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An Interview Study of Pricing

Truman F. Bewley

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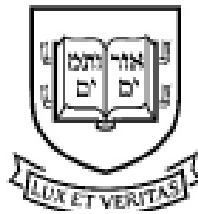
AN INTERVIEW STUDY OF PRICING

By

Truman F. Bewley

December 2023

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YALE UNIVERSITY

Box 208281

New Haven, Connecticut 06520-8281

<http://cowles.yale.edu/>

An Interview Study of Pricing¹

By Truman F. Bewley

Yale University Department of Economics
and Cowles Foundation
December, 2023

1) Introduction

¹ I gratefully acknowledge support from Sloan Foundation Grant B2000-69 and very generous support from the Cowles Foundation at Yale University. I owe a great deal to my colleague, Professor William Brainard, who did some of the interviews with me, helped me arrange some of them, encouraged me, and spent a good deal of time reading and criticizing versions of this paper. I am grateful to Professor James Robinson for comments. I am also grateful to Michael Aronson for advice and encouragement. He was the editor of my book Why Wages Don't Fall during a Recession, (1999) Cambridge, MA: Harvard University Press. .

Why do the prices of some products change little during business cycles while the prices of others vary wildly and tend to rise during economic booms and fall during recessions? In particular, why do the prices of some products not fall or fall only a little when the demand for them declines dramatically. It is not surprising that in highly competitive industries prices fluctuate with shifts in demand and supply, but what explains the stability of prices in markets where firms have more direct control of prices? These questions are central to an understanding of business cycles, and good answers would also help us predict how prices will behave. For instance, a manufacturer that believes that price reduction would do little to increase sales is likely to be much slower to cut prices than a manufacturer that is restrained from doing so by the administrative costs of price change. Although economists have proposed many explanations of price rigidity, no widely applicable theory has firm empirical support. It is natural that this is so, because such support would probably require detailed knowledge of the objectives of price setters and the constraints they face, knowledge that is difficult to obtain.

Hoping to understand price formation and rigidity, I imitated Blinder et al (1998) by interviewing business people who participated in price setting.²

Blinder and his associates used interviews to test empirically twelve theories of

² My colleague Professor William Brainard participated in 19 of the interviews. The interviews took place all over the U.S., some in Canada, and a few in Europe. I ended up doing 563 interviews from June 1999 to June 2015 in over 500 companies or government agencies.

price rigidity. Interviewers asked many questions, but the core of the test was to describe each theory to respondents and to ask them to explain the applicability of the theory to their company. On the basis of the answers, the interviewer then rated on a scale from 1 to 4 the importance of each theory as an explanation of price rigidity at that firm. The average of all the scores gathered by all the interviewers is a measure of the overall relevance of the theory. Blinder and his coauthors chose randomly the companies to be approached for interviews, where the probability that a company was chosen was proportional to the share of its value added in the U.S. GDP.

Although I found the work of Blinder and his coauthors to be very useful, I did not follow them by asking respondents to assess the relevance to their companies of various theories of price rigidity. Instead, when arranging an interview I explained that I hoped respondents would tell me what I needed to know to understand pricing in their company or industry. Before interviews, I emailed respondents a list of questions designed to make clear what topics interested me. During interviews, I listened to what respondents came up with and used that as a basis for further questioning. A disadvantage of this approach is that not all respondents dealt with the same topics. An advantage is that I learned things I would not have thought to ask about. One reason I avoided the approach of Blinder et al is that economists may have overlooked correct theories

of price rigidity. In fact, Blinder and his coauthors did not ask about the explanation of price rigidity that I found to be the most widely applicable.³ Another reason for proceeding as I did was that my experience has been that asking about theories can cause respondents subtly to stop cooperating if they think a theory is silly or if they feel they are being drawn into intellectual competition with a professor.

Because of my interviewing method, I could not use random sampling in selecting respondents. Business people are reluctant to participate in loosely structured interviews, because they worry that they might inadvertently reveal confidential information or say something that would embarrass their company. So I had to gain trust, which I did by using the snowball sampling method. I started with friends and acquaintances and at the end of every interview asked for referrals to other possible respondents while indicating what kind of companies and people interested me. This approach was for the most part successful, though slow. Sometimes more than a year passed before a company's lawyers agreed to let me interview there. I had disappointments as well. For instance, I never penetrated the Internet commerce industry and I never had an interview with a glass manufacturer.⁴ In requesting referrals, I targeted variety in the types of businesses but also strove to cover adequately the main

³ I had not thought of it either, but pieced it together from what respondents told me.

⁴ I heard that no one in the glass industry would talk to me, because it was being investigated for possible anti-trust violations.

industries in the American economy and the most important companies within each of those. I did not record the percentage of interview requests that were refused, but believe I talked to key people in the main companies of most of the categories of businesses I studied. Interviews usually took place in the respondent's office or in a restaurant and lasted about 90 minutes. Most interviews were tape-recorded and later transcribed, though a few respondents refused to be recorded. I checked for accuracy all the transcriptions that I did not do myself.

I describe in this paper the three main findings from my inquiry. A major part of all three findings are the reasons the observed phenomenon occurs. One finding is that the prices of differentiated products that customers buy repeatedly seldom decline and tend to increase only sluggishly in response to changes in demand or supply, whereas the prices of undifferentiated products respond quickly to such shifts and can even be volatile.

Another finding is that the marginal variable costs of manufacturing firms tend to remain constant or to decline as a function of output until capacity is reached, at which point marginal costs rise abruptly. This assertion may seem counterintuitive, since presumably as output increases in the short-run more labor is used with a fixed amount of capital. The proposition that marginal variable costs may be constant over a wide range is not new. For instance,

Robert Hall (1986) suggests and defends this idea and Blinder (1998) and his coauthors present strong empirical evidence supporting it. What may be new are the explanations for this behavior of marginal variable costs.

It might be imagined that constancy of marginal variable costs could imply price rigidity and so provide a link between price rigidity and constancy of marginal costs. I found no convincing evidence of this link.⁵ Manufacturers with market power did not argue that price should be a constant markup over marginal cost. Those without market power presumably are obliged to set price equal to marginal variable cost, but manufacturers without market power usually sell undifferentiated products, which tend to have volatile prices.

The third main finding is the widespread use of formula based pricing in contracts governing trade in commodities between firms, where in business jargon prices are "formula based" if they are indexed to some publicly available statistics or numbers and the word "commodity" refers to an undifferentiated product sold on a reasonably competitive market. I will use the word in this sense.

It is well-known that most commodities have volatile prices. Respondents' explanations of the volatility varied with the product. Respondents attributed variation in the prices of fresh fruits and vegetables to supply fluctuations.

⁵ Blinder et al (1998, chapters 10 and 12) reach a similar conclusion.

Extreme changes in the prices for natural gas and wholesale electricity were blamed on demand. Fluctuations in the prices of fresh fish and of petroleum and its products were said to be due to changes in both supply and demand. In discussions of the prices of lumber and commodity plywood, I heard about price inventory cycles, where expectations of price increases motivate market participants to buy and store the products, thereby driving prices higher. The reverse was said to occur when prices decline.

In most commodity markets, there is a volume of trade between individual buyers and sellers who negotiate prices for what are usually spot transactions. Because of the volatility of commodity prices, traders need guidance as to what to bid and ask. This need is filled by market reporting companies, trade journals, and government agencies who make and publish surveys of the negotiated prices. Summaries of the survey results not only guide traders, but form the basis for formula based prices. Formulas specify mathematically prices as a function of the survey results. The formulas are usually defined in long-term contracts between buying and selling companies. Trading at formula based contract prices is now common in many commodity industries, and in some markets the volume of trade at formula based prices far exceeds that at negotiated prices. The main attraction of trading at formula based prices is that it reduces the risk of disruption of the relationship between buyer and seller caused by an impasse in

price negotiations. Because of the volatility of commodity prices, fixed price contracts are not practical and if there were no contract the price would have to be renegotiated frequently. Buyer and seller need only negotiate a formula once in a while. Furthermore, formula based contracts can safely be made long-term, since the formula based price follows the market.

It should not be imagined that all products are either differentiated or are commodities, since there are many degrees of differentiation. For instance, airline travel, car rentals, and hotels are to some extent differentiated, yet have flexible pricing, and the processes generating their prices have little in common with the pricing of typical commodities or of typical differentiated products.⁶ The variety of degrees of differentiation adds to the difficulty of interpreting price behavior.

There is a link between the first two main findings, a link created by the impact of declining or constant marginal variable costs on the ability of manufacturing firms to make money when selling to competitive markets. Firms with flat or declining marginal costs lose money if they set price equal to marginal variable cost unless they produce at or near capacity. This predicament no doubt helps explain the drive of many firms to differentiate their products,

⁶ These industries use sophisticated combinations of Bertrand and Cournot pricing known as yield management.

because differentiation enables firms to charge more than marginal variable cost and hence to cover fixed costs and be profitable in slow as well as good times.

2) Rigidity of Differentiated Product Prices

The root cause of the price rigidity of differentiated products is that an important fraction of buyers are closely tied to particular products or to the firms that supply them, and these ties create costs to buyers of switching from a product to a substitute. A consequence is that reducing a price normally does little to increase demand. When product substitution is costly, there are few customers of competing products who could be convinced by a price reduction to switch their demand from the product they currently buy to the one with the reduced price. This lack of response is an important reason for not cutting price. Another consequence of switching costs is that customers who change products are not likely to switch back soon. For this reason, sellers of differentiated products with repeated sales go to great lengths to avoid losing customers. They cultivate the relationship and raise prices only if they can convincingly rationalize doing so. Still another consequence of switching costs is that because customers are tied to a product and buy it repeatedly, they can feel trapped and vulnerable to exploitation, especially if they are firms. They are also likely to notice a price increase. For both these reasons, customers are likely to try to do something

about it. A small buyer might search for and switch to a substitute product. Large buyers might refuse to pay the increase, daring the supplier to enforce it. Resistance to price increases often comes from intermediaries who distribute the product. These can be brokers, wholesalers, or retailers, especially large retailers who act as their own wholesalers. A manufacturer of differentiated products often negotiates the price of its products with these intermediaries. Anticipating opposition, manufacturers try to raise prices only occasionally. The difficulty they experience increasing prices creates another reason not to reduce them; manufacturers are reluctant to reduce prices because it will be difficult to raise them back up later.

From the point of view of a manufacturer, reducing a price means losing part of the investment in the complicated process of establishing a selling price. This process may involve not only choosing a price, but doing market studies, designing a product that fits the needs of a particular class of buyers, test marketing, and advertising. Manufacturers want the price to strike potential customers as appropriate, given the prices of existing related products or brands. Although producers of differentiated products have market power, they normally are not monopolists and face competition from related products. A central problem of this research project was to reconcile this competition with downward price rigidity.

Manufacturers strive to find a hook that will tie a clientele of buyers to their product. The hook can be brand loyalty or the customer's habit of eating a certain food. It can be that the customer knows how to use only certain kinds of computer programs. It can be that the customer's industrial process requires a certain proprietary chemical. In industrial settings, some manufacturers use an approach to pricing called value pricing, where the seller claims that its product saves the buyer a certain amount of money in its production processes, and that the product's price is set so as to share the savings between the buyer and seller. Although canny buyers resist such sales pitches, they are nevertheless effective in locking buyers in to certain products. If the manufacturer adheres to its value pricing story, then its price is not affected by demand for its product.

A natural question is if manufacturers of differentiated products believe that reducing prices does little to increase sales, why don't the manufacturers raise prices. The answer is that although manufacturers differentiate their products in order to be able to charge a profitable price for them, anticipated buyer resistance makes them careful about raising prices, unless they have a persuasive argument based perhaps on their costs or inflation.

Manufacturers of differentiated products do raise and lower prices, but price change often entails marketing expenses and takes time to take effect, since buyers and potential buyers have to adapt to the changes. The process of price

change is much slower than it is in a commodity market, where the price may change from one sale to the next. It is no doubt easier to raise prices during a period of inflation. A speculative thought is that during a period of inflation raising the price of a differentiated product at the rate of inflation plays the same role as not changing the price during a period with no inflation. Unfortunately, I have little information about this matter, as there was almost no inflation during the period of this study.

Since buyers and sellers of commodities constantly negotiate prices, one might wonder why the difficulty of these negotiations does not lead to rigidity in commodity prices. One answer is that in commodity markets there are little or no switching costs in changing from one buyer or seller to another. The choice of trading partners in commodity markets is fluid. Everyone chooses the partner and deal that are the best they can find at that moment. The markets are organized to make it easy for buyers and sellers to find each other and to change trading partners quickly.

The contrast between the price behavior of differentiated and undifferentiated products is similar to the contrast between the behavior of wages and salaries of regular and temporary employees. The market for temporary employees is almost an auction market and has fairly flexible wages. The close relationship between employer and regular employees makes it difficult to reduce their pay,

because employees expect loyal service to be rewarded by pay increases and so are likely to consider a pay reduction to be a betrayal.⁷ The parallel between labor and product markets weakens when one compares the consequences of price increases and pay reduction. The main concern about increasing the price of a differentiated product is that the buyer finds a substitute product and stops buying. The main concern about reducing the pay of regular employees is that they become less productive, though there is also concern that they may quit and so stop selling their labor.

None of the assertions about product market (or labor market) price rigidity should be understood to be absolute. Wages of regular employees do fall in some companies, even during economic booms, as do the prices of particular differentiated products. A company may cut pay if it can convincingly argue that doing so will save a large number of jobs. A company may reduce the price of a differentiated product if a competitor introduces a cheaper and superior substitute. The assertions about rigidity describe tendencies that are so strong that economy wide averages of regular employee wages and salaries and of the prices of differentiated goods seldom fall. I came across no differentiated product that had a price as volatile as that of a typical commodity.

⁷ Bewley (1999) describes the behavior of the wages and salaries of temporary and regular employees.

Since product differentiation gives the seller market power, one might conclude that it is market power alone that generates price rigidity. This idea appears not to be valid, because there are nearly undifferentiated products, such as cement and gypsum wallboard⁸ and some kinds of paper and steel, that are sold by oligopolists who clearly have market power and yet the prices are somewhat flexible, though not as volatile as the prices of typical commodities. Interviews in these industries suggest that when products are not differentiated, sellers can gain enough advantage from price reductions to make it worthwhile to risk spoiling the market.

In order for price stability to be an obvious way to avoid conflict over price and to avoid loss of customers, it is important that the product not be a commodity. There are many examples of pairs of firms that are linked by the regular sale of a commodity by one firm to the other, and where it would be expensive to change buyers or suppliers. A typical way to handle pricing in such situations is to have it be determined by a contract with formula based prices. Such indexed contracts are common in the chemical, food, petroleum, steel, and natural gas industries.

It is interesting to note that formula based prices have the same function in commodity markets as do rigid prices in the markets for differentiated goods.

⁸ There are many producers of cement and gypsum wallboard, but because of high transportation costs each producer has few competitors within its market area.

Both help preserve the relationship between buyer and seller by side-stepping the price adjustment process.

Pricing is quite different when one manufacturer depends on another for a product that is not a commodity, so that it is not obvious what the price should be. Typically one manufacturer regularly buys a complicated component of one of its products from another manufacturer, who may be what is called a contract manufacturer that specializes in such work. The components are normally of little use to other buyers, and it might be hard for another company to produce the component, because its production requires special equipment and training. In such settings, buyer and seller are linked, and in the cases I learned about prices were specified by long-term contracts and seldom adjusted. The reasons given for fixing the price were to avoid disruption and to facilitate planning. Thus the conditions that lead to price rigidity are high costs to buyers of switching from one product to another and ambiguity about what the price should be.

There are vast numbers of companies that produce closely related but differentiated products and that compete on product attributes as well as on price. Examples are restaurants, manufacturers of small parts for other manufacturers, and contractors in the building trades. These businesses are examples of monopolistic competitors. Consideration of such companies

supports the connection between product differentiation and downward price rigidity.

Restaurateurs explain that their industry relies on customers who frequent only a few restaurants and in each always order one of a few dishes. Such customers are likely to notice price increases and to react badly to them, even shifting their patronage to other restaurants. For such customers, the switching cost is change of habit. In order to avoid antagonizing and maybe losing some of these customers, restaurateurs hesitate to raise prices and are reluctant to reduce them because of the difficulty of raising them back up later. Restaurant resistance to price increases is a well-known phenomenon that has repercussions throughout the food industry. In many restaurants, this resistance is due in part to the cost of reprinting menus or changing menu boards, but the main concern is the anticipated reaction of customers.

Normally competitive bidding by producers determines the initial prices of businesses producing small parts. However, repeat business with the same customer often leads to dropping the requirement of competitive bidding, even when the business is for a new part. Renunciation of bidding requires trust that can be threatened by perceptions of price increases. Concern about such issues can discourage price change for types of jobs where price change can be detected.

The building contractors I interviewed often bid for business, and the rigidity of their prices again depends on the extent to which business is repeated and jobs are sufficiently similar to make price comparisons meaningful

I tried to find out from manufacturers of clearly differentiated products whether they reduce prices in slow times and if not why not. They answered that they normally did not reduce prices, though some were forced to do so by large corporate customers who insisted on price relief. The main explanation for downward price rigidity was that the manufacturers encounter such strong resistance to price increases that they are reluctant to reduce prices out of concern that they would not be able to bring them back up later. Another common explanation for downward price rigidity was that price reductions do little to increase sales.

It is interesting to compare bargaining over price in commodity markets with that over the prices of differentiated goods. When manufacturers of differentiated goods sell to large companies, such as retail chains, wholesalers, or large manufacturers, the buyers usually can use their buying power to hold prices down. But large buyers may have trouble pushing down the prices of commodities. A large buyer could certainly cause a commodity's market price to fall by reducing its purchases, but then it would be buying less product and large buyers typically want to pay less for more product not for less product.

Furthermore, many commodity markets are so large that enormous reductions in purchases would be required to achieve significant price reductions. Some large buyers of commodities use forward contracting to protect themselves against sudden price increases. Restaurant chains and manufacturers of prepared foods do this by making contracts with farmers that fix the price before the beginning of the growing season. These contracts also protect the farmers against price declines.

There is an interesting theoretical literature on switching costs dealing mainly with issues in industrial organization. See von Weizsäcker (1984), Klemperer (1987a, 1987b, 1987, 1989, 1995), and Beggs and Klemperer (1992).⁹ These authors capture part of the intuition that switching costs can generate price inflexibility. They point out that price reductions attract few new customers, since switching costs discourage the customers of rival firms from taking advantage of the reduced price. (See von Weizsäcker (1984, p. 1103) and Klemperer (1987b, p. 386)).¹⁰

A well-known theory of price rigidity is the kinked demand curve theory of Hall and Hitch (1939) and Sweezy (1939). According to this theory, oligopolists who all produce the same or nearly the same product refrain from reducing prices,

⁹ I owe knowledge of Klemperer's work to Professor James Robinson.

¹⁰ These authors do not point out that switching costs tend to put buyers in a position where they can push back against price increases. As has been explained, it is anticipated buyer resistance to increases that inhibits sellers from raising prices, even though price reduction does little to increase sales.

because rival firms will match the reduction. Similarly such oligopolists refrain from raising prices, because no rival will match the increase. The theory does not apply to producers of strictly differentiated products, since such products by definition have no close substitutes. When a producer of a strictly differentiated product lowers its price, the concern is not that rivals will reduce their prices too, but that even if they don't their customers will not leave them to take advantage of the producer's lower price. When a producer of a strictly differentiated product raises its price, the concern is not that rivals will not raise their prices, but that even if they do the price increase will stimulate the producer's customers to look for an alternative product and perhaps shift patronage to it.

The kinked demand curve theory does seem to apply to firms producing products that are only weakly differentiated. Some respondents from such firms did mention that they did not want to reduce price because rivals would match the reduction or because they did not want to spoil the market. Such concerns seemed to be real and no doubt inhibit price cutting.

The logic of the kinked demand curve argument applies no matter how many sellers there are. The kinked demand curve behavior, however, involves careful coordination of price setting by different sellers, which it is hard to imagine would happen if sellers were numerous. The wild behavior of the prices of typical commodities indicates that this coordination does not occur when there are

many sellers. Thus it seems appropriate to assume that the kinked demand curve theory is appropriate when there are few sellers of the same product or of close substitutes.

An argument against the kinked demand curve theory is that the prices of undifferentiated goods do seem to be somewhat flexible even when there are so few sellers that the kinked demand curve theory ought to apply. I encountered four examples of this flexibility, which I have already alluded to, namely, the markets for cement, gypsum wallboard, and some kinds of steel and paper.

Okun (1981, chapter 4) provides an explanation of price rigidity in some ways similar to that presented here, an explanation inspired by an analysis of retail trade. He focuses on the search costs of consumers who shop at different retailers looking for the lowest price. He observes that retailers can reduce consumers' average search costs by always having low prices. He asserts that some retailers act to attract and retain loyal customers by having consistently low prices that they seldom change. The commitment to steady low pricing is part of an implicit contract between buyer and seller. Okun assumes that there are customers throughout the economy, not just in retail trade, that favor certain sellers for similar reasons. He calls markets where such attachments occur customer markets. He reasons that prices in customer markets do not fluctuate much, because sellers wish to attract regular buyers by reducing the buyers'

search costs. Customer loyalty gives these sellers market power. He contrasts customer markets with what he calls auction markets, which are highly competitive markets where prices fluctuate constantly in response to changes in supply and demand.

The steady pricing Okun attributes to successful retailers is nearly the marketing strategy that everyday low price retailers use today. They have few promotional discounts, but do, however, pass on to consumers large fluctuations in the wholesale prices of fresh foods. There are many successful retailers, however, who use an opposite pricing strategy, called high-low, which uses heavily advertised temporary promotional discounts to attract customers, and many sellers of all kinds find that similar pricing strategies succeed in enticing buyers. Okun is correct, I believe, in pointing out that much of the price rigidity in the economy is a consequence of alliances between buyers and their suppliers. My conclusion from contact with business people is that in the case of differentiated goods, those alliances stem not from the reduction of buyers' costs of searching for the lowest price but from buyers' costs of switching suppliers. Okun's thesis that buyers want price stability often applies, I believe, to buyers who are manufacturing firms purchasing inputs, because such firms frequently make fairly long-term price commitments to buyers of their products.

I provide verbatim quotations from interviews. The quotations bear on some of the assertions made about price rigidity. I give the quotations to show the nature of the evidence and the variety of responses. Most of the interviews were tape-recorded. My own words are enclosed in square brackets.

Setting A Price

A high official of an automobile manufacturer said, "[What about setting this initial price? Is there some danger in charging too low a price that you will get retaliation or damage the image of the product?] It is the same issue around, sort of, the product image is in many parts built on the price. How customers view your product is, to some degree, and how they, sort of, fix it in the universe of similar products, is in large degree based on price. [So you can really hurt your product....?] By not positioning it appropriately. [You can even make them think so badly of it that it would hurt the sales, if you charge too low?] Yeah, because people will think, 'Well, if it is priced this way, then this is not my segment' or this is not - you know, though the features of the vehicle may seem to appeal to me, I have some questions about whether this vehicle is really - [Is what it seems to be?] Yeah."

A Vice President of Finance for a manufacturer of marine engines said, "We have got to stay pretty close within ranges of our competitors. A good share of our dealers are what we call dual. They will handle more than one line of outboard engines. If you get out of whack with your competitor on that price (of one model), they just start to shift their sales to the other one. That is why you have got to be so super sensitive to what is happening with all of the competitors. If you had the ability to just price off of costs, then you would expect that (the profit margin as a percent of sales) to be pretty uniform, and it is not uniform at all. We have to price much more to the competition in the marketplace, and so that number will vary widely."

Price Cuts Do Little to Increase Demand.

The President of a rerolling company said, "[What happens when you have an overall slump in demand?] Typically the ingot price (of aluminum) goes down during that time, so our margins tend to be better, but our volume is less. [Do you price lower to try to recapture some sales?] There is an expression in this business. 'There is no use chumming in an empty lake.' (Another expression is) 'Cutting the price of coffins to increase demand.' There is no more demand there. The question is whether you hold your share and whether you keep your relationships. First of all, it is hard for people to switch (suppliers). There are switching costs. So in a short recession, they have to do trials, they have to feel comfortable with you. And then your salesman is going in and saying, 'Look, you know, this guy came in with a low price, but is he going to take care of you like we did during the last upturn, when

nobody else could supply you and you called us and we took care of you? Is he going to do this? We need your help now. You are going to need our help later.' Most people feel a sense of obligation."

The President of a company that manufactures proprietary small parts and fasteners for the electronic and aerospace industries said, "A price reduction at (our company) might or might not increase demand. Service, which is availability, is more important. Print position is important too. If (our company's) part number is on the customer's manufacturing drawings, then that manufacturer has to use that part. We are now in a downturn. Price is an issue, but there is not a lot of business out there. There are real limits as to how much you can expand sales by cutting price."¹¹

The Controller of a consumer products manufacturer said, "I think there will be a slowdown. Whether it is really going to create a lot of pricing pressures for us, I really don't think it will. What it will affect in us is movement off the shelf, because we are dependent on the number of people that walk down an aisle (in a store), and as consumers shop less, our product is going to be impacted, because like I said for the most part, it is not the type of product where you wake up in the morning and say, 'Buy one.' From the studies that we have done and from our knowledge, it is still very impulsive. [Why don't you think that it (a recession) would bring any change in price?] Because I think as the number of people dwindle going through the stores, the fact that this light is 50 cents less is still not going to increase the volume. I don't think somebody is walking up to a flashlight and saying, '5.99 is too much,' because if 5.99 was too much, then they would buy another model that was 4.99, but they wouldn't just suddenly say, 'Well Jee, this is a better value now that it is 4.99 and it used to be 5.99.' There is enough different - you know, the price points are all out there. So I think for the consumer, if he has a price point in mind for what a flashlight is worth to him, he is going to find that price point."

The Director of Marketing, Research, and Pricing Administration for a Manufacturer of Specialty Materials said, "I don't think we would gain in sales (from a price cut). I mean, when you are dealing with industrial accounts, they can only use what they can use. I mean, if he is not producing as many cars, you can't sell him more adhesives no matter what price you sell it at. And so - if we are on every car made in America - if they reduce the number by a million or two million - we could give it away and they are not going to use more than what they are using, so it doesn't make sense to do it."

The President of a manufacturer of marine accessories said, "[So did that affect pricing the downturn in sales (in the early 90s)?] No, it really didn't, because at that time dropping price wasn't going to help anything. There just wasn't any business. I mean, if I went to (a boat builder) and said, 'Hey, that switch instead of being \$50 is now \$25,' they would say, 'That is nice. I am not building any boats.' So there was no elasticity, so no we didn't change price. [And the same with your competitors?] Pretty much. [So there was no competitive pressure from them, they were reasoning the same way?] Pretty much."

¹¹ This quotation is from handwritten notes, not a tape-recorder. The other quotations are from tape-recordings.

The President of a steel service center said, "[So you really can't by lowering price get trade away from other sellers?] You can in some ways. I mean, if you have got five guys bidding for a job, and they are going to go with the lowest guy, yeah. But if you have got ongoing business, going in and attacking your own price, lowering it, it is not going to help you. There is examples where you can get more by lowering the price, but there is plenty of examples where you get nothing more by lowering the price."

It is Hard to Reverse a Price Reduction.

The President of a machine shop said, "We have never cut prices in a global sense because the economy was bad. We cut prices only on a particular set of products for a particular account in order to beat out competition. In our business, there is little relation between price and demand. Our products are relatively unique and are not sold in large volume. The battle is to get them into a store. If they are there, they will sell. There will be few competitors in the store. They are unusual products. Most of our business is retail. If you reduce a price, it is hard to get it up later. If we are making brass parts, where a large part of the cost is in materials, you can get your price back up again. Everywhere else, price changes are very hard, and this influences our thinking about pricing. This is an additional reason not to cut prices in a recession."¹²

The Vice President and General Manager of a ball bearing manufacturer said, "[What is against lowering the price?] Because you will never get it back again. [It is just too hard to get the price back up?] Impossible. [Explain why that is true.] Because they simply won't pay it. Price increases have been out of the question in the bearing business for the last ten years. In most OEM's business, they probably have 75 percent of their cost in goods and services that they purchase and only 25 percent or less probably in direct labor. So they immediately go out and attack where they can get the biggest bang for their buck. [So they are really putting you under pressure for price decreases?] Decreases, correct. Everyone wants price decreases."

The Chief Engineer of a manufacturer of injection molding machines said, "I would say, when a customer buys a lot of machines on a regular basis, there is resistance to lowering the price with that customer, because once you give him a discount it is there forever for that customer, unless there is some new machine or something where you can regain your footing. There is always a resistance by sales and marketing to reduce the price, because you will never get it back."

The Vice President of Marketing for a medium size manufacturer of materials for the installation of tile and stone said, "What we find is that once you lower your price to a particular level in terms of your price list or your accepted price, it never goes back up. [Why is that?] A lot of resistance to price without real justification based on inflation, costs, all that sort of stuff. [Now who resists? Your distributors?] Distributors and the contractors. They can't then turn around and pass that cost increase on to their customers, who in some cases, might either be builders or big construction firms. [You mean, they will have already

¹²) This quotation is from handwritten notes. Although I have labeled this company as a machine shop, I have not excluded it from the set of companies selling differentiated products, because it did not bid for business.

bid the job and the price will be in there?] That is one thing, but if you are a builder of tract homes and you are building 300 homes every year. The builder he is not allowed to jack his prices because he is being treated from the consumer side. The builder says you can't increase your prices 5 percent. I will go find another contractor. [Some other kind of grouting?] Another guy will do it for less. He has got better control over his labor or uses a different material. To respond to a competitor who reduces price you try to use promotion rather than price reduction."

A marketing official for a tire manufacturer said, "[Is there a reason for not lowering the price (in a recession)?] Yeah. Once you lower the price, it is awfully hard to get it back up. [Oh, it is? Oh, why is that?] Well, your customer (i.e., distributor or dealer) thinks if you could afford that margin at that point in time, why can't you afford it now?"

The CEO of a large dairy cooperative and a large cheese manufacturing company said, "When your (milk prices) get down in these periods, all the suppliers generally are saying, 'Well, it is so hard to get prices up, let's not reduce it.' So these (cheese) prices become real sticky here."

It is Hard to Raise Prices in General.

The Vice President of Strategy and Business Development for a large tool manufacturer said, "[My next question was resistance to price increase. So you get that from all your retailers, from all your buyers?] They just say, 'No.' 'We will drop the product.' It is a very tough effort to get large (retail) customers to agree to price increases, right now. It has been for a while, very very difficult. Their view is that they are always trying to figure out ways to get prices down. There is no such thing as a price increase. That is their stance. That is their culture. People who take price increases don't keep their jobs."

The Director of Sales of a machine tool manufacturer said, "Market conditions in Europe have forced us to lower our price, because of the exchange rate. When the exchange rate recovers, if it recovers and I suppose it will some day, I doubt that prices will go back up. We will figure out a way to grind some cost (out) of it. [Why would you not?] It is very difficult to raise prices and make them stick. [Oh people resist.] Oh absolutely. [They get used to it?] Yeah. We have a fifteen-year track record of (our) machines get cheaper. They get better and they get cheaper every year."

A Vice President of a huge producer of branded and unbranded foods said, "(A brand of vegetable) oil, let's say the price of vegetable oil goes up. Well we will stop our trade spend (for advertising and promotions) on that. So we will say, 'The cost of the inputs have gone up. We don't want to change the price at the store level, but we are going to apply less monetary resources behind that to move that product,' [Why don't you want to raise price to the store?] Well the consumers are pretty resistant to that. [It is not that the stores resist?] The stores don't like it. They don't want to be known as the store that is carrying the higher priced brands."

Buyers' Switching Costs Are Important.

The Plywood Sales Manager for a eastern lumber company said, "[Let's start with the commodity plywood and work our way back. How is that priced?] Most of it is based on (a publication of a wood products market reporting company). It is so volatile that - I mean, it literally can change by the hour. It usually changes three or four times a week. We have, for example, an (a company's name), where they are a distributor, but they are strictly distributing to boat manufacturers and RV manufacturers and truck body OEM's, those types of people. That type of business, it is more stable. There are, say, five other mills that can supply the panels that that particular customer base needs, whereas if you are dealing in commodity sheathing, there is 50 mills in the country that can supply that panel. [So the stuff used for boats and so on, that is so specific. I guess you can't have any hollow parts inside.] Well, for one thing, they are typically specified just for that application. So we will change our lay-up and create an item that is specifically for that application. And then the other thing is, a lot of those products are speced out as western plywood. So they need the species of veneer that we get in the West versus like southern pine, where all the southern mills are. It just doesn't have the same strength characteristics. So that limits the amount of competitors that can supply into those markets. [And that really makes the pricing easier?] Well, yeah. It makes it more stable, so we are not sort of riding this (market reporting company's) roller coaster as I call it. [Why is that?] Well, because the customer can't shop around nearly as much. [Well, they could just call up another supplier.] True, but when their customer is a manufacturing operation. When they find a panel that they like, they don't want to deviate either, because when you introduce something new into their process, then they have to deal with it. Maybe it is a little different than what they are getting from the other supplier, and there is a lot of brand loyalty when you go into that type of market, which is another reason why it is good for us. [That is a more convincing argument for me than the fact that there are just a few competitors.] Yeah, right. [You can just play two people off against each other.] True. But we do offer some things that others don't. We have different sizes. So we can produce panels that are larger. So if a shop is cutting them, there might be an optimal panel size where they can get 10 parts out of it instead of 6 parts out, if it is smaller. Then we have volume capacity that a lot don't. Some of these are still pretty big operations, and there is a consideration that at certain times of the year, because a lot of those businesses of boats and RV's and stuff, they are seasonal as well. They are cyclical, and there is a consideration that at certain times of the year when they are really running strong, they might outstrip the capacity of one of our competitors, where they won't for us, because we are such a large operation. With our distributors, we have agreements, where we will try to keep pricing stable for them. They are supplying into industrial markets where they (the customers) are a manufacturer just like we are, so they don't necessarily need the cheapest price. They just want it to be stable. They need to be competitive, of course, but they want it to be stable. If nobody is buying boats, and the boat manufacturer has to drop his price of the boat, well then the person supplying the parts to that boat is going to get a request from the boat manufacturer to say, 'Hey, you have got to drop your pricing of parts.' Then they are going to come back to us and say, 'Hey, I can't get as much for my parts, so you have got to drop your price on your plywood.' So it does work its way back. It is just not nearly as volatile. Usually what will happen is the demand for that will dry up. I mean, we will get some pressure on pricing and we will have to make some adjustments, but we will just see the volume slow down significantly. [And really the origin for that is that only a few competitors can do what you do?] Right. So they could get it from someone else, but typically there is some R&D that has to be done and there is a transition period. Sometimes it might be a few weeks, but sometimes it might be a few

months where their production process is interrupted or at least isn't running as smooth as it was, because they have tried a new product. You know, maybe the thickness tolerance isn't as tight or it warps a little bit more or those types of things, and it just takes a while to really dial in a product. I am sorry if I misled you there. They (industrial plywood prices) are not that stable. If the commodity price changes everyday, the industrial prices change once a month, let's say. It is just a different level of stability. [So then on sales there tends to be bargaining every time?] For the commodity items. [And for the industrial items?] For the industrial items, typically it is more of a programmed type business. So we will have a pricing formula or we will just flat out have a fixed price that we say, 'We will hold it for a month,' or 'We will hold it for a quarter or that type of thing. [And the formula is based on what?] The formula is typically based on (a market reporting company's publication)."

Contract Manufacturing

The Chief Financial Officer of a manufacturer of parts for recreational vehicles said, "[How do you come up with a price on these parts?] It is an engineering function. Once it has been decided what is going to be built, then we have manufacturing engineers who can figure out how much material it is going to require, how much labor it is going to require, put in overhead factors. So we come up with an estimated cost before we make the sales decision, before we arrive at the price, and we put our margin on that. [So you just decide the price, or it is negotiated with them?] Oh, it is negotiated. [During the recession, it was not going to increase your volume lowering the price?] No, no. That doesn't have anything to do with volume. Most of our customers on LTAs (long-term agreements) live up to their word. [They are not going to say, 'I can get it cheaper somewhere else.' There is just too much invested in the relationship?] Too much invested in the relationship."

Firms Try to Avoid Spoiling the Market When There Are Close Substitutes.

The President and CEO of a manufacturer of synthetic rubber seals and gaskets said, "We have a case right now with a filter customer who is aggressively saying that he has a price from one of our competitors that beats our price. We have a different product that we are going to offer for these people. We are going to counter with that new product, which also has some manufacturing economies. It can run faster. We are going to pass that into it and offer the new product at a slightly lower price, which has a slightly better margin. I will lose a customer before I destroy my market in that area. [If you gave too low a price to him, you think that would mean other customers would demand it?] Oh, it would get out. That looks good on the absorption of overhead, but what happens when your competitor does the same thing? Then you have predator pricing and you destroy the marketplace. [What you do is start a price war then?] Oh, yeah. That goes on all the time. You just have to be careful of that."

Restaurants Rely on Regular Customers.

The Director of Marketing Analysis for a large restaurant chain said, "About 90 percent of our customers we would say come four times or more a year. There are a lot of people who come in here and order the same item every time they come. It goes back to a majority of the business being a core group of guests that come fairly often."

Restaurant Customers Resist Price Increases.

The Manager of a chain of truck stops, hotels, and restaurants said, "We have a lot of repeat business in all of our sites. This restaurant over here is, I think, the most popular restaurant in Utah. We do a couple of million covers a year. If we increase the price 25 cents on halibut, we will get a couple of hundred letters of protest. So people watch that very closely."

The Assistant General Manager of an upscale casual dining restaurant said, "Usually customers come in and they end up purchasing some similar items time and time again, and they would actually notice the price changing and question it themselves at that point."

The Director of Purchasing for a large restaurant chain said, "[Why don't you like changing (prices)?] Because it is not an easy thing to do in a restaurant, and sometimes it is perceived from a customer negatively, where maybe you have raised something up and all of a sudden he says, 'I can't afford to bring my family here anymore' or 'I can't afford to have lunch here anymore.' [So he will switch to another restaurant.] Yeah."

The Vice President of Purchasing for a large restaurant chain said, "It is almost an axiom that whenever you raise prices in our business you are going to lose a customer. [Oh you see your sales decline?] The counts decline. Your sales don't, because you are charging more. But your guest counts will be impacted, at least temporarily for sure."

A restaurant owner said, "When last year, veal went sky high. I went up \$2 a piece for a dish. Oh, they mostly would kill me. I learned one thing now that how to raise price. Cut the portion like everybody else is doing. They don't notice so much."

3) The Behavior of Marginal and Average Variable Cost as a Function of Output

I turn to the finding that for many manufacturers marginal variable costs remain constant or fall as output increases, until output reaches capacity. For many manufacturing processes, the behavior of marginal variable costs as a function of output is governed by technology, because the production equipment is designed to operate at one speed and so labor and material costs are nearly proportional to output. In some businesses, respondents could not

speak sensibly of the relation between output and marginal or average variable costs, because their equipment runs around the clock at a nearly constant speed and shutting it down damages it and incurs huge repair and startup expenses. Slowing the pace of production can involve similar expenses. Iron and aluminum smelters, cement kilns, petroleum refineries, and paper mills face such constraints.

A technological issue is one of the explanations often given for decreasing marginal variable costs. Most factories use the same equipment to produce a variety of products, and manufacturers usually count as variable the setup cost of changing a production line from one product to another. Usually the larger are orders for products, the longer are the production runs for each of them and hence the lower are the changeover costs per item produced and the lower are the marginal variable costs of producing each product.

The other common explanations for decreasing marginal variable costs have to do with the attitudes of the workforce. The less activity there is in a workplace, the more likely are workers to slow down in order to preserve their jobs. A high production rate also creates a sense of urgency that inspires employees to work harder and more imaginatively.

A problem I faced in asking about marginal variable costs was that not all respondents fully grasped the concept. When I sensed that this was so, I asked

about average variable costs, since these were well understood. This switch does not weaken the validity of the basic finding regarding marginal variable costs, because if average variable costs remain constant or decline as output increases, then the product of output and marginal variable costs is less than or equal to total variable costs. Hence a firm that sets price equal to marginal variable cost would earn no more than its total variable cost and earn no margin to pay for fixed costs or profit. This is the conclusion of interest. Another reason for thinking of the findings as applying to marginal as well as average variable costs is that all the reasons respondents gave for constant or declining average variable imply constant or declining marginal variable costs as well.

It may have occurred to the reader that in a firm with more than one production line for each product, marginal variable costs might increase with output, even if the marginal cost of each line did not do so. The firm might use its most efficient lines when output is at low levels and use the less efficient lines as output increased. Although it is true that even some small manufacturing companies have multiple lines for producing a product, I conclude from respondents' emphasis on the increase in productivity with output that the effects of increased use of less efficient lines in good times is normally more than offset by other productivity enhancing effects of increased output.

The assertions regarding marginal variable costs are supported by the findings of Blinder et al (1998, p. 102). According to these authors, about half of the U.S. gross national product is produced by firms with constant marginal costs and another 40 percent is produced by firms with declining marginal costs.

Blinder et al asked about average rather than marginal variable costs for the same reason that I did; they found that respondents did not understand marginal costs.

I provide interview quotations that give explanations of why marginal variable costs remain constant or decline as output increases.

A Technological Explanation

The Business Manager of a large electric generating company said, “[Do you have decreasing marginal costs for more output?] It depends on the type of unit. A coal-fired unit will initially have very high costs to start the unit up and to operate at minimum loads, because it is your least efficient point. Then as you go up to your kind of sweet point of the machines, and each machine has an engineered point that is excellent. That is going to be your most efficient point. Then if you go above that, you run into a high cost. [So what happens between your start-up and your most efficient point?] It is very tight. I mean, if it changes, it changes by a minute amount. [The marginal cost?¹³] Right. [So is it going down or up?] It actually remains almost flat. [And then when you hit capacity, it is just sort of where you hit a wall?] You hit a point on the unit where it was not engineered to operate at that point on a regular basis. You are putting your unit at steam temperatures and pressures that are almost at the max of the machine. You will run at that point if the system needs it, but generally you don’t want to be there on a regular basis. [Because of the danger of breakdowns?] Exactly.”

Average Variable Costs Rise Abruptly Near the Capacity Limit.

A Vice President of a huge producer of branded and unbranded foods said, “Well the raw inputs that go into it are, in most of what we buy, are not affected by whether we run our plant at 60 percent, 80 percent, or 100 percent. But when you start having people with overtime costs, you have lower yield from a plant, because you have too many things going

¹³ Respondents in the electricity generating industry were familiar with marginal costs, because their companies are required to bid marginal costs when offering electricity to regulatory organizations.

on at once. Some operations we run during peak season three shifts for six days and then one shift on Sunday and that leaves us 16 hours to do any plant repairs. Well, if the margins are so good that you don't run those - if you run the full seven days or run additional, you have only got eight hours for repairs and you start to run into natural problems and hiccups. You get breakdowns, where you are less efficient."

Lower Changeover Costs

The Vice President of Sales and Marketing for a metal stamping company said, "[That is true, that your variable costs per unit of output increase, because of this overtime premium?] Variable cost would increase, and that you recoup by running sustained production. See, there is a lot of setup cost in our business. When you change a job in a machine, the setup cost can wipe you out. This is why we strive to get large volumes. Then you can just run uninterrupted other than normal maintenance."

The Vice President and General Manager of a ball bearing manufacturer said, "[Do your variable costs fall, stay the same, or increase when you get busier, your average variable costs?] The variable costs per unit go down, because we can take advantage of scale too. If business goes up and we increase our lot sizes, that means once again you can have one guy running three machines as opposed to two, because if he has to be changing it over all the time, then you can't do that."

A district sales manager for very large manufacturer of branded foods said, "There is efficiencies to scale on a lot of things, because you get to run high speed lines and not be changing the dies on pasta or not stopping line shipment down and switching sizes. You know, only produce 18-ounce peanut butter for a week straight. So they never change the jar. They never change the product. That thing never stops for one straight week. I don't know what it takes to shut down those lines, clean them out, change the jars that you are putting on there, change the label. You have a different label, different caps, all sorts of different things are happening. [So with more volume you don't have to change so often?] Sure."

The Director of Marketing in North America for a manufacturer of injection molding machines said, "[Do you have any idea how much unit variable costs of production depend on your output?] I think, (with large orders) the guys become more efficient on the floor. From one machine to the next, they know exactly what needs to be done. They know what materials they need. They know where to get those materials. So they are not out searching around talking to engineering, trying to figure out how this thing should mount on a machine or how they are going to have to pipe it or anything special. They have done it on one. The second, the third, the fourth, the fifth become much easier, and we see that in our margin reports as well in terms of labor."

Employees Work Harder When There is More to Do

The Business Manager of a subsidiary of an aluminum producer that produces building products said, "When we are busier, we are more efficient. [So your variable costs are lower per unit of output?] Right. Costs are driven down typically with increased volume. [Why is

that? I know the fixed costs are over a larger volume, but let's talk about your variable cost?] It has a lot to do with the mental state of the workers. If our fabricators don't see a lot of work coming in, their tendency is going to be to slow down. That is protection. They don't want to run out of work."

The Chairman and CEO of a machine tool manufacturer said, "[When the volume improves, variable unit costs - ?] Variable costs might go down slightly. I mean, there is an old expression in our industry called the 'empty bench syndrome.' When people know that things aren't busy they tend to slow down a little bit. And so our variable - when things slow down our variable costs probably actually go up a little bit."

The owner and President of a concrete block manufacturing company said, "[So when you have high volume is your plant more efficient in a sense?] Yes. [Your labor, more output per labor hour, and production labor and so on?] Right. [Why is that?] Our people are happier. They don't stray around. They are more focused. So we are not as efficient, if we are not busy."

The President for North America of a manufacturer of specialized paints said, "I was the plant manager for awhile and one of the things that - it wasn't a secret, it was pretty open - was that as we got more and more busy there was a greater sense of urgency and there was also less, if any, sense of concern over job security and hence a need to feel that the work was getting spread over the day and that everyone looked busy. And so when we took a look at our average outputs on certain pieces of equipment when we were busy versus when we were slower we found pretty interesting changes and it was pretty clear that when things slowed down work was spread out to fill the day."

4) The Treatment of Fixed Costs by Producers of Differentiated

Products¹⁴

Part of the evidence for constancy of marginal variable costs has to do with how manufacturers of differentiated goods treat fixed costs.

¹⁴ There is a large economics literature on dependence of price on "full costs." Two references are Hall and Hitch (1939) and Okun (1981), pp 160-4. Coutts, Godley, and Nordhaus (1978) estimate econometrically the dependence of industrial prices in the United Kingdom on the related concept of normal costs, which are average costs in a period of normal capacity utilization.

If manufacturers' marginal variable costs increase with output, then those who both produce for competitive markets and can set their own prices might in principle be able to sell for marginal cost, cover fixed costs, and make a profit. This is so, because marginal variable costs would exceed average variable costs. Although many of the 278 manufacturing firms where I interviewed both faced stiff competition and could set their own prices, few were in this happy situation, and most had to charge more than marginal variable cost just to break even. They charged more than marginal variable cost by basing price on cost systems that assigned fixed costs to individual products so as to ensure that sales revenues covered these costs. These systems are called standard or fully absorbing. Although manufacturers use them flexibly, the result seemed not to be marginal cost pricing, which some respondents frowned on. They were concerned that it would cause their factories to be very busy producing low margin products at a loss.

A plant manager for a ball bearing manufacturer said, "Standard costs, does that make sense to you? This is what my company looks at on a monthly basis. So we basically start off with sales, which would be here and we deduct from that material, labor, and what we call burden. So material is really basic material. Labor is labor. Burden is where it gets messy. So what happens is, what we do is we assign a chunk of our fixed costs to each part that we make in a standard cost system. In this case, it is done based on machine hours."

The President and owner of a machine shop said, "[Does this hourly rate include all your overhead expenses?] All the overhead expenses, yes. [So the building, the lights, the secretaries, plus the machines?] Everything, plus the machines. [So that must be a big fraction of the hourly rate isn't it?] Oh yeah. I would say like 70 percent to 80 percent. [This is something that you arrive at yourself. It is not something that you look at others and ask around and find out?] Well, you do know other machine shops. It is word of mouth also. You talk about it."

The President of a consumer products manufacturer said, "[And how do you calculate whether you are making a loss or not on a particular product? I mean, you have big fixed costs, I suppose? I mean, this building and your salaries and so on. How do you assign that to individual products? Does that determine whether you are making a profit on them or don't you do that? Is that below the line?]" The Vice President of Marketing said, "Your fixed are below. But you know what your fixed are and you have got to make a certain amount of gross profit to cover your fixed and leave enough for profit left over. And so we work from percentages. We shoot for a certain profit percentage on a new item."

The Vice President of Operations for a pressed powder metal manufacturer said, "[So the reason for keeping track of this fixed cost and so on and having this markup of whatever it is, 20 percent say, that is a rule of thumb to make sure you are making money? Is that it?] A rule of thumb, right, to make sure you are covering office expenses and managers' expenses and all that other stuff."

The President and COO and owner of a folding carton manufacturer said, "A marketing guy could go out and fill up your plant overnight with low or no profit business and put you out of business. You are busy as hell, but you are not making any money."

A few manufacturers who set their own prices did not let an allocation of fixed costs influence pricing.

An Operations Manager for an aluminum extruder said, "[How do you allocate to your different orders your fixed costs, which would be your cost of insurance, the building, your salary, overhead staff?] Right now, it is not allocated to a specific order. [You don't have a fixed markup?] We don't. [You just get the best price you can?] Yeah. [So these fixed costs are not affecting your price?] Correct."

5) The Treatment of Fixed Costs by Commodity Manufacturers:

A test of the assertions regarding marginal variable costs is to see if commodity producers treat fixed costs in a way consistent with marginal costs' being constant or declining up to a capacity limit. If their marginal costs are constant or decreasing, producers should operate production facilities at full capacity or not at all, provided the companies are sufficiently small that their output would not significantly influence the market price. The behavior of commodity producers supports constancy of marginal variable costs, though the

support is clearest in the cases of the lumber industry and the agricultural and fishing industries. The other commodity industries where I interviewed are those that produce hogs, pork, cattle, beef, chicken, turkey, aluminum, chemicals, petroleum, natural gas, and wholesale electricity. The farmers I interviewed operated farms at full capacity or within the limits imposed by programs for controlling output that are organized by governments or agricultural cooperatives. A few of the farmers owned enormous operations. Similar remarks apply to the domestic U.S. fishing industry. The lumber industry has many smaller companies, which produce at full capacity or not at all, and some even increase output when lumber prices fall. Large lumber companies tend to reduce output when lumber prices are low, and do so with the openly expressed goal of supporting prices. Aluminum producers operate at full capacity even in slack markets, largely because it is prohibitively expensive to shut down aluminum smelters or to reduce their output and because surplus output is absorbed by the futures exchange. No respondent from the petroleum and natural gas industries said they reduce production in order to support prices. Respondents from large chemical companies did say they cut back output to support prices. In all of the commodity industries, production facilities are occasionally closed because they are old and inefficient. In the other cases where output was reduced, whole plants were closed or shifts removed and respondents said these things were done in

part at least to support prices. No one spoke of operating with partial shifts, because it would not be profitable at current prices to operate at a higher level. This is what one would expect to hear if marginal costs increased with output and if the elasticity of demand for the producer's product was high because it was a commodity. I interpret these observations as supporting indirectly constancy of marginal variable costs.

The President of a large lumber and plywood brokerage said, "As we become more automated, it is harder to shut down, because your fixed costs become a bigger and bigger percentage of your costs. So if you shut the mill down and you only let two people go, well, what is the point? I mean, we can go into OSB mills, oriented strand board¹⁵ mills, and it is uncanny. A production facility of 500,000 square feet making 10 boxcars a day of oriented strand board and there is one engineer on the line and there is two guys driving a forklift and a supervisor, and that is the plant. I suppose you have got a maintenance crew. [So it would only be worthwhile to shut down if the price goes below the materials cost.] Right."

The owner of a northeastern lumber producer said, "[Is your production higher in slow times?] Well, you know, that is a good question, because you say, 'Well Jes, if we produce a little more and drive the operating costs down, we will be in a better position relative to someone else.' [You can still sell it?] Yeah, at some price. Now the question is is the price going to drop faster than you can cut your operating costs, and you don't know that until you do it. [So your output really does not seem to depend much on the price?] That is correct. [So the market supply adjusts by having the high cost mills shut down? The individual mills are not cutting back?] That is right. Typically they are selling more."

A Product Manager for synthetic fibers in a large chemical company said, "In a business where maybe two thirds of the costs are variable in the function of these chemicals and one third fixed, there is still some value to the spreading of fixed costs to grow volume. It is very commodity-like behavior – sell at my capacity, and that is what price wars are all made of. Recently one of our competitors built a very large new factory in a market environment that is not growing. In North America, the market is growing at a couple of percent per year. They just added ten percent to the market's capacity. Now where is it going to go? They have to find a place to put it, and that creates, because of an oversupply, a lot of price warring. [Why do they add capacity like that when they know that the market is in over supply?] I don't know for sure. (They think,) I will have a modern factory, which can produce at a lower unit cost. So I can win in a cost-based way, and I myself have older factories. I might choose to shut one down, and therefore I am not really adding capacity to the market, but I have secured my share with a state-of-the-art fiber. To build a factory, presuming that someone else will shut theirs down is an enormous business risk. I have

¹⁵ Oriented strand board is a low-priced alternative to plywood and is used to sheath houses.

been on the giving and receiving side of those speculations for years and I have never seen anybody give up (by ending a price war). [Oh, really? Do they get mad?] No. It is not spite. The difference between full costing and incremental costing is an enormous difference."

6) Formula Based Pricing

During the period of this study, there was a marked increase in the use of contracts with formula based pricing. This was fortunate, because respondents could explain to me why they were adopting the contracts. Two factors seem to explain the increased popularity of formula based pricing since the mid 1990s. One factor is the increased volatility of commodity spot prices, which makes long-term contracts with formula based prices more practical than those with fixed prices. Contracts with fixed prices are not likely to last when spot prices are volatile, because the spot prices are likely to drift away from the fixed price, so that either the buyer or the seller in the contract would find it more advantageous to trade spot than at the fixed contract price. The other factor that explains the increased use of formula based pricing is the increased consolidation of American business, which creates huge corporations that build large factories whose sole function is to supply another corporation with some commodity. Such large organizations cannot afford to allow disagreement over price to disrupt their relationship, so instead of constantly negotiating prices they negotiate a formula that adjusts the price automatically as spot prices or production costs change. There is a long history of contracts that index prices to

government indices of production costs, as in the railroad and coal mining industries. What is new is the increased use of indexation to average spot prices.

The Marketing Director for Dimension Lumber for a western lumber company said, "What we find is if you have a program where you are determining price at time of shipment, like if you would call the customer today and say, 'Let's establish a price for next week.' It is never an ongoing program. At some point you get where you can't establish a price in our business. They think it is too high, or we think it is too low, and you don't establish a price or come to agreement. So pretty soon your program is gone. That is kind of what I have seen over the years."

The Marketing and Sales Manager for olefins in a large petroleum corporation said, "[So it was really increased risk that brought this on?] It is the increased risk. [Brought this use of formula based pricing?] Yeah. Increased risk of change in hydrocarbon prices. [That is a way of handling that? You just appeal to an index? Does it save negotiation costs?] A lot of it saves negotiation. The cost of negotiation is time, which viewed against the cost of these products is nothing. [It is not a consideration?] No, because people like to have certainty around their margins, especially if you are dealing in a lower margin period."

The Vice President of Sales of a northeastern lumber producer said, "Some of our relationships are dealt off Friday's (a lumber price index) prior, which you hear a lot of in our business. [So the price fluctuates during the course of the contract?] Some, yeah, because some customers want to commit to your wood and will pay more money for it, but they want to be tied to a market. [Why is that?] Because they have competition right next to them buying lumber that they have got to compete against."

A senior vice president of a huge meat packer said, "We are a large supplier to (a huge retailer). We supply a large portion of their - they are all case ready to sell. If you go into (the retailer's) meat section, it is all prepackaged, prepriced. We are a very large supplier to them, and you can't have the risk of not coming together on a price, because we have specific large plants that are dedicated to them and it is not like we can go some place else and sell that, and they can't go any place else and buy it. So there is so much interdependence on each other. You are going to find a way to come together on price, because you have to, and it does not matter if it is (one of three large food products firms), you have to find a way to come to terms."

The owner of a northeastern lumber producer said, "[Why have a formula based price like that rather than just continually bid it, continually back and forth over it?] Truman, I think to that question too, I think that it is an interesting question. I think the answer is that regular buyers want fewer more meaningful relationships with suppliers. They would rather buy from a single mill, because quality and communication and all those things can be simplified. But their worry when they commit to a single mill is how are you going to keep my pricing competitive, and I think those formulas are the solution to that, where I can have my cake and

eat it too. I can pick a single mill and yet I can use a formula that will give me some comfort. That is, market prices, especially as they move down, I will stay connected to that."

The General Manager of Sales of a steel manufacturer said in 2013, "So you saw this enormous price change from end of 07 within six or seven months, up to \$1,000 a ton, and it became obvious that the arrangement of having some sort of fixed pricing even if it was for just six months was not working for people. So you got a lot of - there was a lot of discussion about okay, how are we going to approach contracts moving forward in 2009 after we went through this period in 2008, and that is where really I think the indexed concept kind of started to make its way in force into the discussion. [Prices started to fall in 2009?] Prices had already started to fall, so there was no confidence - you know, the recession hit late in 08, so if we are negotiating all these contracts, people were seeing the price of hot rolled go down just as quickly as it had gone up, so the steel mills said, 'I can't get locked into a low price.' The buyer said, 'I can't get locked into a high price, so we need to do something to fix this.' And I think there was a feeling that as long as you were being able to sell product at a rate that generated a return, if it was a variable price mechanism that would work. So you saw the evolution of index based contracts. Now some contracts are based on, as you said earlier, an outside index, like a publication like (a steel price index). Some contracts are indexed based upon raw material costs, like scrap. There are others that are indexed based upon a basket of raw materials, like scrap and coal and coke and iron ore and natural gas. So there are a lot of different ways that people evolved their contracts."

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