable are firms in the industry likely to be? Porter suggests organizing the data into the categories of *rivalry*, *supplier power*, *customer power*, *substitute products*, and *barriers to entry*.

In 1974, the disposable diaper business in the United States, a very profitable business, was largely controlled by Procter & Gamble (P&G), which held a 69% market share.¹ Kimberly-Clark held another 17%, and 9% of the market took the form of private label sales. The business was extremely profitable for P&G; P&G's pretax income from diaper sales was estimated to be \$55 million, a return on sales of 25%. (In comparison, P&G's income from all other lines of business was approximately \$245 million, a return on sales of 6.9%.) What was it about this industry that made it so profitable for P&G and, to a lesser but still significant extent, for other firms in this industry?

Because so many variables enter into an answer to this question, it can be hard in specific cases just to keep track. It is helpful, therefore, to have a filing system for sorting through the facts concerning a specific case. Perhaps the most popular and widely used filing system, applied to profitability of firms within a given industry, is Michael Porter's *Five Forces*, as formulated initially in *Competitive Strategy* (New York: The Free Press, 1980). In Porter's framework, you examine the situation of a given industry by looking at five

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¹ For details and all figures reported here, see “The Disposable Diaper Industry in 1974,” Harvard Business School Case 9-380-175, revised 1981, reprinted in Michael E. Porter, *Cases in Competitive Strategy* (New York: The Free Press, 1983).

groups of factors, the so-called *Five Forces*:

- *Rivalry* among existing firms in the industry, the discipline of competition among the firm and its direct rivals.
- *Potential entrants* (and barriers to entry and mobility).
- *Substitute products* (and complements).
- The bargaining power of *customers*.
- The bargaining power of *suppliers*.

Roughly, according to Porter, firms within an industry are more profitable: the less intense is the rivalry in its industry; the less danger of potential entrants and the higher the barriers to entry; the fewer substitute products for what it sells, the more restrained the firms that sell those substitute products, and the more aggressive and numerous the firms that sell complementary goods; and the weaker the bargaining power of its customers and suppliers. This appendix provides further detail on this framework, illustrating with the case of the disposable diaper industry back in the 1970s.

What is the Industry? What are Important Niches?

In Porter's framework, the first-level unit of analysis is the *industry*. We are interested in profitability of the industry as a whole, so the focus is on factors that affect *all* members of the industry.

Of course, different firms within an industry are differentially profitable. In Porter's framework, we explain those differences by noting the different conditions facing different firms. In some cases, the firms within an industry can be organized into *niches* within the industry; firms within a given niche face similar conditions, different from those facing firms in other niches; then the niche becomes the unit of analysis. And when individual firms face unique conditions, the individual firm (and how it differs from its niche- and industry-mates) becomes the focus.

The initial task in carrying out a Porter-esque analysis, then, is to define what constitutes the industry. Does the industry that includes Coca-Cola and Pepsi also include Royal Crown? Snapple? Anheiser-Busch InBev? E.&J. Gallo? Do we include Vittel, and since Vittel is owned by Nestle, should we then include the Hershey Company? This list can be continued along a path that takes us, a step at a time to, say, Foster Farms, a producer of packaged chicken. It is relatively clear that Foster Farms is not in the same industry as Coca-Cola and Pepsi. But where is the line drawn? Are Coca Cola and Anheiser-Busch in different industries or in different niches of the same industry? What about, say, Anheiser-Busch versus Gordan-Biersch (a

small craft-brewery in the San Francisco Bay Area)? The question to address is, In terms of the five forces, which firms face roughly similar conditions and which exist in a different, if related, universe? There are no hard-and-fast rules here; you must rely on judgment in specific instances. And in some sense, drawing a single line is not logical; the world is not in or out but a matter of degree. Two things make drawing the line less than crucial:

1. If too expansive a definition is used, you can still use the notion of niches within an industry to get to a more useful unit of analysis.
2. If you draw the lines too tightly, the third factor, *substitute products*, captures firms you place outside the industry; wherever you draw the line, you do not ignore the impact of outside firms.

Example: Disposable Diapers

One question concerning the definition of the industry in this specific case is whether to include within the industry cloth diapers, either washed at home or procured through a diaper service. If we include either form of cloth diapers in the industry, then the disposables become a distinct niche. If we do not include them, then home-washed and diaper-service diapers are substitute products.

And a second question concerns the geographic scope of the industry. Is the industry global? Should we look only at North America? Transportation costs (as a fraction of the price of the product) might argue for a regional definition of the industry; manufacturing technology (and firm-specific proprietary knowledge) pushes for a larger scale.

There are no uniquely right answers to these questions, but they are questions that must be answered, at least tentatively, at the outset. For the disposable diaper industry in 1974, my judgment is that it probably makes the most sense to choose North America for the extent of the market and to treat cloth diapers as substitute products, so that is how I will proceed. But when you make choices of this sort, you should be ready to amend your choices when the analysis suggests that a broader or narrower definition of the industry is warranted.

Having defined the industry, the five factors are examined one by one. I leave rivalry to the end, for reasons that will become apparent.

Substitute and Complementary Products

The force of *substitute products* reminds us that the ability of firms within an industry to make large profits through the imposition of high prices is limited, at least to some extent, by the existence of substitute products. In

part, this is a simple matter of what economists call demand elasticities (discussed in Chapter 7 of the text): Formally, the elasticity of demand for a product is the percentage demand for the product falls per one percent rise in the price of the product, other prices held fixed. So the more and better substitutes there are for the product in question, the higher the elasticity of demand facing the industry—more customers switch to an acceptable substitute—hence the lower the profits the firms within the industry can achieve.

When looking at a particular industry, you should be pretty liberal in your use of the term *substitutes*. In practice, there is sometimes a tendency to look for tangible substitute products: Commercial airlines see bus, train, and highway transportation as substitutes. But if the industry is, say, commercial air transportation between major European cities and a large fraction of that business or its profits comes from business travel, think at least prospectively of teleconferencing and other ways of doing business across a distance when you think of “substitutes.”

While Porter's original list did not explicitly consider the impact of *complementary goods*, in some cases complements can be as important as or more important than substitutes. For instance, makers of air-engines must be concerned with the actions of airframe manufacturers. In general, what is good for you concerning the producers of substitutes is bad concerning the producers of complementary goods and vice versa. For example, the aircraft-engine manufacturers benefit from the cuthroat competition of Boeing and Airbus, because lower airframe prices mean increased demand for airframes, which means a more robust market for aircraft engines.

Disposable Diapers, Continued

For firms in the disposable diaper industry (in North America, in the 1970s), the obvious substitute products were cloth diapers, purchased by families that do their own laundry, and diaper service firms that provide laundered cloth diapers, picking up soiled diapers for cleaning and reuse.

Diaper services were a more convenient alternative to home laundry but also a more expensive alternative. The diaper-service industry was quite fragmented, which normally means a more competitive industry and bad for the disposable diaper industry, but the industry was typically quite concentrated on a local basis, with constant allegations of local price fixing, which is good for disposables.

The big advantage of disposables is convenience in use and disposal. This is particularly true when baby and parent(s) travel. Hence, a rise in general mobility acts as a complement to disposable diapers; airline deregulation was good for the disposable diaper business. (You might think that

the impact of airline deregulation is small, because most people with diaper-clad children don't travel all that much. But the decision whether to go cloth or go disposable is, in many cases, a one-or-the-other decision. And parents who anticipate increased airline travel will, on the margin, be inclined to go with disposables.)

The Bargaining Power of Customers and Suppliers

The power of firms inside an industry to make substantial profits depends on how strong they are vis-à-vis their suppliers and customers. The seven sister oil refiners were once the epitome of a strong oligopoly, until OPEC came along and raised the price of crude oil. Major airlines and large airplane leasing companies are able to insist on preferential treatment from the airframe manufacturers Boeing and Airbus and from aircraft-engine manufacturers, such as Pratt & Whitney, GE, and Rolls Royce, which erodes the profits of the manufacturers.

What makes a customer or supplier powerful? Among the factors are these:

- The supplier has a unique franchise on a particular product required by firms in the industry, protected by patents or some other barrier to entry.
- The supplier industry is not restrained by any close substitutes for its product.
- The supplier industry is concentrated, with firms that are not aggressively rivalrous with each other.
- The client industry is highly concentrated.
- The client industry takes a very large share of the products of the industry in question. For example, tire manufacturers are at a substantial disadvantage vis-à-vis the auto assemblers, because such a large percentage of their output is sold to the auto assemblers.
- The product being sold is inessential to the clients. (This is, more or less, the problem of substitutes all over again.)
- The cost of the product being sold is a substantial fraction of the client's total costs—or, if the client is a consumer, the client's budget—so that the client is apt to resist attempts to push up prices.

You will see many more items on lists like this one in more complete treatments of this subject. Sometimes you see items that are less than clear. For instance, it is sometimes asserted that a supplier is more powerful the less important the industry is to the supplier's overall demand. The reasoning

is that, the less important the industry is to suppliers, the better able the suppliers are to tell the industry to "take it or leave it." But the more important the industry is to suppliers, the more attention the suppliers pay to the industry and the greater the efforts they expend to get as much out of the industry as they can. Put the other way around, suppliers may be unwilling to spend the effort required to get the most they can out of an industry that represents a small share of the suppliers' business. This may depend, in turn, on the extent to which the supplier's overall reputation is affected by what it does vis-à-vis this industry, a topic we discuss in Chapter 4. There are no easy answers, either theoretical or empirical, along this dimension.

Moreover, the notion that more powerful suppliers or customers means less profit is, perhaps, true on average. But under certain circumstances, empowering suppliers or customers can increase profits. The details, which involve a closer look at economic relationships, are supplied in Chapter 5. For now, simply note that there is more to this story than the straightforward admonitions to avoid powerful suppliers or customers and to avoid empowering either group.

Disposable Diapers, Continued

The position of the manufacturers of disposable diapers vis-à-vis their suppliers and customers was fairly strong, very strong in the case of P&G. Diapers are manufactured in a continuous flow process, using large, complex machines. The raw materials are the outer and inner liners and the fluff pulp filler that absorbs the "moisture." Paper and woodproduct firms, such as Kimberly-Clark, produced their own fluff pulp. P&G must buy it, but several large paper or woodproduct firms would welcome the business. Outer liners come from large plastics firms and are not extraordinarily specialized. Inner liners, which ideally let moisture cross in only one direction, are more specialized, produced by Kendall, J&J, Sterns & Foster, and Dexter Corporation, a fairly concentrated group but perhaps not as powerful as the diaper manufacturers. The diaper forming machines are crucial to low-cost production, and one might imagine that manufacturers of these machines have substantial bargaining power. But this power is substantially diluted because newly purchased diaper forming machines are not themselves very valuable. A brand new machine might produce 125 diapers a minute, but by making on-site improvements to a given machine, based on its own proprietary experience and knowledge, the diaper manufacturer could triple this rate of production. Other "suppliers" to the production process included transportation services (most firms in the industry had their own distribution systems) and labor, largely semiskilled. Overall, then, some suppliers have some power (the manufacturers of the forming machines and of the in-

ner liners are the best bets here), but on balance the suppliers to this industry are probably not as strong as industry participants.

Diapers in 1973 were largely (70%) sold in supermarkets, with a small but dramatically increasing fraction of sales coming from mass merchandisers such as K-Mart. Sales to supermarkets and drugstores were via wholesale brokers on fixed commissions; sales to mass merchandisers were probably more likely to be direct. Supermarkets and drugstores, even the large chains, were much more fragmented than the producers of diapers, and it is easy to imagine that a consumer expendables manufacturer such as P&G had tremendous bargaining leverage with these outlets. P&G's bargaining power with a national mass merchandiser such as K-Mart was probably somewhat reduced, but it still seems likely that P&G would be at something of an advantage relative to those firms. (In 1973, warehouse distributors such as Costco and Price Club did not exist; it is interesting to contemplate how these outlets would have affected the wholesale margins received by firms such as P&G.)

Because disposable diapers take up enormous amounts of shelf space, they are expensive for retailers to stock. So, while P&G might be in a relatively strong bargaining position vis-à-vis retailers, one imagines that smaller firms or new entrants would have a harder time.

Going the final step in the distribution chain to consumers, disposable diapers, and specific brands of diapers, are somewhat addictive. Parents who begin with disposable diapers for newborns are likely to continue through toilet training, and parents who find success with a particular brand (success being defined as no leaks) are unlikely to switch brands to save a small amount of money. Therefore, profits to the manufacturers in this business are highest for diapers for toddlers; diapers for newborns are sold with much smaller margins and are even given away in gift-packs presented to the parents as they leave the hospital with their new baby.

Tangible Barriers to Entry

If the firms in an industry are profitable, firms outside the industry are likely to attempt to enter, to share in the good times. Insofar as this entry is successful, the good times worsen somewhat for the incumbent firms. Therefore, firms in a profitable industry remain profitable to the extent that barriers to entry impede potential entrants.

Barriers can be classified into two major types: tangible barriers and psychological barriers. Tangible barriers are anything that would put an entrant at a disadvantage in the competition that would ensue after entry takes place. Among the tangible barriers to entry are these:

1. *Scale-based cost advantages.* When production involves substantial fixed costs, large-volume producers have relatively lower average costs. In most cases, a firm contemplating entry into an industry expects that it will take time to build market share and, as long as the entrant's share is small, fixed-cost factors of production mean high average costs, lower margins, and so lower profit. The potential entrant might reason that, eventually, it will gain enough market share to be competitive on cost. But the longer is "eventually," the bigger is this sort of barrier.
2. *Scope-based cost advantages.* *Scale* refers to the volume of output of a particular good. Complementing scale-based cost advantages are scope-based advantages where certain (fixed) costs can be shared among a number of different products. In consumer marketing, for example, distribution can be cheaper for a firm that sells a wide variety of products. Alfred P. Sloan built GM on the basis of scope-based cost advantages, where the development of car technology in one division such as Pontiac could be shared with other divisions, say, Chevrolet. Sloan also relied on scope economies in the sale of cars, getting repeat customers to stay within the GM family while trading up from Chevrolet to Pontiac or Buick to Oldsmobile and finally to Cadillac.
3. *Knowledge-based cost advantages.* Firms may hold proprietary information concerning how to do things cheaply and efficiently. This knowledge may be built up by experience or accumulated by years of R&D. Whatever its source, potential entrants that lack this knowledge may be impeded from entering. For example, for many years, Boeing and Airbus resisted entry by Japanese firms through their tight control of the "technology" of building large airframes. On political grounds, Boeing has in the past subcontracted out pieces of airframe assembly—for instance, they subcontracted tail assemblies of the 777 model to Japanese manufacturers—but they (and Airbus) kept tight hold on the manufacture of wings, which is the key technological piece. (For manufacture of the 787, however, wing-manufacture has been outsourced to Japan.)

In industries with substantial experience-curve effects, where unit costs fall with cumulative volume of production, cumulative volume can be a substantial barrier to entry. For example, in the early years of handheld calculators, Texas Instruments rode the experience curve to a ferocious cost advantage in basic calculators, which for a while kept them dominant in the market.
4. *Financial resources and extending market power.* When firms in an industry face entry, their ability to fight off that entry, by cutting prices and so forth,

depends on the financial resources they can command. So the possession of financial resources inside the industry deters entry. Financial resources can be obtained from capital markets (having low debt to equity gives the firm leverage in raising capital quickly) or it can be obtained internally. In the latter case, we have *extending market power*: Firms that are powerful in some industries can use the financial resources this strength gives them to impede entry into other areas of their businesses.

5. *Favored access to particular resources.* If firms inside the industry have favored access to resources that are useful or even essential for efficient production, entry is impeded. Airlines, insofar as they make money at all, do so in large measure because they can control slots and counter space at particular airports. The classic competitive strategy of hub and spoke in commercial passenger air transport, in addition to having basic production efficiencies, also gives the airline a strong-enough presence at its hub to impede entry into that particular market by new carriers. Control of landing slots at favorable times by existing airlines is another barrier to the entry of new airlines.
6. *Favored access to distribution channels.* When a firm or firms in the industry can more easily reach the ultimate customers or impede competitor access to distribution channels, a formidable barrier to entry is created. For instance, Sabre, the chief computer-based information system concerning airline schedules and fares, was a creation of and, until 1996, a subsidiary of American Airlines, which American is alleged to have used to its considerable advantage.
7. *Customer goodwill and reputation.* A firm that has built up a loyal customer following has placed a substantial barrier to entry in the path of any potential entrant that, to be successful, has to wean the loyal customers away. This is the second half of Alfred P. Sloan's strategy for GM, where he tried to develop customer loyalty to GM. As a variation on this, a new entrant sometimes has difficulty being taken seriously by customers, since it has no track record in the business. Public accounting firms, for instance, rely on reputation with customers to impede competition from new entrants.
8. *Customer lock-in.* A slightly different turn on customer goodwill is customer lock-in, where customers of firm X tend to continue to source from firm X because of after-sale considerations, such as compatibility with existing equipment, economies in repair and maintenance, and so on. This barrier can be dangerous, however: If a firm tries to raise barriers by locking in its customers too strongly, those customers may go else-

where from the start. For instance, when Intel introduced the 086 chip for early generation personal computers, it licensed production of the chip to other manufacturers, to assuage customer fears that, once locked in to the 086 chip, PC manufacturers would be forced to pay Intel very high prices for successor generations. (In fact, Intel later pulled back its licensing agreements, exploiting to some extent the lock-in that it had tried to convince customers was not “just around the corner.”)

9. *Legal and political restrictions.* Firms may be protected against entry by legal restrictions on entry; government certification or licenses may be required. Firms may also use political levers to impede entry. Examples include trying to obtain special assistance, such as subsidies and low-interest loans from the government and invoking the government to ban foreign competitors from entering.

Psychological Barriers

The list of “tangible” barriers to entry does not exhaust the category, but it gives you a flavor of the more important barriers. Note that *tangible* is in quote marks here; it is hard to see customer goodwill as something entirely tangible. Still, this is tangible compared to the second category of barriers to entry, which are psychological. The idea here is that entrants come to believe that, if they enter, the firms already in the business will react aggressively, regardless of any short-term losses that must be sustained, to force the entrant out.

Fighting off an entrant or two is perhaps the surest way for firms in an industry to gain a reputation for being willing to fight off entrants. (For U.S. firms, at least, it can also be a good way to attract the attention of the Antitrust Division of the Department of Justice, so it can be a mixed blessing.) But there is a question of credibility² here, and often firms take tangible actions that add credibility to the psychological barrier they wish to erect. Keeping excess capacity on hand, for either production or distribution, often deters entry. Holding patents and products on the shelf, ready for use when and if needed, is another strong signal. Putting in place a high-fixed, low-variable cost technology is usually taken as a sign that the firm would react aggressively to protect its market share, to keep its capacity utilization high. Some analysts believe that capital structure can also be used to signal aggression—a highly leveraged firm is seemingly compelled to protect its market share, to be able to service its debt—but the evidence on this is mixed. High leverage may raise a psychological barrier, but it may simultaneously

² See Chapter 4 of the text for a general discussion of credibility and its connection to reputation.

lower a tangible barrier; namely, access through the capital markets to a war chest in case war does break out. To threaten implicitly a particular firm that might enter, a firm in the industry may take steps to develop a foothold in the target firm's own backyard, sending the message, "If you invade my territory, your own 'homeland' will not go unscathed."

Mobility Barriers

Just as profitable industries attract entry unless entry is impeded, so do relatively profitable industry niches attract entry from outside the industry and, perhaps more interestingly, from within. Firms occupying a relatively profitable niche within an industry need protection from firms within the industry but outside the niche. To convey that this is within-industry movement, such barriers are called *mobility barriers*.

The list of potential mobility barriers is not much different from the list of entry barriers. But to add to that list, niches can be established by product differentiation when the differentiation is protected by some barrier or another. Patents or copyright production can be particularly useful here, as can specific channels of distribution, customer lock-in, the value (to customers) of dealing with a single supplier, and experience curves specific to the differentiated product. For instance, Apple was for many years able to maintain relatively high margins for its Macintosh-based computers, relative to the margins obtained by Wintel computer manufacturers, by a combination of legal protections and customer lock-in.

Mobility barriers that accompany differentiation or segmentation strategies may lower overall entry barriers: If companies A and B in an industry segment the market geographically, each is on its own if company X attempts to enter either segment. If A and B share the full market, potential entrant X must figure that either rival could trigger a price war, and the financial resources of both must be taken into account.

Erecting Barriers

Taking a normative message from the preceding discussion, firms inside an industry, to protect themselves, should construct barriers to entry. Firms within a specific niche should construct mobility barriers. There are limits to how much of this is possible (some barriers are fully outside the control of the firms in the industry or niche), but particularly in the psychological realm, barriers can be built and strengthened.

To take another important example, experience-based barriers are constructed out of a large level of experience. A firm that creates a new product or industry and wishes to protect itself from future entrants may, if the production process exhibits an experience-curve effect, increase its production,

to build up experience, which means lower costs and higher barriers to entry subsequently.³

Disposable Diapers, Continued

In the disposable diaper business, entry barriers were formidable. The production process, oriented around the huge machine that makes diapers, requires significant capital investment. A strong experience curve takes effect as the manufacturer learns to get more out of a machine. P&G certainly had favored access to channels of distribution, especially with its scope-based advantages on getting shelf space in supermarkets. In terms of shipping costs, P&G's huge market share gave it a cost advantage. Many potential customers (families with newborns) are introduced to disposable diapers in the gift-packs handed out at hospitals as the new parents depart with the baby; P&G had gone to great lengths to tie up that marketing channel. And P&G had cultivated, over the years, a strong reputation for being a vicious competitor.

Rivalry

We come, finally, to rivalry. The basic story is simple. Good rivals, in terms of the profits of the industry, are rivals that are restrained in their competition. Taking a more normative approach, there are good rivals to have (firms that will follow your firm's lead; in a segmented industry, firms that are content to tend their own garden and leave you to cultivate your own) and there are bad. A firm, looking for profits, should encourage the former and discourage the latter.

P&G regarded Kimberly-Clark as an excellent rival, because Kimberly-Clark seemed entirely willing to accept its status as number 2 in the industry. When, at virtually the same moment, P&G faced entry into the business from Johnson & Johnson and from Union Carbide, P&G (more or less) welcomed J&J into the industry while pulling out all stops in impeding (and, eventually, reversing) Union Carbide's entry. Why? Because P&G viewed J&J as a "natural" and relatively docile rival for a product connected to babies, while Union Carbide had a history of trying to dominate industries in which it had products.

To say that restrained rivals are good for profits and vicious rivals are bad is virtually to say that good profits are good for profits. But what makes for restraint? Is it a matter of psychology? Are structural and economic factors at work? This is the main topic of Chapter 3 in the text.

³ The issues connected to production volume and pricing for technologies that exhibit experience-curve effects are complex; see Chapter 12 in the text and the supplemental material on this topic provided in this *Supplement*.