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"Bundling and the GE-Honeywell Merger"

Barry J. Nalebuff, *Yale School of Management*

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Barry Nalebuff
Yale School of Management

INTRODUCTION

The economic theory of bundling has moved from the classroom and academic journals to the public policy arena. Its debut was dramatic. On July 3, 2001, the European Commission blocked the $42 billion merger between GE and Honeywell.[1] A primary reason for their objection to this combination was a concern over bundling.

This paper uses the context of the proposed GE-Honeywell merger to address the concerns raised by bundling.[2] We set out the theory as put forth by the Commission and try to reconcile this theory with both the economic theory of bundling and the facts of the case. We discuss what is meant by bundling and explain when it is a potential problem and when it is not. Based on this understanding, we propose anti-trust policy recommendations to deal with the novel issues raised by bundling.

Background

On October 19, 2000, United Technologies Corporation (UTC) reported that it was in merger discussions with Honeywell. Three days later, a merger was announced – but the buyer was GE, not UTC.

[1] The merger was voted on by the 20-member European Commission. Their vote confirmed the recommendation made by Competition Commissioner Mario Monti, who, in turn, was given a recommendation by the European Union Merger Task Force.

[2] The author was an economic expert for GE-Honeywell in their presentation to the European Union Merger Task Force. The application of bundling theory to the GE-Honeywell merger was done together with Patrick Rey, Carl Shapiro, Shihua Lu, and Greg Vistnes. The opinions expressed in this paper are solely those of the author.

This case generated a good deal of attention. General Electric is one of the most well-known and admired companies in the world. At $42 billion, this was a large merger even for GE. The proposed integration passed the scrutiny of the US Department of Justice. Because of the size of GE and Honeywell's European sales, the merger also had to be approved by the European Commission.[3] On July 3rd, 2001, that permission was denied.[4] The divergence of outcomes between the US and European antitrust authorities added to the publicity of this case.

The Players

GE's 2001 revenues exceeded $125 billion, and its businesses included everything from plastics and television (NBC) to financial services, power systems, medical imaging, and lighting. In the arena of aviation, GE produces aircraft engines on its own (GEAE) and through CFMI, a 50/50 joint venture with SNECMA (a French company). This joint venture accounted for a large majority of GE's engine sales, as CFMI is the exclusive provider of engines for Boeing's most popular plane, the 737. CFMI engines also power the Airbus A320 family and the A340-200/300. GE's own engines power the Boeing 777, 767, and 747 planes. They also power the Airbus A300, A310, A330, and the not-yet launched A380 super-jumbo aircraft.[5] In almost all of these cases, CFMI and GEAE compete with Pratt & Whitney (a division of UTC), Rolls Royce, or IAE (a PW/RR joint venture).

[3] "The Commission has authority to review all mergers, acquisitions and takeover bids and other deals that can be defined as a 'concentration', involving companies with a combined turnover worldwide in excess of €5,0 billion and European sales of at least €250 million." Commission press release IP/01/939. See also Article 1 (2) (a) and (b) of the European Merger Control Regulation, Council Regulation 4064/89 EEC of 21 December 1989 on the Control of the Concentration between Undertakings, 1990 O.J. (L 257) 13, as amended by Council Regulation 1310/97 EC of June 30, 1997, 1998 O.J. (L 180) 1.

[4] While the parties have appealed the decision to the Court of First Instance of the European Communities, a judgment is not expected until sometime in 2003, too late to resurrect the prohibited transaction

[5] The GP7000 engine, designed to power the Airbus A380, is a joint venture between GE and Pratt & Whitney

Honeywell started out in heating and environmental controls and over time developed a leadership position in aerospace.[6] Honeywell's position in avionics was enhanced through a series of mergers, most notably the purchase of Sperry Aerospace in 1986 and a merger with Allied Signal in 1999. Allied Signal was itself a leader in aerospace, the result of Allied Corporation 's purchase of Bendix in 1983 and merger with the Signal Companies in 1985. Along with avionics, Honeywell's nonavionics aerospace products include auxiliary power units (which gives power to the plane when on the ground), starter motors, environmental control systems, aircraft lighting systems, engine accessories and controls, wheels and braking equipment. In 2001, nearly half of Honeywell's $23 billion of revenue came from their aerospace division.

The Case Against the Merger

To block a merger, the Merger Control Regulation requires the Commission to demonstrate that the proposed merger would lead to market dominance. According to European case law, dominance is defined as:

> a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by giving it the power to behave to an appreciable extent independently of its competitors, customers and ultimately of consumers[7]

In this case, the claimed route to market dominance was unusual. It was not through the merger of competitors. Nor was it through a vertical integration of customer and supplier.[8] Given the depth and breadth of GE and Honeywell product offerings, there was a remarkable *lack* of overlap between the two companies. Instead, the focus of the merger

[6] Honeywell instruments helped guide Apollo astronauts Neil Armstrong and Buzz Aldrin's landing on the moon.

[7] Case 27/76 *United Brands v. Commission* [1978] ECR 207 at 286.

[8] The very few areas of competitive overlap could have been resolved by divestitures. GE's role in speculative aircraft leasing and Honeywell's starter motor business did bring up some issues of vertical integration, which are not discussed here. See Pflanz and Caffarra (2002) for an excellent analysis of the unorthodox arguments made regarding the role of GE's leasing company, GECAS. A good summary of the Commission's case regarding GECAS is presented in Giotakas et. al. (2001).

review was on "conglomerate effects" or horizontal integration issues of bringing complements together.[9]

The Commission's case against the merger emphasized three linked points.

> First, the Commission claimed that GE had a dominant position in aircraft engines for large commercial aircraft and Honeywell had a leading position in avionics and non-avionics areas.
>
> Second, they claimed that the proposed merger would allow the new firm to bundle these complementary products. The bundling strategy would lead to price discounts that would give the firm an unbeatable advantage over its rivals.
>
> The third leg of the argument was that this advantage would lead to the exit of rivals and thus ultimately to strengthening the dominance of GE.

As explained in the EU Final Decision (para. 355)

> Because of their lack of ability to match the bundle offer, these component suppliers will lose market shares to the benefit of the merged entity and experience an immediate damaging profit shrinkage. As a result, the merger is likely to lead to market foreclosure on the existing aircraft platforms and subsequently to the elimination of competition in these areas.

To an economist, the Commission's case was unorthodox. The concern was that under the merger prices would fall --- not that prices would rise. The idea that bundle discounts

[9] The Commission referred to this as a conglomerate effect. I prefer the term horizontal integration of complementors as it emphasizes the specific nature of the relationship – namely that their two products are used together by a common customer. Honeywell's customers are primarily the airframe manufacturers and airlines, not the engine maker. Thus Honeywell is a complementor to GE as opposed to a supplier. (See Brandenburger and Nalebuff (1996) for a more formal definition of complementors.) Starter motors (and a few related components) are the exception to this rule.

could be an anticompetitive strategy was novel to this case.[10] A merger that created cost savings that resulted in lower prices would be permitted. But if the lower prices came from pricing efficiencies, this was viewed as anticompetitive. There was no discussion of whether the lower prices on the road to market dominance would or would not result in a net increase in the present discounted value of consumer surplus. Such considerations do not appear to be within the Commission's mandate.

Even to a lawyer, the Commission's case was unorthodox. The Commission did not demonstrate that the combination *would* lead to dominance, as required by its mandate. Rather, it emphasized the *theoretical* potential for future anti-competitive behavior.[11]

In this paper, we focus on the Commission's arguments concerning bundling. Not only is this aspect of the case novel, it also has wide-ranging implications for other mergers. We present the Commission's case for why bundling might create an antitrust issue, and then discuss whether the theory and evidence justified their conclusion.

It will help to define bundling at the outset. Many items are sold as a package. That in itself does not mean that the items are bundled. The answer depends on how else and at what prices the items can be purchased. For example, if two items are *only* sold together and are not available separately, this is a case of pure bundling. This may be done via pricing or via technology.

Pure bundling becomes tying when one of the items, say item 1, is sold by itself, but item 2 is only available as part of a package with 1. Thus the National Football League (NFL) has a season pass program to television viewers to watch every game of the season. This

[10] Range effects had been considered in a number of prior EU cases, including Coca-Cola/Amalgamated Beverages and Guinness/ Grand Metropolitan. These cases focused on distribution efficiencies rather than pricing strategies.

[11] Schmitz (2002) criticizes the decision on this basis: "Although it is probably true that the new company would indeed have the *potential* to bundle and it cannot be ruled out that at one point in time it might engage in this behavior, using this potential to conclude that the merger would strengthen a pre-existing dominant position within the meaning of Article 2 European Merger Control Regulation is questionable … Describing the question of whether it is permissible to block a merger because of possible future bundling as theoretical, hardly fits the impact it has. …[T]he tool for this investigation is and must be Article 82 EC, not the European Merger Control Regulation."

viewing option is only available on satellite TV and it not offered to cable viewers. Of course, satellite viewers can also buy a contract without the NFL season pass. Thus we would say that the NFL season pass is tied to satellite TV.

The most general form of bundling is mixed bundling and this was the type of bundling emphasized by the Commission. In mixed bundling, two items are available both separately and as a 1--2 package. *What makes this bundling is that the package is sold at a discount relative to the individual items*. If the package is simply priced at the sum of its component prices, and these components are each available on an a la carte basis, then we do not call this bundling, as there is no strategic impact of the bundle pricing. Note that mixed bundling includes pure bundling and tying as special cases.

In this next section, we first present the argument as made by the Commission concerning mixed bundling and then question whether this theory of bundling was applicable to the case at hand.

The Economic Theory of Bundling

The theory of bundling begins with Cournot (1838). Cournot considered the case of a monopoly seller of good 1 and a different monopoly seller of good 2 where the two goods are used together by the customer. Cournot used as an example the case of copper and zinc that are combined to make brass. Here one can think of the two goods as a jet engine and avionics.

Cournot's insight is that two monopolists, acting independently, will set an inefficiently high price. Were they to merge or coordinate their pricing, they would lower they price and earn more money. The simple intuition is that the lower price of good 1 stimulates sales of good 2 and this effect is not considered when goods 1 and 2 are sold independently.

It is not surprising that the merging firms make more money. What is unusual here is that prices *fall* so that consumers are also better off. The merger is a Pareto improvement. Thus the antitrust authorities should encourage such mergers.[12] We return to this issue when we discuss policy implications.

The Cournot example is the horizontal equivalent of "double marginalization." Each firm causes a negative externality on the competition by raising its price. When the two firms combine, they internalize this effect and lower prices. The simplicity of Cournot's argument has led to general confusion about when the theory is applicable.

In some ways this result is very general. It does not depend on the specific form of the demand function nor the cost function. It does not require that the goods be perfect complements. But there are several hidden assumptions on which the result relies. Two, in particular, are of concern to us.

First, the basic Cournot model does not consider the impact of the merger on any other firms in the market. This is by design. In Cournot, the producers of goods 1 and 2 were alone in the market. To apply this approach to the facts as interpreted by the Commission in the GE-Honeywell merger, we need to consider how the results change when the two merging firms are not alone in the market. Naturally, the results are more complicated.

There are now two reasons to cut price: market expansion and competition with rivals. Cournot looked at the price reduction as a way to increase the total market. Though the total demand for airplane engines can be expanded with a price reduction, the engine (along with avionics) are only a minority of the total airplane cost. The greater impact of a price cut is through the potential to gain market share from rivals.

Because there are rival firms, there will also be a response to a price cut. This response may offset the potential gain to the merging firms. Thus we will want to consider the

[12] One of the ironies of this case is that if one took the view that GE/Honeywell each had a monopoly position then bundling would unambiguously improve welfare. The only possible source of harm would be

equilibrium impact on the non-merging firms and on consumers to determine the overall social welfare implications.

A second reason why the Cournot framework may not apply to the GE-Honeywell merger is that the basic result depends on an unstated assumption: *that firms set a single price in the market to all customers*. This is a quite reasonable assumption for a typical consumer good, such as Microsoft Office. But it is not a reasonable assumption for the sale of large commercial products in which the two parties engage in extensive negotiation as part of the sale process. If firms can price discriminate or negotiate with each customer, then the advantage to bundling disappears.

Our focus here will be on the applicability of the Cournot model. There are others reasons to offer a bundle besides curing double marginalization. For example, even a monopolist seller of both A and B might be able to use bundled pricing as a way to improve its ability to engage in price discrimination.[13] This incentive to bundle is more important if there is demand for the goods individually (as is the true case with copper and zinc) than when all customers buy both goods (as is typically the case with jet engines and avionics).[14] We do not emphasize this aspect of bundling, as it did not play a role in the GE-Honeywell case.

Competing Against Bundles

We first extend the original Cournot model to cover the case where the two sellers face competition in the market. The results from this approach were at the heart of the Commission's theoretical argument against the merger.

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on competitors. But to the extent that the firm does not face competitors, there is no harm done.

[13] See, for example, Adams and Yellen (1976); McAfee, McMillan, and Whinston (1989); Bakos and Brynjolfsson (1999).

[14] There is still an advantage to bundling in a world where all customers buy an A-B package and the rival sellers of A (and B) are imperfect substitutes. This advantage only exists so long as the firm cannot perfectly price discriminate.

This approach is based on Nalebuff (2000). We consider the case with four firms in the market. There are two differentiated versions of the first good, produced by firms, A_1 and B_1 and two differentiated versions of the second good, produced by firms A_2 and B_2.

To model the product differentiation we assume that both A components are located at 0, while both B components are located at 1. The two goods can be thought of as avionics and engines with the "A" firms being GE and Honeywell and the "B" firms being Pratt & Whitney and Rockwell Collins.

Because planes require both engines and avionics, the customer will purchase one unit of both components in the basket. Thus, each consumer will buy one of (A_1, A_2), (A_1, B_2), (B_1, A_2), or (B_1, B_2).

Customers assemble the package that best suits their preferences. Each customer purchases the package with the smallest total cost, where total cost is composed of price plus a linear unit transportation cost. We assume that for each of the two goods, the customer's ideal location is uniformly distributed over [0, 1].[15] Location preferences for each good are independent.

There are three possible market structures. All four firms act independently; the two A firms bundle as do the two B firms, resulting in bundle-against-bundle competition; the two A firms combine, while the two B firms remain separate.[16]

Case 1: A_1, A_2, B_1, B_2 each separate

Case 2: A_1-A_2 combination versus B_1-B_2 combination

Case 3: A_1-A_2 combination versus B_1 and B_2 separate

[15] Later we will explore cases where the sellers have more information as to the customer's preferences. This leads to a different distribution of customer locations.

Case 1: All Firms act Independently

With a uniform distribution of customers and unit transportation costs, the equilibrium prices equal 1 and the market is evenly split between firms A and B.[17]

$$P_{A1} = P_{A2} = P_{B1} = P_{B2} = 1. \qquad \prod_{A1} = \prod_{A2} = \prod_{B1} = \prod_{A2} = 1/2.$$

This case is the baseline from which we can evaluate the impact of coordinated pricing decisions. In this baseline case, consumers mix and match their preferred components and pay a price of 2 for their 2-good customized bundle.

Case 2: Bundle versus Bundle

Here all the A firms coordinate their pricing and sell their product as a bundle against the B firms, who have also coordinated their pricing decisions.[18] Let bundle A sell for $P_A = P_{A1} + P_{A2}$, and bundle B sell for P_B, defined similarly. In this equilibrium

$$P_A = P_B = 1, \qquad \prod_A = \prod_B = 1/2.$$

Profits fall by 50%. This is because the aggregate bundle price has fallen by 50%. The price of the entire bundle is reduced to the prior price of each of the single components. In hindsight, the intuition is relatively straightforward. Cutting price brings the same number of incremental customers as when selling individual components. So the bundle price must equal the individual price in a symmetric equilibrium. Bundle against bundle is ferocious competition. Similar results hold for bundles with more than 2 goods as demonstrated in Nalebuff (2000).

Case 3: Bundle against Components.

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[16] The case where the two B firms combine and the A firms remain separate leads to the same results.
[17] We further assume that production has constant and equal marginal costs. With this assumption, profit margins are independent of costs and so we employ zero marginal costs in the results below.
[18] For simplicity, we assume that consumers buy only one of the two bundles.

The pricing externality suggests that the bundler will have an advantage over the component sellers. But the results of case 2 suggest that this gain may be offset by an increase in competition induced by the A firms selling their products only as bundle. Which effect dominates?

$$P_A = 1.45;\ P_{Bi} = 0.86,\ P_B = 1.72. \qquad \prod_A = 0.91,\ \prod_{Bi} = 0.32$$

It turns out that the increased competition effect dominates so that bundling reduces Firm A's profits from 1 to 0.91. The bundler does roughly 50% better than the sum of the uncoordinated B firms. The market share moves from a 50:50 split to 63:37. But even with this gain in share, the bundler does about 10% worse than in the case where each component is sold in an uncoordinated fashion. The explanation is that the bundle takes away enough market share from the B firms so that the resulting equilibrium prices are low enough to make the A firm worse off.[19] Thus, even though it leads to an advantage, there is no incentive to bundle.

These results, taken from Nalebuff (2000), consider the case of pure bundling --- products A_1 and A_2 are only available as a bundle. To apply this model to GE-Honeywell, the results need to be extended to cover the case of mixed bundling.

Mixed Bundling

Rolls Royce presented to the Commission an extension of this model to include the case of mixed bundling.[20] While it is difficult to find a closed-form solution, the approximate equilibrium prices and profits can be found through simulation. The results are not identical to the pure bundling case, though they have the same flavor.

[19] As the bundle grows in size, the gap in prices continues to grow and, consequently, so does the bundler's market share. Once the bundle has four or more items, equilibrium profits rise for the bundling firm. See Nalebuff (2000).

[20] The non-confidential version is presented in Choi (2002).

The A bundle is sold for a 19% discount below the pre-merger price of 2 and the component prices for A rise from 1 to 1.21. The B firms respond to this increased competition by lowering their component prices to 0.890.

$$P_A = 1.63,\ P_{Ai} = 1.21;\ P_{Bi} = 0.89,\ P_B = 1.78. \quad \prod_A = 0.97,\ \prod_{Bi} = 0.40$$

Even with mixed bundling, the merging firm still sacrifices profits. Profits fall from 1.00 to 0.97 or 3%. Although its profits fall, firm A gains an advantage over its rivals. Firm A's market share is 55.4% and the rival's profits fall by 21%.

This model is obviously quite stylized. The results about whether or not the bundling is profitable can be reversed with relatively minor changes in parameter values or modeling assumptions. For example, bundling becomes more profitable the more items are added to the bundle (at least for the case of pure bundling).

While the biggest impact from lowering price comes from gaining market share, there is also the potential to expand the total market. As recognized by Choi (2002), even if this effect is small, it can be enough to make bundling profitable.

Thus the Commission reached the conclusion that economic incentives would lead a firm to engage in mixed bundling. That a firm that bundles obtains an advantage over its rivals is a relatively robust conclusion. But whether or not a multi-product firm has an economic incentive to bundle is a much more delicate finding. And by the same token, so is the expected loss to the competition. Among other factors, it depends on the number of items in the bundle and the elasticity of total market demand. The results presented rely on a specific distribution of preferences, namely a uniform distribution. It is not clear if the results would be robust across different distributions of customer preferences.

The results also depend on the two goods in the bundle being of symmetric importance to the consumer. Clearly the engine is more important than the avionics or even all of the potential Honeywell components combined.

An aircraft engine might have a $15 million price tag while a piece of avionics could sell in the $100,000 range. Overall the avionics components add up to less than 5% of the total aircraft cost. The basic model of bundling has the two products being symmetric in valuation. Nalebuff and Lu (2001) extend the earlier model to allow for asymmetry in importance. In the examples considered, there appears to be little incentive to bundle and minimal impact on competitors. In fact, with pure bundling and enough asymmetry, bundling actually *increases* the profits of all the players in the market.

The Rolls Royce model only examines the two-goods, two-vendor case. Realistically, the number of avionics and nonavionics goods purchased is in the several dozens, and the number of important vendors is at least a dozen. We need to understand not just whether mixed bundling is attractive or not, but also how much more attractive is it as the bundle size increases and what impact that increased bundle has on the market.

Thus before we try to use these type of models to make predictions about the likely impact of a merger, the models need to be robust enough to capture some important elements of the real-world market.[21] If one takes the results of this model at face value, it is not clear why there should be any antitrust concern. Average prices fall in the market. Consumers are better off at the expense of firms.

One can make the argument that social welfare falls, but as Rey observed in his presentation to the Merger Task Force this is truly an artifact of the model. As demand is inelastic, the only change in social welfare is due to a change in transportation costs. Since transportation costs are minimized in the initial symmetric equilibrium, *any* change would lead to a fall in social welfare. But this argument depends critically on the starting

[21] But even assuming for a moment that all of these issues did not exist, work by Patrick Rey shows that even on its own terms the Rolls Royce model was fatally flawed. In order to estimate the impact of the proposed merger, one needs to have coefficients on the model. The problem is that there is only one observation to use to estimate these parameters. Rolls Royce used the existing market shares. At best that would leave the model exactly identified. However, in this case the model was still underidentified. Thus the impact of the merger would depend on the choice of some parameters for which there were no data to make an estimate.

points being completely symmetric. If, for example, the merging firms have a superior position and a larger share, then the bundle discount can lead to increased efficiency.

The Commission's problem with bundling was not with the immediate loss to social welfare but rather with the long-run (and even short-run) impact on competition. Similar to the argument against predation, the Commission believed that rivals would exit and that GE-Honeywell would obtain and exploit a dominant position.

Dynamics

If one wants to consider the expected market dynamics, then there are other factors that should be taken into account. For example, is it realistic to imagine that the individual competitors would not respond in any way? One option for those firms is to invest in product improvements or cost reductions. Another option would be to offer a competing bundle.

For the B firms, offering a competing bundle would lead to a further reduction in profits, but it would also level the playing field (recall case 2). Firms may prefer to be in a symmetric position relative to a rival. They may prefer a lower but level playing field if they are worried that a bundler would use its profit advantage to position itself better in R&D or gain other advantages in a repeated game.

Even if the B firms did not want to offer a competing bundle, their customers could drive them to this outcome. Customers would stand to gain a great deal if they could create a bundle-against-bundle competition. Customers are anything but passive in this market and would use their power to influence the nature of competition.

The Rolls Royce model looked at the advantages of bundling when the competition was selling their products individually. *Whatever advantages may exist, they quickly disappear if the rival firms coordinate and offer a competing bundle*. Given the level

playing field for rivals and the advantages to customers, a firm that introduces a product bundle cannot expect that rival firms will not offer competing bundles.

Negotiating Bundles

The previous discussion suggests several potentially interesting questions for antitrust policy, but its relevance to the GE-Honeywell merger is doubtful. The reason is that the previous results on bundling all depend critically on the assumption that there is one price to all customers in the market. This is such a basic assumption to most economics models that it is usually not even stated. However, this assumption does not apply to the aerospace industry.

Customers don’t pay list price for jet engines or avionics. Airplane customers are large and powerful. A vendor cannot ignore an airline that asks for a better price. Nor are vendors uninformed as to their customers' preferences. The vendors in this market spend a great deal of resources getting to know their customers. Vendors take into account previous purchases as well as technical performance differences between their products and those of competitors. Going into a competition a vendor has a good idea of where it stands and by the end of the competition, it has a very good idea.

The result of this buyer power and vendor information is that prices are negotiated, not set by the seller. Examples of transaction prices confirms the fact that different buyers pay different prices. Every deal is negotiated, and the price is customized to the specifics of the situation.

In a world where firms negotiate prices with customers and do so with perfect information, the combination of two complementor firms is completely neutral. To see why, first take the case where a customer has a preference for the two firm A products. Imagine that the advantages are equal to (0.2, 0.3). In this case, the A firms would be expected to win both competitions, whether the items are sold separately or if the firms merge and the products are sold in a bundle.

Before conceding defeat, the B firms would be willing to price down to marginal cost. In the case where the A goods are sold separately, Firm A_1 would be able to negotiate a profit up to 0.2 on good 1 and Firm A_2 could negotiate a profit of up to 0.3 on good 2. If the goods were sold as a bundle, then the merged firm A would be able to negotiate a profit of up to 0.5 on the bundle.

Nothing is different if firm B has an advantage in one (or both) of the goods. Take the case where the customer has a preference for A products of (-0.2, 0.3), so that the customer actually prefers B_1 to A_1. With individual pricing, firm A_1 would lose to B_1 and firm A_2 would beat B_2. If merged A firm tried to sell the two products as a bundle, it could do so, but only at a profit of 0.1. This would be worse than selling just the second good at a profit of 0.3.

These two examples are quite general. The point they illustrate is the following: *When the customer type is known and prices are negotiated, bundling can never lead to higher profits. If the customers would have made all of their purchases from a single firm, bundling has no impact – on customers, prices, profits, or efficiency. If customers would prefer some products from A and others from B, then the combined firm will continue to offer the individual goods at their pre-merged prices. Forcing a bundle on the consumer can only lower firm A's profits. In effect, it would have to subsidize its disadvantage using profits it could have earned from products where it is strongest. This is no different from selling individual components at a loss – a strategy it can do but would choose not to, even without bundling.*

One additional perspective can help with the intuition. Firms make profits only to the extent that their products are differentiated. Profits exist to the extent that the firm has an advantage with the customer. When a firm bundles two good products or two bad products together, the advantages (or disadvantages) sum up and there is no impact. But when a firm mixes good and bad products together, this mitigates the advantage and

profits fall accordingly. With mixed bundling, there would be no bundle discount and thus no effect at all.

The perfect information negotiation model is designed to capture the basic nature of competition in this market. But, like all models, it presents a simplified description of the market. While vendors are well informed about the customer, their information is not always accurate. Firms can still negotiate prices even with good but imperfect information as to customer preferences.

The conclusion from this negotiation model is not a narrow result. The mathematics of the more realistic cases becomes more difficult, but simulation results suggest that bundling has little effect when vendors have good but not perfect information.

As one example, imagine that the firms don't know the customer's exact location (and thus preferences) but do know which firms the customer prefers. [22] Consider a customer who is known to prefer both A products.

In this case, bundling offers a small advantage. A firm that knows it has an advantage in all components can use a bundle to do a better job of price discrimination. Market efficiency increases. Competitors' profits fall, but their profits in this case were very low to start with.

In contrast, bundling is not profitable when the merging firm is at a disadvantage in all products. Here we also note that this is the case where rivals have the highest profits. Thus bundling has the lowest impact when rivals make the most money.

Pure bundling or tying would be counter-productive in the two cases where the merging firm is better in one component and worse in the other. If the merging firm employs mixed bundling, then the majority of consumers do not take advantage of the bundle, and there is again a small impact of the mixed bundle.

Averaging across these four cases, the net impact of the mixed bundling strategy is reduced by 50%. This is in line with the improved information. Half of the uncertainty has been removed in the sense that each firm knows if it is ahead or behind, although not by how much.[23] Nalebuff and Lu (2001) show that with even better information, the impact of mixed bundling is even smaller.

The distribution used in generating the simulation results provides the results for a given type of customer with some uncertainty, but that leaves open the question of what is the proper distribution of customer types. The tightness of the distribution is a proxy for the quality of information in any particular negotiation.

The wide margin variations that we observe are indicative of high-quality information, but this is not something that has been empirically measured and calibrated to the model..

Empirical Evidence of Dominance and Bundling

Ultimately, the Commission's case against the proposed merger rested on a claim of market dominance. The starting point in this argument was that GE already had a dominant position in aircraft engines for large commercial aircraft. Recall that market dominance means that a firm can act independently of its rivals and its customers.

It almost follows from the definition that a firm without a commanding market share cannot have a dominant position in the market. The Commission presented its calculation that GE had a dominant position with a 52.5% market share of the installed base of engines on large commercial aircraft still in production:[24]

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[22] For more specifics on this approach, see Nalebuff and Lu (2001).
[23] Another way of putting this is that each firm knows which half of the line the customer is in and thus the range of uncertainty has been reduced by half.
[24] The data is of 12/31/2000. The table is reproduced from European Commission decision in Case No. COMP/M.2220 – General Electric/Honeywell, paragraph 70.

	GE	PW/IAE	RR/IAE
Narrow Body	51	22	27
Wide Body	54	31	15
Overall	**52.5**	**26.5**	**21**

Planes still in production leaves out planes still in service but no longer produced. While new engines are obviously not longer sold to planes no longer being built, this perspective misses the spare parts market. With spare parts an engine can be "sold" up to ten times over its working life. Pratt & Whitney, in particular, has a large annuity coming to it from selling spare parts to planes in service that are no longer being produced. Using the planes-in-service approach, GE's market share falls to 41%.

The calculation of market shares for PW (Pratt & Whitney) and RR (Rolls Royce) include the engines of IAE, a joint venture between Pratt & Whitney and Rolls Royce. IAE's market share is split evenly between PW and RR. In contrast, all of the market share of CFMI, the 50/50 joint venture between GE and SNECMA is attributed to GE.[25] If CFMI is eliminated from consideration and we consider market share on planes in service, then GE's market share falls to 10%. If we attribute half of CFMI to GE and half to SNECMA, then GE's market share is still only 28%. Even if we use the planes in production, GE's market share counting only half of CFMI to GE is 36%.

In any of these calculations other than that of the Commission, GE's limited market share would practically preclude it from having a dominant market position. Which definition is correct?

There is no one correct definition of market share made in the abstract. The issue should be market share measured for what purpose. For example, if the purpose is to evaluate the

[25] The Directorate-General Competition justified this calculation: "Although in legal terms GE and SNECMA jointly control CFMI, the only meaningful attribution of market shares for the purposes of analyzing the transaction could only be made to GE, to the extent that SNECMA is not an independent supplier of civil jet engines for large commercial aircraft. The analyses of the joint venture and of SNECMA's participation in other GE engine programmes indicated that SNECMA would act jointly with GE as a profit-maximising entity." Giotakos et. al. (2001).

firm's financial resources to continue investing in this business, then all of its revenue streams are relevant. Thus PW can use earnings from its entire installed base (not just planes in production) to finance new investment. GE only gets half of the revenue from CFMI. Thus for this purpose it would seem that the 28% number is most appropriate as it reflects GE's revenue share of today's market.

To understand future financial viability, one might also want to examine pre-orders on next-generation planes, those that have that have been launched but are not yet in production (such as the A380, B777x). It is common for airplanes to be ordered in advance of production. As of 2001, Rolls Royce had a 40% share of the engines on these next-generation planes, while GE and CFMI's combined share was second with 38% and PW was third with a 21% share.

If market shares are used to provide evidence of market power, it would seem that most of CFMI's share should not be included in GE's share. This is because the great majority of CFMI's sales are not in a position to exercise any market power. Recall that CFMI is the exclusive provider of engine to the Boeing 737 plane.[26] Prior to entering this exclusive relationship, Boeing realized that its customers would be in an untenable bargaining position if CFMI were the sole provider. Thus Boeing prenegotiated a deal with CFMI as part of the exclusivity contract.

For most engines, the airline purchases the engines separately from the plane. Having decided upon a 747, the airline can then put the engine order out to bid between GE, PW, and RR. But in the case of a 737 purchase, the customer negotiates with Boeing and the engine is included in the price. CFMI does not have the ability to control engine pricing on these orders. For that reason, a more appropriate measure of GE's market share used to measure market power would be its share of engines excluding its exclusive-contract

[26] In addition to CFMI's exclusive sales contract for the Boeing 737, its CFM56 engines also power the Airbus A320 family and A340 long haul.

sales.[27] This corrected share is on the order of 10% or 20% depending on whether one looks at planes in service or just those in production.

If market shares are used to understand the potential for bundling then, again, it would seem that CFMI's sales should not be attributed to GE. This follows for two reasons.

First, because the engine is offered to Boeing at a predetermined deal it is almost impossible to employ a bundled pricing strategy. If the customer has already bought the Boeing plane and CFMI engine, there is no gain in providing a retroactive engine discount for the purchase of Honeywell components. The company would do just as well to offer the discount directly on the Honeywell parts.

The only way even to offer a bundle discount would be to promise a *future* discount on Honeywell components if the 737 plane is purchased. This would only make sense if the discount would increase the 737 plane sales. (If the sales of 737s are unchanged, then there is no increase in demand for the CFMI engine, and hence the discount might as well be applied directly to the Honeywell components.)

There are practical problems with this approach. The cost of Honeywell components is small relative to the plane and engine. Thus there is little ability for the tail to wag the dog. Second, the sale of avionics and other Honeywell components is done at a future time at a negotiated price. One party can't promise to give the other party a "better deal" in a future negotiation, as there is no baseline against which to measure what makes a better deal.[28]

[27] There are some GE exclusive sales, such as for the two new "longer range" (LR) versions of the Boeing 777. Here, again, the engine is sold at prenegotiated terms. One would want to take out all of the exclusive engine sales in calculating a firm's ability to act strategically.

[28] To help make this clear, consider the following hypothetical bundling offer: if "New Air" purchases a 737 plane, GE will offer a $1 million rebate good towards the purchase of Honeywell avionics. When it comes time to negotiate the price of those avionics, Honeywell and the customer both factor in the $1 million discount when setting the price. Thus if the negotiated price would have been $4 million, the new negotiated price would be $5 million, which achieves the $4 million post-rebate price.

Bundling would be further complicated by the fact that CFMI is a joint venture. Thus the decision on offering a bundle price would have to be made by both GE and its partner SNECMA. By its charter, CFMI is always led by a SNECMA representative. The joint venture nature of the relationship complicates CFMI's ability to offer a bundle, as SNECMA has no incentive to help sell Honeywell avionics.

GE's ability to act strategically so as to gain market share is practically restricted to its own engine sales, and this is roughly 20% of the market for planes in production. A 20% market share does not put a firm in a position where it can act independently of its rivals and customers.

However one measures shares, there is no disagreement regarding the extensive use of bidding competitions, the emphasis on market intelligence, and the very dynamic nature of shifting market shares. But the same facts were viewed very differently on the two sides of the Atlantic. In the US, the fact that GE had won several of the recent engine competitions was viewed as evidence of competition as work. In Europe, these recent wins were viewed as evidence of dominance.[29]

A contributing factor to GE's alleged dominance in engines was the company's unique financial strength. Excerpts from Giotakos (2001) demonstrate this perspective:

> GE Capital offers GE business enormous financial means almost instantaneously and enables GE to take more risk in product development than any of its competitors … GE has also taken advantage of the importance of financial strength in the industry though the use of heavy discounts of the initial sale of the engine. … [T]hanks to its financial strength and incumbency advantages as an engine supplier, GE can afford to provide significant support to airframe manufacturers under the form of platform-programme development assistance that competitors have not been historically in a position to replicate. … Unlike

[29] For a more detailed comparison of the US and European approaches, see Patterson and Shapiro (2001) and DOJ (2001).

> any other engine manufacturer, GE can afford to pay for exclusivity and capture aftermarket, leasing and financial revenues.

Patterson and Shapiro (2001) show the dangers in the approach. They look at as these same activities as procompetitive. Taking risks leads to innovation; discounting benefits customers. In the US, entrenchment of a dominant firm is a discredited theory and is no longer grounds for challenging non-horizontal mergers (DOJ, 2001):

> Challenging a merger because it will create a more efficient firm through economies of scale and scope is at odds with the fundamental objectives of antitrust law. And there is no empirical support for the notion that size alone conveys any significant competitive advantage that is not efficiency-related

Whether or not GE was starting from a dominant market position, the Commission was concerned that this merger would allow GE to extend its dominant position to Honeywell products. The proposed route to this dominant position was through bundling. To what extent was this theoretical concern supported by evidence?

While the theory suggests that bundling is unlikely to be an important factor, there remains the empirical question: do we see much evidence of bundling in aerospace? At first glance, the answer seems to be yes: many bids are multi-item bids. Companies such as Honeywell and its competitors often make a bid to supply a long list of components. This led several observers and even industry participants to conclude that bundling was a feature of this industry.

However, the long list of items is also broken down into prices for each individual component. And the component prices add up to the “bundle” or package price. If there is no discount then we don’t consider this to be bundling.

Compare this situation to Microsoft Office. Microsoft’s July 2001 list price for Office XP Professional was $547. One could also buy the components separately, but one wouldn’t.

Word, Excel, PowerPoint, Access each cost $339 separately and Outlook was a bargain at $109. The total adds up to $1,465. The software package comes at a 60% discount compared to the individual items.

In the cases cited by the Commission, the claimed bundle discounts were much smaller – by an order of magnitude. The claimed bundle discounts were also much smaller than those predicted by the Rolls Royce model. Even more importantly, these discounts were evidence of negotiation and not of mixed bundling.

In cases where the Commission attempted to document examples of a mixed bundle discount the analysis failed to distinguish between a *discount* and a *discount conditional on buying a package*. As a result, the cases cited actually demonstrated the absence of mixed bundling.

Even if a discount were offered for buying a package, this does not mean that the discount would not be applied to individual items. In general, this would be a matter of speculation. However, in the cases cited by the Commission, the alleged mixed bundle *failed* to induce the customer to buy the entire package. Thus it is possible to observe what prices were paid and whether or not the discount was in fact conditional on buying the entire package. In the cited cases, the customer was not penalized for breaking apart the bundle. Whatever discounts the customer was offered for purchasing the bundle were applied on a proportionate basis to the partial bundle that was ultimately purchased.

The evidence of bundling provided by the Commission undercut its own argument. If bundling was such an anti-competitive tool, then why did it fail to get customers to purchase products for which the firm was otherwise at a disadvantage? The fact that customers were able to get any discount offered without having to purchase the bundle confirms the industry perspective that it is a mistake to offer a bundle discount as this will simply end up coming back as a discount on whatever the customer ends up buying.

If bundling is to be a matter of concern, we should see contracts that are won, not lost. And these contracts should offer a substantial discount for buying the entire package over a la carte purchases.

The (Im)practicality of Bundling Engines

The theory suggests that bundling will not lead to an advantage with negotiated prices. The evidence suggests that bundle discounts are not prevalent, if they even exist. But perhaps the combination of GE and Honeywell would create a new opportunity to offer an engine and avionics/nonavionics bundle. Even if this were desirable, there are institutional features of the airplane purchase process that make this type of bundling impractical.

We have already discussed the problems of bundling CFMI engines with Honeywell's avionics (and other nonavionic) equipment. These include the joint venture with SNECMA and the pre-determined engine price for 737s. An additional factor that makes it impractical to bundle engines with other components is the timing of purchases. Typically the engine choice is made well in advance of other components, such as avionics.

To see why this is a problem, consider how bundling would have to work. Once GE has won the engine competition, there is no incentive to give retroactive discounts on engines if the customer would also buy Honeywell avionics. This would be no different than giving a discount on the Honeywell avionics directly.

In order for there to be any possibility of bundling to work, it must be the case that at the time the engine selection is being made the customer is led to believe that by choosing the GE engine there will be a better price on Honeywell avionics. For example, the customer might be given a 10% off discount for their later purchase of avionics if they have a GE engine. While this story is possible in some industries, it is not applicable to avionics. The reason is that all prices are negotiated so that a discount off of list price has

no bite. One person can't promise to give the other party a "better deal" in a future negotiation as there is no baseline against which to measure what makes a better deal. Here again, we see the importance of taking into account whether prices are fixed or negotiated.

The bundling of avionics components would seem to be much more practical than bundling engines and avionics. Indeed this issue was considered only two years earlier when the commission approved the merger of Allied Signal and Honeywell. While there was some dispute as to whether bundling exists at all, even the Commission did not argue the Allied Signal-Honeywell merger had led to widespread bundling. From the Commission's perspective this was only because the merger was too recent and thus the impact of bundling had not yet been felt.

Evidence that Bundling Would Lead to Exit by Rivals

At the same time the Commission was arguing that the Honeywell-Allied Signal bundling effects were slow to arise, the Commission took the stance that the GE-Honeywell merger would lead to nearly immediate exit or marginalization of rivals.[30]

Is exit (or marginalization) really likely in this business? Here the Commission seemed to rely on the dire warnings of some competitors. Of course, these competitors are not disinterested parties. They would hope to block the merger or purchase various Honeywell "jewels" that the Commission would require to be spun off.

Nor was there evidence provided that the rival firms were in any danger of exit. To the contrary, evidence was presented that showed the long-term viability of the rival firms. For example, the stock market's reaction did not anticipate the financial vulnerability of aerospace firms. From the time of the announced merger to the time of the EU hearing,

[30] If the exit or marginalization were to occur more gradually, then one would want to take into account the benefits gained by customers during the period of lower prices. Such a calculation was never made.

almost all of the rival firms had a gain in stock price that exceeded the S&P index. The firm that under-performed the index was GE.

One would not expect to see aerospace firms concede defeat quickly. Airframes are long-lived. The typical plane is on the market for 25 or more years. Thus a contract gained today (or ten years ago) would provide a long stream of profits down the road. Hence, even if firms were precluded from new contracts, they are not going to disappear any time soon. In fact, the next plane for which the engine choice has not been made is the Boeing Sonic Cruiser, which is not set to debut until 2007 or later (if it is built, at all).

In the aerospace industry there are several large players who have an interest in maintaining competition. Military purchases play this role. Both Rolls Royce and P&W have multi-billion dollar annual revenues from military contracts, and there is a substantial amount of spillover between civilian and military work. While it could be argued that no single airline would be eager to provide the public good of maintaining competition, Airbus and Boeing (each of which has about a 50% market share and each of which works closely with airlines when making purchase decisions for the aircraft it designs) do have this incentive.

Policy Prescriptions

We have discussed at some length whether competition authorities should be worried about mixed bundling in the context of the GE-Honeywell merger. Putting relevancy to GE—Honeywell aside for a moment, in an environment in which the Cournot effect does exist, there remains the issue of what should be the antitrust policy toward a merger of two producers of complements, each with market power. Another way of saying this is that if we did indeed find a case where the Cournot effect was large, what should we do about it?

At first blush, the answer would seem to be nothing. Prices fall! Social welfare is higher. Consumers gain and competitors lose. This is not the arena for antitrust authorities to get involved.[31]

The European Commission took a novel perspective. They were concerned that the long-run impact of the combination could be to put competitors out of business. Similar to a predatory pricing case, once the competitors were either hobbled or vanquished, the merging firm would have even more power to raise prices, and then social welfare would fall.

Unlike the typical predatory pricing case, recoupment might or might not be an issue. Depending on the parameters and setup of the model, the combining firms might actually make money in the process of putting their rivals out of the market.

If we follow this line, this suggests a several part-test. This test is an extension of one developed by Professor Carl Shapiro and by the Department of Justice.[32]

1. Is there an incentive to bundle?
    a. Under what circumstances does the combined firm earn higher profits through a bundled pricing strategy?
    b. Did either firm have an opportunity to bundle prior to the combination? If so, is there evidence that bundling is a common practice in this industry?
        i. If we see bundling, then what is the marginal impact of increasing the potential scope of the bundle?
        ii. If we do not see bundling, then how do the opportunities created by this combination create a different incentive to bundle?

2. What is the immediate gain to consumers from lower prices?

[31] While the European law is concerned with market dominance, the economic rationale would be a concern about high prices. Here the problem is with low prices. The European law does not seem to take efficiencies into account that might lead to lower prices (Schmitz 2002).

a. How much do we expect prices to fall due to bundling?

3. What will be the impact on competitors?
    a. How much will competitors' price fall?
    b. What will be the shift in share?

4. How long do we expect these lower prices to persist?
    a. How long do we expect the rivals will be able to hold out?
    b. Are rivals sufficiently close to exiting the market that this will tip the scales?
    c. Are there large customers with market power that have an incentive to keep multiple firms in the market?

5. If the rivals exit, what is the expected harm?
    a. Will other firms be able to enter the market?
    b. Will large buyers be able to hold prices down?
    c. Or, if prices rise, what is the expected damage?

In short, there are immediate benefits to the combination. How long can we expect these benefits to last? How likely is the potential harm and how big is the potential harm? Or, even simpler, what is the present value of the net expected change in social welfare from allowing the combination?

Applying this approach to the GE-Honeywell case, the Commission stopped at step 1. Even if bundling were to threaten the long-term viability of competitors no analysis was made of the tradeoff. Properly discounted for time and the fact that the outcome is uncertain, was there any argument to be made that the net present discounted value would be negative? The Commission made a recommendation against a merger that by its own

[32] The Shapiro test was presented to the Merger Task Force. The DOJ guidelines are described in a report submitted to the OECD roundtable on portfolio effects in conglomerate mergers, DOJ (2001).

account would be expected to lower prices without demonstrating that the expected long-run harm would outweigh short-term gains.

Remedies

When the net impact of some conduct is negative, the next step is to look for remedies, either structural or behavioral, that would solve the problem. In the case of bundling a very simple behavioral remedy presents itself. The firm can commit itself not to bundle.

Since it was the potential to engage in this behavior that concerned the Commission, the fact that the merging parties would agree not to offer bundle discounts should signal that this was not an important element of their incentive to merge. And since it was the bundling behavior that had the potential to lead to dominance, without bundling there would be no dominance.

A no-bundle discount policy is straightforward. A firm can do that by having to provide an itemized breakdown of the package price giving a price to each component in the package. The individual prices must add up to no more than the bundle price.

A bundle only works if it is offered at a discount to the components. A firm need not be regulated on what it can charge for each item. It can charge whatever it would like for components and for the bundle just so long as the combined price of the components is not more than the bundle.

The Commission rejected this approach based on its preference for structural over behavioral remedies. Yet this particular behavioral solution does not appear hard to monitor or enforce. If the component elements of a firm's bids are not itemized or add up to more than the package total, that would be an automatic violation.

Conclusions

In the Statement of Objections, the Commission presented a theory of bundling that was based on the premise that the merged firm would be able to bundle and would have a rational economic incentive to do so. The result of this bundling would be prices so low that competitors will be foreclosed.

When closer scrutiny was given to this argument, it turned out not to apply to the market for aircraft engines, avionics, and non-avionics products. The Commission subsequently abandoned its original approach.

> The various economic analyses have been subject to theoretical controversy, in particular, as far as the economic model of mixed bundling, prepared by one of the third parties, is concerned. However, the Commission does not consider the reliance on one or the other model necessary for the conclusion that packaged deals that the merged entity will be in a position to offer will foreclose competition from the engines and avionics/non-avionics markets.[33]

Instead, it based its decision on a new, dynamic, theory: Foreclosure of competitors would occur as a result of predation accomplished through the cross-subsidization of bundled sales.[34] As explained in the EU's Competition Policy Newsletter (Giotakos, 2001)

> …thanks to GE's strong generation of cash flows resulting from the conglomerate's leading positions on several markets, following the merger, Honeywell would have been in a position to benefit from GE's financing surface and ability to cross-subsidise its different business segments, including the ability to engage in predatory behaviour.

There may be a simple explanation as to why reliance on the Rolls Royce model was so attractive to the Commission. If, in fact, a merged firm would make *more* money by

[33] Paragraph 352 of the Decision.

reducing prices when selling complementary products, then there is no need to estimate the cost of predation (as there is none) and there is no need to estimate recoupment (as none is required). Moreover, the merger becomes the proximate cause of the price discounting and so there is now a reason to think that this type of economically rational predation will occur post merger even if it does not occur pre-merger.

Against this background, the Commission may have been disappointed to discover that the economic models upon which it had relied – the model advanced by Rolls Royce, and even the basic Cournot complements model – were unsuited to the task.[35]

Although the Commission abandoned the original model, it did not replace the flawed model with another model. Rather, the Commission switched to a dynamic theory of predation. But, it never carried out any of the steps required to establish the facts necessary to support that theory.

In the end, the Merger Task Force did back away from its economic theory of bundling. But it did not back down from its conclusion that bundling was a reason to block the merger. The decision in this case presents a challenge for the role of economic analysis in the design and implementation of antitrust policy.

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[34] Predation was never seriously discussed in the Statement of Objections: there is only a *single* mention of predation in the SO, unrelated to the bundling theory, and this occurs in a footnote.

[35] The Cournot complements model has a crucial assumption, namely that each firm charges one price in the market to all of it customers. While this may be an acceptable assumption for a consumer good, it does not apply to the negotiated sales of aircraft engines and avionics. With perfect information, there would be no Cournot complements effect at all. Even with imperfect information, the Cournot effect is diminished to the extent that firms can differentiate between their customers. The evidence suggests that prices and profit margins vary substantially among customers. But the Commission did not attempt to estimate the degree of uncertainty and distribution of preferences so as to employ the negotiation model presented to them.

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