Spring 2010

NERA
Economic Consulting

Going Beyond the Conventional Wisdom on Whether Merger-Related Cost Savings Will Benefit Customers

By **Michael R. Baye** and **Graeme Hunter***

Antitrust Insights

From the Editor

The motivation for many proposed mergers and acquisitions is the potential to reduce operating costs or to improve product quality, customer service, or the rate of innovation. Although the prospect of efficiencies may explain why the merging parties want to merge, what determines whether consumers are likely to benefit as well?

In this issue of *Antitrust Insights*, Michael Baye and Graeme Hunter examine the conventional wisdom that reductions in marginal costs will be passed through to consumers in the form of lower prices. They explain how and why a given reduction in marginal cost may or may not lead to a drop in price. The market factors that may determine the outcome include the nature of consumer demand and the dynamics of competition in the market served by the merged firm.

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I hope you enjoy this issue.

Lawrence Wu, Editor

For the vast majority of proposed transactions, a major motivation is the desire to achieve efficiencies that could not otherwise be achieved, such as the ability to reduce costs or to improve product quality, customer service, or the rate of innovation. The potential to cut costs by combining operations is particularly important and frequently announced by merging parties.[1] Although the prospect of cost savings and other efficiencies provides a rationale for why the merger may make economic sense to the merging parties, a question that arises in the context of an antitrust analysis is whether consumers will benefit as well.

Economic theory suggests that different types of efficiencies will have different impacts on the prices that consumers pay for goods and services. For example, the conventional wisdom is that reductions in marginal costs will lead to lower prices, but that reductions in fixed costs don't benefit consumers at all. This wisdom is well grounded in economic theory, but as we discuss below, whether and by how much a given efficiency will affect the prices that consumers pay will depend on a variety of market-specific facts, which include the nature of consumer demand and the nature of competition among firms. Because a number of factors determine whether cost-saving efficiencies will be passed on to consumers, an assessment of the benefits of a proposed merger or acquisition will often require a

careful economic analysis of not only the types of cost savings that will result from the transaction, but also the markets in which the merging firms compete.

The Conventional Wisdom

As laid out in the Department of Justice (DOJ) and Federal Trade Commission (FTC) *Horizontal Merger Guidelines*, the DOJ and FTC tend to place more weight on marginal cost efficiencies than on fixed cost efficiencies. This is because marginal cost efficiencies are "more likely to be susceptible to verification, merger-specific, and substantial, and are less likely to result from anticompetitive reductions in output."[2]

This reasoning reflects basic economic theory that decreases in marginal cost are likely to lead to decreases in price. Indeed, the application of the basic rule of profit maximization tells us that firms make price and quantity decisions such that marginal revenue will equal marginal cost.[3] Thus, a decrease in marginal cost will lead a profit-maximizing firm to lower its prices. Because this holds for all profit-maximizing firms, even monopolists have an incentive to lower their prices if their marginal costs fall.

This conventional wisdom can be illustrated with a simple monopoly pricing example. Suppose a *local* monopoly face painter in Times Square has a marginal cost of $3 per face painted; these costs represent the variable cost to the artist (time and paint) of decorating each face, but excludes fixed costs (the $4.50 round trip subway ticket from his apartment to Times Square). Further suppose that the demand for the artist's services is such that 10 people per day would choose to have their face painted if this service were "free," but for every $1.00 increase in price, the quantity demanded falls by one person. Thus, at a price of $10, no one chooses to have their face painted; at a price of zero, 10 people would opt to decorate their face on a typical day.

Mathematically, this relation between quantity (Q) and price (P)—known as the demand curve—may be described by an equation that describes how much people will buy at any given price. In this example, the demand curve is expressed in mathematical terms by the linear relationship, $Q = 10 - P$. Of course, the demand curve need not be linear. It could take any shape, and in principle, such a relationship may be discovered via econometric methods given appropriate historical data.

One can summarize the demand function described above in tabular form, and this is shown in the first two columns of Table 1. Notice that when the price is $10, quantity demanded is zero, as is the artist's total revenue (shown in the third column). As the artist lowers his price, additional consumers choose to have their face painted and the quantity demanded increases. For instance, lowering the price from $10 to $9 induces one consumer to have her face painted, and the artist's revenues increase to $9. The associated change in revenue, which is called marginal revenue, is shown in the fourth column of the table as $9. Since the change in revenue ($9) exceeds the marginal cost of painting the first face ($3), the artist earns incremental profits of $6. The revenue added to the artist's hat (his cash drawer) exceeds the cost of the time and paint required to paint this extra face.

In Table 1, the marginal revenue exceeds marginal cost until the price falls to $6 and four faces are painted. At this price, the marginal revenue ($3) equals marginal cost ($3). Thus, $6 is the monopolists' profit-maximizing price. At this price, the artist collects $24 in revenues and his variable costs are $12. Since his fixed costs are $4.50, his overall profits are $7.50 per day.

Table 1. **Determining the Price that Maximizes Profits**

Price (P)	Quantity Demanded (Q)	Total Revenue (P × Q)	Marginal Revenue	Marginal Cost
$10	0	$0	$ --	$3
9	1	9	9	3
8	2	16	7	3
7	3	21	5	3
6	4	24	3	3
5	5	25	1	3
4	6	24	-1	3
3	7	21	-3	3
2	8	16	-5	3
1	9	9	-7	3
0	10	0	-9	3

What would happen if the artist's *marginal* cost declined from $3 to $1 due, for example, to efficiencies stemming from negotiating a more favorable contract with a paint supply company? Marginal revenue now equals marginal cost when the price is $5 and five faces are painted in a typical day. At this price, revenues are $25, variable costs are $5, and the monopolist now receives $20 on a typical day over and above his variable costs. Deducting his fixed costs of $4.50, his net profits are now $15.50. As a result of the reduction in marginal cost, both consumers and the monopolist benefit: the price paid by consumers declines from $6 to $5, and the monopolist's net profits increase from $7.50 to $15.50.

The conventional wisdom is that marginal cost savings are passed on to consumers in the form of lower prices. While this is intuitive, quantifying the actual amount of the cost savings that are passed through to consumers requires more than conventional wisdom.

Consider, in contrast, what would happen if the artist's *fixed* costs declined from $4.50 to $1 but his marginal cost remained at $3. In this case, marginal revenue equals marginal cost at a price of $6—which is identical to what it was before the reduction in fixed costs. Thus, the artists' revenues and variable costs remain at $24 and $12, respectively. However, the monopolist's net profits increase from $7.50 to $11 thanks to the reduction in fixed costs.

This example highlights the conventional wisdom: reductions in fixed costs *do not* benefit consumers, but reductions in marginal cost *do* benefit consumers because they result in lower prices. For this reason—which is consistent with the objective of making enforcement decisions based on consumer welfare—the FTC and DOJ tend to place more weight on marginal cost savings and less weight on fixed cost efficiencies when evaluating proposed mergers.[4] Of course, the amount of any efficiencies passed on to consumers must be weighed against any price increase stemming from the market power the merged entity might obtain through the merger. In other words, the greater the efficiencies passed on to consumers, the greater the scope for efficiencies to outweigh adverse competitive effects resulting from a merger.

Quantifying the Effect of Reductions in Cost on Price

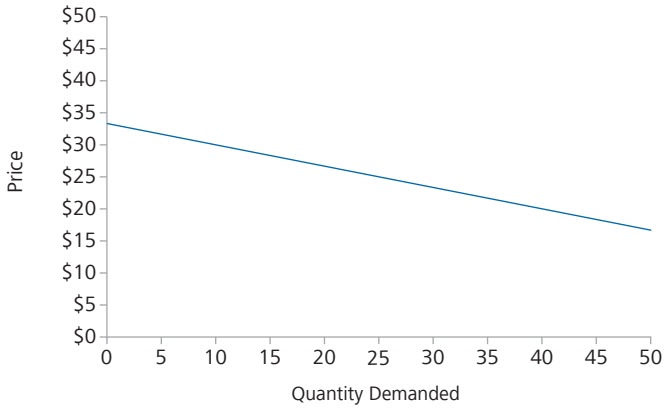
The conventional wisdom is that marginal cost savings are passed on to consumers in the form of lower prices. While this is intuitive, an analysis of efficiencies in the context of a merger review requires a second step—quantifying the reduction in price that would result from the claimed reduction in cost. The reduction in price that will result for a given reduction cost is called the pass-through rate, and as discussed below, quantifying the actual amount of the cost savings that are passed through to consumers requires more than conventional wisdom.

In the above example, the $2 reduction in marginal cost (from $3 to $1) reduced price by $1 (from $6 to $5). This represents a pass-through rate of 50%: only half of the cost-savings are passed on to consumers.

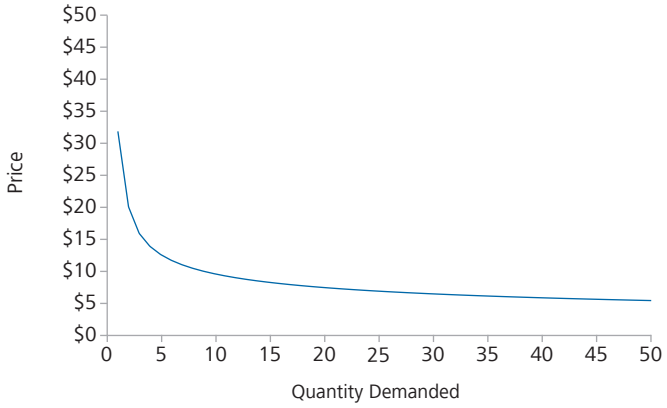
It turns out that the amount of the pass-through depends critically on the shape of the demand curve.[5] Figure 1 shows three shapes of demand curves. The curve in panel A is a linear (straight-line) demand curve, which implies that the pass-through rate is always 50%—regardless of the slope and intercept of the demand curve. Thus, the 50% pass-through rate in the example of our monopoly face painter is not an artifact of the numbers in the example but rather the assumption that the number of faces painted is a linear function of price.[6]

Figure 1: **Three Common Specifications of Consumer Demand**

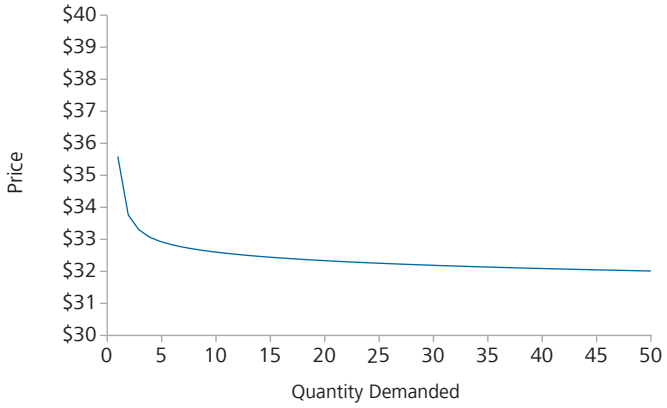
Panel A: Linear Demand Curve



Panel B: Log-Linear Demand Curve



Panel C: Semi-Log Demand Curve



The log-linear curve in panel B has a constant elasticity of demand (i.e., the elasticity of demand is constant everywhere along the curve and hence the elasticity does not depend on the price or quantity).[7] A firm that faces this kind of demand curve will pass-through *more* than 100% of the cost savings to consumers. In fact, the amount of the marginal cost reduction that is passed on to consumers is smaller the more elastic is demand. For example, if the elasticity of demand is -3, then the firm would pass on 150% of any marginal cost reduction to consumers.[8]

Finally, the semi-log demand curve shown in panel C implies that all of the cost savings are passed on to consumers.[9] Table 2 illustrates the range of pass-through rates that might result depending on the shape of the demand curve.

Table 2. **The Pass-Through Rates for a Reduction in Marginal Cost Will Depend on the Nature of Consumer Demand**

The Demand Curve: The Relation Between Price and the Quantity Demanded	Implied Pass-Through Rate
Linear Demand $Q = 100 - 3P$	50 Percent
Log-Linear Demand (Elasticity of -3) $\ln Q = 9 - 3 \ln P$	150 Percent
Semi-Log Demand $\ln Q = 100 - 3 P$	100 Percent

These three specifications of consumer demand are all commonly used in economic modeling, and, as shown in Table 2, they have very different implications for pass-through rates. This is a subtlety that arises when assessing the consumer benefit of a reduction in costs: taking both the market power of the merged firm and the magnitude of the reduction in marginal cost as given, different specifications of demand imply that the prices paid by consumers could decline by an amount that is less than the cost reduction, exactly the same

as the cost reduction, or more than the reduction in cost. These results suggest that the amount by which reductions in costs benefit consumers depends on the nature of consumer demand. Thus, whether consumers are likely to benefit from a given post-merger reduction in price is an empirical question that may require a careful econometric analysis of consumer demand.

There is a subtlety that arises when assessing the consumer benefit of a reduction in costs: the amount by which reductions in costs benefit consumers depends on the nature of consumer demand.

In economic environments that are more complex than the landscape confronting our monopoly face painter, fixed cost efficiencies also can result in lower prices to consumers. For example, a merger between a biotechnology firm and a large pharmaceutical company could lead to lower research and development costs, which in turn could increase competition and lower prices in the long run if the merged entity is better able to develop new drugs to compete with existing therapies.[10] A 2009 study by Malcolm Coate and Andrew Heimert documents that both economists and lawyers at the FTC recognize the legitimacy of reductions in fixed costs, although economists tend to put more weight on these arguments than attorneys.[11]

Accounting for Competitive Conditions That Break the Link Between Firm-Specific Reductions in Cost and Price

The conventional wisdom is that reductions in marginal cost lead to lower prices. However, in some market circumstances, a reduction in marginal cost may not lead to any reduction in price. On the surface, this is counterintuitive—and certainly unconventional wisdom—but it is a possible outcome that is consistent with economic principles.

As discussed above, a firm's pricing decision is determined by its costs, as well as the nature of consumer demand in the markets it serves. In addition, there is a third factor—the nature of the competitive interaction among the merging firms. In the above example, for instance, the face painter was assumed to be a *local* monopolist. When a firm's market power is only local in nature—and stems from the fact that other potential competitors sell products that are "distant" in the sense of either product characteristics or geographic space—it is possible that the pass-through rate is zero, in which case, none of the cost savings arising from a merger are passed on to consumers. One important factor is product differentiation in the market, and the role of both product and geographic differentiation is discussed below.

Product Differentiation and Pricing

In many markets, the products or services that firms sell can be differentiated in location or quality. In either case, it is possible for a firm-specific marginal cost saving to be kept by firms and not passed on to consumers in the form of reduced prices. The examples below describe why a reduction in marginal cost may not provide a firm with an incentive to lower price.

In many markets, the products or services that firms sell are differentiated in location or quality. In either case, it is possible for a firm-specific marginal cost saving to be kept by firms and not passed on to consumers in the form of reduced prices.

Suppose that there are three coffee purveyors supplying an area: 1) Fancy-Pants Coffee, 2) Middle-Road Coffee, and 3) Almost-Sludge Coffee. Fancy-Pants is known for its high quality, fair trade brew. Because it buys beans in smaller batches and the brewing is more labor intensive, Fancy-Pants has the highest marginal cost—$3. Middle-Road also

sells reasonably decent coffee. Because it uses mass produced beans, its coffee is not as fresh as Fancy-Pants, but its marginal cost is lower—$2. Almost-Sludge sells low quality, mass produced coffee, recycles coffee grinds for repeat batches, and requires customers to supply their own cups. As a result, its marginal cost is only $0.10.

Suppose that the customers served by these coffee purveyors have different preferences. There may be, for instance, many premium coffee drinkers who place a high value on quality coffee and are willing to pay up to $5 for a premium cup of coffee. However, these same customers would buy moderately good coffee if they saved more than $2. They would buy sludge if they saved more than $4.50 on a cup of premium coffee and more than $2.50 on a cup of moderately good coffee. Suppose further that there are a handful of consumers that have a preference for Middle-Road and Almost-Sludge—barely enough to permit them to exist in the market. These customers will buy their preferred brand of coffee—and only their preferred brand—provided the price does not exceed $2.01 and $0.11 per cup, respectively. Middle-Road and Almost-Sludge would make $0.01 on each cup of coffee they sell to their die-hard customers at these prices.

In the pre-merger world, Fancy-Pants charges a price of $4.01, Middle-Road charges $2.01, and Almost-Sludge charges $0.11 per cup. At these prices, Fancy-Pants serves the premium segment of the market and its competitors cater to their die-hard customers. Here, the price charged by Fancy-Pants is determined by the price charged by its next closest competitor, which is Middle-Road. At any price above $4.01, Fancy-Pants' customers would switch to Middle-Road, so it finds it profitable to keep its price $2 above that charged by Middle-Road.

If Fancy-Pants and Middle-Road merged, Fancy-Pants will be able to raise prices and still capture all of the premium drinkers. After the merger, the only constraint on price will be Almost-Sludge, which customers would choose if Fancy-Pants were to charge a price higher than $4.61 (because premium customers are willing to pay an extra $4.50 for a cup of really good coffee compared to a cup of bad coffee, and Almost-Sludge must charge at least $0.11 to turn a profit). As a result of the merger, Fancy-Pants can profitably raise its price from $4.01 to $4.61 after the merger. If it raised its price above $4.61, its customers would switch to Almost-Sludge. Thus, pre-merger, Fancy-Pants' price was disciplined by the lowest price that Middle-Road could profitably charge; but post-merger, the price that Fancy-Pants could charge would be constrained by the price charged by Almost-Sludge.

In a situation like this, we can see that a reduction in marginal cost may not affect prices. Assume, for instance, that the merger reduced Fancy-Pants' marginal cost from $3 to $2. Even though there is a reduction in marginal cost, Fancy-Pants is already capturing the sales to all premium drinkers, which means it would not increase its sales by dropping its price. Thus its marginal revenue from a price cut is actually negative, and still less than its now-lower marginal cost. Thus, the post-merger price would still be $4.61 because Almost-Sludge provides the only competitive constraint post-merger.

In some differentiated products markets, a reduction in marginal cost would lead to a reduction in price. However, as illustrated by the simple example above, the pass-through rate may be zero when prices are determined by localized competition rather than costs. In these economic environments, marginal cost efficiencies may not be passed on to consumers.

Geographic Differentiation and Pricing

Geographic differentiation is similar to product differentiation in that a firm with "local" market power due to a preferred geographic location may not have an incentive to lower its price after a reduction in marginal cost.

Consider, for example, two pizza parlors, Adams Morgan Pizza (in Adams Morgan) and Dupont Slices (in Dupont Circle), that are located in close proximity to each other. Suppose Adams Morgan has a marginal cost of $6 per pie and Dupont has a marginal cost of $5. Suppose it costs Dupont $4 to transport a pie to customers in the Adams Morgan neighborhood and that it costs Adams Morgan $1 to deliver pies to its local customers. The lowest profitable price that Dupont can charge these customers is therefore $9 (i.e., the sum of its marginal cost and transportation cost), and the lowest profitable price that Adams Morgan can charge is $7. If the next closest pizza parlor to Adams Morgan is Van Ness, which has a minimum

price of $11 for a pie delivered to these customers, what will happen to price in the event of a merger between Adams Morgan and Dupont?

In the pre-merger world, Adams Morgan will win the business by charging $8.99 to undercut Dupont. If Adams Morgan and Dupont merge, then the new entity will be able to charge up to $10.99 and still undercut Van Ness, the next closest rival. Assume that because of the merger, the merged firm (i.e., Adams Morgan/Dupont combined) gets access to Dupont's cheap supply of flour and now faces combined marginal and transportation costs for customers in Adams Morgan of only $6. Despite this drop in costs, the merged entity will still have an incentive to charge $10.99 to local customers because Van Ness has to charge at least $11 to cover its cost. In this instance, none of the savings are passed on to customers in the Adams Morgan neighborhood because Adams Morgan knows that it can charge $10.99 and still capture all local pizza deliveries. So here, the merged firm is able to increase price because of its increased market power and has no incentive to lower price despite a reduction in marginal costs. This example demonstrates that for customers for whom Adams Morgan and Dupont are the "closest" competitors, reductions in marginal and/or transportation costs may not be passed on to customers.[12]

Here, the concept of the "closest" competitor is literal, referring to the distance of the next supplier. In the product differentiation example above, the concept of closest instead refers to product attributes and quality. However in both cases, a marginal cost efficiency may not be passed onto customers.

Conclusion

Assessing the effect of reductions in marginal cost on the prices paid by consumers is informed by conventional wisdom, but quantifying whether and by how much a given reduction in cost is likely to benefit consumers requires an analysis that goes beyond textbook models of competitive and monopoly pricing. It is not enough to demonstrate that efficiencies are simply "cognizable;" what is required is an assessment of the cost savings that will be passed through in the form of lower prices.

Assessing the effect of reductions in marginal cost on the prices paid by consumers is informed by conventional wisdom, but quantifying whether and by how much a given reduction in cost is likely to benefit consumers requires an analysis that goes beyond textbook models of competitive and monopoly pricing.

The cost pass-through rate depends critically on the nature of the demand curve facing the merged firm and the nature of competition in the market served by the merged firm. In practice, economists can estimate the parameters of the demand curve using historical data and empirical methods, including econometric techniques. The analysis also may require careful modeling of the nature of the competition, which could have given rise to pre- and post-merger market power. Quantifying the pass-through potential of the claimed efficiencies is central to a careful economic analysis of the efficiencies and the overall consumer welfare effect of a proposed transaction.

The opinions expressed herein do not necessarily represent the views of NERA Economic Consulting or any other NERA consultant.

Notes

* We wish to thank Casey Salvieti, Lawrence Wu, and Scott Thomas for helpful comments and assistance in drafting this article.

1 As an example, in 2010, United Airlines and Continental announced their intent to merge, citing annual cost savings of $200 to $300 million through reductions in overhead, marketing, sales, advertising, and technology functions. (See http://www.unitedcontinentalmerger.com/benefits/investors.)

2 US Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines*, Section 4 (1992, revised 1997). (Available at http://www.justice.gov/atr/public/guidelines/hmg.htm#4). See also Section 10 in the proposed 2010 *Horizontal Merger Guidelines* that was released for public comment on April 20, 2010. ("In a unilateral effects context, marginal cost reductions may reduce or reverse any increases in the merger firm's incentive to elevate price.") (Available at http://www.ftc.gov/os/2010/04/100420hmg.pdf.)

3 See Michael R. Baye, *Managerial Economics and Business Strategy, Seventh Edition* (New York, New York: McGraw-Hill/Irwin, 2010) at 396.

4 As stated in Section 4 of the 1992 *Horizontal Merger Guidelines* (revised 1997), "[o]ther efficiencies, such as those relating to research and development, are potentially substantial but are generally less susceptible to verification and may be the result of anticompetitive output reductions. Yet others, such as those relating to procurement, management, or capital cost are less likely to be merger-specific or substantial, or may not be cognizable for other reasons." (Available at http://www.justice.gov/atr/public/guidelines/hmg.htm#4.) The proposed 2010 *Horizontal Merger Guidelines*, Section 10, also give more weight to efficiencies that are passed through to consumers in the form of lower prices. ("The greater the potential adverse competitive effect of a merger, the greater must be the cognizable efficiencies, and the more they must be passed through to customers, for the Agencies to conclude that the merger will not have an anticompetitive effect in the relevant market.") However, the proposed 2010 *Horizontal Merger Guidelines* also recognize that there are other efficiencies that must be considered, even if the consumer benefit is not immediately apparent. ("Efficiencies also may lead to new or improved products, even if they do not immediately and directly affect price.) (Available at http://www.ftc.gov/os/2010/04/100420hmg.pdf.)

5 See, for example, Jeremy I. Bulow and Paul Pfleiderer, "A Note On The Effect Of Cost Changes On Price," *Journal of Political Economy* 91, 1 (February 1983): 182-185.

6 If the inverse demand curve is $P = a - bQ^{(x)}$, then the pass-through rate is 1/(1+x). A linear demand curve is a special case of this general function, where x=1, and so the pass-through rate is ½, or 50%. See Bulow and Pfleiderer, "A Note On The Effect Of Cost Changes On Price," at 183 (as cited in note 5).

7 This is called a log-linear demand curve because $\ln Q = a + \eta \ln P$ is linear in the logarithms of output and price. The equation implies that the elasticity of demand (denoted by the parameter η) is a constant. For this specification to make sense for a monopolist, the elasticity of demand (η) must be greater than one in absolute value.

8 A constant elasticity inverse demand curve has the form $P = bQ^{(1/\eta)}$, where η is the elasticity of demand. For a demand curve of this form, the pass-through rate is $\eta/(\eta+1)$. See Bulow and Pfleiderer, "A Note On The Effect Of Cost Changes On Price," at 183 (as cited in note 5).

9 This is the so-called semi-log demand function. If the inverse demand curve has the form $P = a - b\ln(Q)$, then the pass-through rate is 100%. See Bulow and Pfleiderer, "A Note On The Effect Of Cost Changes On Price," at 183 (as cited in note 5).

10 For a more detailed discussion of how reductions in fixed costs can be passed onto consumers in the form of lower prices or quality improvements, see Robert N. Rubinovitz, "Acquisitions that Create Efficiencies: Merger Analysis and the Treatment of Reductions in Fixed Costs," *Antitrust Insights*, NERA Economic Consulting, Spring 2008. Section 10 of the proposed 2010 *Horizontal Merger Guidelines* also recognizes the importance of fixed cost savings: "Efficiencies relating to costs that are fixed in the short-term are unlikely to benefit customers in the short-term, but can benefit customers in the longer run, e.g., if they make new product introduction less expensive." (Available at http://www.ftc.gov/os/2010/04/100420hmg.pdf.)

11 See Malcolm B. Coate and Andrew J. Heimert, "Merger Efficiencies at the Federal Trade Commission, 1997-2007," Economic Issues Paper, Bureau of Economics, Federal Trade Commission, February 2009. (Available at http://www.ftc.gov/os/2009/02/0902mergerefficiencies.pdf.)

12 Note that this example assumes unit demand to the pizza parlor with the third lowest delivered price. The results described here also obtain if there is a downward sloping demand, provided that the price required to slightly undercut the next best price (post-merger) is less than or equal to the monopoly price associated with the lower production/transportation costs of the merged firm.

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