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**ECONOMIC THEORIES OF BUNDLING
AND THEIR POLICY IMPLICATIONS IN
ABUSE CASES: AN ASSESSMENT IN
LIGHT OF THE MICROSOFT CASE**

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ABSTRACT

Economic Theories of Bundling and their Policy Implications in Abuse Cases: An Assessment in Light of the Microsoft Case*

Theories of bundling have had great importance in European competition policy in recent merger control and abuse of dominance cases. Prominent examples include GE/Honeywell, Tetra Laval/Sidel and the recent Microsoft decision. The European Commission has been heavily criticized in all of those cases. In this Paper we attempt to sketch how a systematic approach to bundling cases can be structured. We first provide an overview of existing bundling theories, concentrating on robust economic mechanisms and their empirical implications. This allows us to develop a number of clear criteria to identify potentially anticompetitive bundling. We show that a careful reading undermines recently proposed arguments for a (modified) per se legality rule for bundling.

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*The authors advised the CCIA (Computer and Communications Industry Association) in their intervention against Microsoft on the bundling of Windows Media Player with Windows in the context of the recent European Commission investigation. The Paper is based in part on this work. The authors have also advised Sun Microsystems in their European complaint against Microsoft on exclusionary practices in the market for workgroup servers. Kühn advised Honeywell in its appeal against the GE/Honeywell decision, Caffarra advised GE in GE/Honeywell, and Stillman advised the merging parties in Tetra Laval/Sidel. All opinions expressed are those of the authors and not attributable to any of the mentioned companies.

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1 Introduction and Overview

Theories of bundling have gained enormous prominence in European competition policy in a number of recent cases, concerning both merger control and abuse of dominance. Prominent examples include GE/Honeywell, Tetra Laval/Sidel and the recent Microsoft decision in which the European Commission ordered the unbundling of the Windows Media Player from Windows. The Commission has been heavily criticized, especially in the US, for its treatment of bundling in these cases. Indeed, in the US there is an important current of opinion that advocates a “laissez faire” approach to bundling practices. Ahlborn, Evans, and Padilla (2003) have recently summarized the arguments of this school of thought.² They suggest a (modified) “*per se* legality” rule for bundling on the basis that the efficiency effects of bundling are ubiquitous, while the anti-competitive effects highly non-robust.³

In this paper we show that the “laissez faire” approach to bundling cannot be based on the current state of the economic literature. Like most economists, we are hesitant about very restrictive policies against bundling. One reason is that they may interfere with product design decisions of firms, which may hamper product innovation. But such a cautious approach to policies towards bundling does not imply that intervention is never appropriate. We show in this paper that there are identifiable circumstances in which bundling can lead to anticompetitive effects and in which intervention against bundling can be justified as a legitimate remedy. This does not mean that the general hard-line position the European Commission has taken against bundling can be justified. The relevant theories identify a very limited set of characteristics and very specific evidence that can support a conclusion of anticompetitive bundling. The most important criticism in cases like Tetra Laval/Sidel and GE/Honeywell has been that the specific anticompetitive mechanism was never clearly identified, and therefore there was no clear set of evidence that could have led to the conclusion that bundling was anticompetitive.⁴ The Commission’s arguments on bundling in the “media player” portion of the Microsoft case stand on much more solid foundations. They rely on specific theories and well-understood anticompetitive mechanisms. Furthermore the evidence put forward by the Commission in the “media player” case is unquestionably relevant to the anticompetitive mechanisms identified⁵

In this paper we attempt to sketch how a systematic approach to bundling cases can be structured. For that purpose we first provide an overview of existing bundling theories, concentrating on the key economic mechanisms (Section 2). After an exposition of the state of the theory on bundling and its empirical implications, we critique the interpretations made of this body of literature by supporters of a “laissez faire” approach to bundling. These include the incorrect attribution of efficiencies to bundling, misinterpretations on the robustness of the relevant theory, as well as errors in the theory of policy

² Ahlborn, C., D. Evans and J. Padilla (2003), *The Antitrust Economics of Bundling: A Farewell to Per Se Illegality*, AEI-Brookings Joint Center for Regulatory Studies, Related Publication 03-3 (February).

³ See also, among others, Evans, D., Padilla, J.A. and Polo, M., “Tying in Platform Software: Reasons for a Rule of Reason Standard in European Competition Law”, *25 World Competition* 509, (2002).

The arguments about the competitive effects of bundling are the same whether Art 82 or merger cases are involved. The only complication in mergers cases is that competition authorities have to make predictions about a change in bundling practices due to a merger. See Kühn (2002) for a critique of using bundling arguments in merger cases.

⁵ This statement does is not an assessment of the strength of the evidence in the media player case. Our involvement in this case was limited to assessing the literature and the relevant empirical criteria for implementing anti-bundling remedies.

(Section 3). We attempt to overcome these shortcomings by developing a number of criteria to identify potentially anticompetitive bundling, based on the more robust features of the theory. Section 4 puts forward a set of rules to guide competition authorities in determining when intervention against bundling is justifiable as a matter of economics. Section 5 concludes.

The policy rules outlined in this paper involve three elements:

1. A “safe haven” rule that specifies circumstances under which bundling should never be challenged;
2. For cases that do not fall within the “safe haven”, a decision rule that determines when bundling is likely to have anticompetitive effects;
3. A rule for evaluating potential offsetting efficiency benefits from bundling.

Our “safe haven” rule specifies that intervention against bundling should never be considered unless all three of the following conditions are met: (a) the firm in question has *monopoly power* (i.e. at least a dominant position), in one market which is affected by bundling; (b) the bundled goods are *complements*; and (c) there is significant (and costly to overcome) *asymmetry in the product lines* of the dominant firm and its rivals.

The decision rule that determines whether anticompetitive effects are likely cannot be based on a set of pre-determined market characteristics. The reason is that there are many theories capable of yielding anticompetitive effects from bundling, and there may well be other valid theories that have not yet been formally articulated. A rigorous approach to the competition assessment of bundling will require that *in each specific case, a plausible theory of how bundling can have anticompetitive effects in the market in question is formulated. Furthermore, evidence needs to be presented to show that the mechanism described by the theory has relevance in the markets in question.*⁶

Generally, there are a number of mechanisms through which bundling can plausibly lead to anticompetitive effects. However, we explain that intervention against bundling is most justified when the evidence suggests that the motivation for the bundling is to affect the intensity of competition in the future. As discussed below, industries in which network effects are important seem especially conducive to such bundling. This in turn suggests that competition authorities should pay special attention to the competitive effects of bundling for instance in industries such as software, where network effects are unquestionably important.

Finally, it is necessary to take account of possible *efficiency benefits* of bundling practices. However there are good reasons for placing the burden of proof for demonstrating material efficiencies on the bundling firm. Efficiency defences should not be accepted if bundling does not appear necessary for realising the efficiencies claimed. Many plausible-sounding efficiency claims do not pass such a test. We also point out the important distinction between the *ex ante* benefits of designing a bundled product offering, and the *ex post* cost of unbundling. We argue that only the *ex ante* benefits of designing a bundled product should matter in the assessment of efficiency effects. Allowing a dominant firm to

⁶ In the Tetra Laval/Sidel and GE/Honeywell cases the European Commission failed to make a case against bundling on the basis of this criterion.

continue with a bundling strategy simply because the *ex post* costs of unbundling are high would be highly undesirable, as it would encourage irreversible anticompetitive bundling.

In summary, we provide a systematic economic framework for marshalling arguments and evidence for an effective evaluation of bundling practices. Our framework does not advance any radical new ideas, but rather illustrates how a sensible approach can be developed from the established economic literature that will, in specific circumstances, justify intervention against bundling practices.

2 The economics of bundling

The term “bundling” is used for a variety of pricing and product design practices that involve, in some form, offering different goods together as a *package*. Economists speak of “pure bundling” or “tying” when two different goods are offered *only* together at a package price.⁷ A special form of pure bundling arises when the two products are linked technically such that it is physically impossible for the consumer to separate them. This form of pure bundling is called “technical bundling” and involves some form of lasting product design decision. Pure bundling is distinguished from “mixed bundling” where a firm offers the products together at a bundle price but also offers the component products individually at stand-alone prices. An equivalent form of mixed bundling occurs when a firm quotes stand-alone prices but gives a discount for buying both products.

Technical bundling (and to a lesser degree mixed bundling) is widely observed in real world markets: Shoes are sold in pairs, cars come with motors, and so on. Such examples are used by some economists to ridicule the historical per-se prohibitions of bundling practices in the US. However, they are not relevant for the issue of bundling in the context of competition policy. For example, even the historical “per se” prohibition of tying in the US would not have required unbundling a motor from the rest of a car. Bundling has only been an issue for competition policy when one firm has strong market power or a monopoly on at least one component part of the bundle. Only then do concerns about the competitive effects of bundling or tying ever arise. Even a per-se prohibition would therefore only cover bundling by a firm with considerable market power for one of the components in a (potential) bundle.

But the established economic knowledge narrows the scope for a debate even further. The economic literature has clearly established both efficiency reasons and anticompetitive reasons for bundling. The real debate is not about whether bundling can have anticompetitive effects. The real debate is about *identifying the circumstances under which anticompetitive effects of bundling are likely to occur and what criteria should be used to come to the conclusion that an unbundling remedy is justified*).

Exponents of the “laissez faire” approach to bundling have argued that the literature provides little guidance for identifying anticompetitive bundling in practice, and that efficiencies are so overwhelmingly important that intervention is never justified. We will show that this conclusion cannot be drawn from the existing body of literature. The existing theories give clear guidance as to the relevant evidence in specific cases. This section reviews this economic literature on bundling theories as a necessary foundation for identifying the circumstances under which bundling is likely to have anticompetitive effects.

2.1 Theories of anticompetitive bundling

A common way to think about the decisions of firms in markets is to distinguish between “short-run profit maximizing” and “long-run profit maximizing” behaviour. For the purposes of our analysis, the important distinction is that short-run profit maximizing firms take the anticipated decisions of competitors as given and are therefore not aimed at influencing actions of competitors. Long-run profit maximizing firms in contrast recognize that current actions can influence, for example, investment

⁷ For purposes of exposition we find it clearer to use the term “pure bundling” used in the economics literature instead of the term “tying” that is more frequently used in the anti-trust literature.

decisions of competitors. If a firm aims at influencing the *future* competitive interaction in the market, it will typically not maximise short-run profits. Leveraging and foreclosure are examples of phenomena that arise because firms recognize the impact of current actions on the future competitiveness of the market.⁸

Bundling has the potential to be anticompetitive whether it is part of a strategy to maximize short-run profits or whether it is part of a strategy that sacrifices profits in the short run in return for larger profits in the long run via the effect of bundling on future competitive conditions. We will discuss anticompetitive theories of bundling based on short-term profit maximization first and then review the theories based on long-run profit maximization. We will show that robust conclusion mainly arise from the second set of theories.

2.1.1 The competitive effects of bundling to maximize profits in the short run

2.1.1.1 Bundling as price discrimination

The incentives for bundling under short run profit maximization arise purely for reasons of price discrimination. There is an ample literature (e.g. McAfee, McMillan and Whinston (1989), Salinger (1995)) that describes these incentives for a monopolist selling two goods. These papers show that bundling is a means by which the monopolist can realise more revenue than if the two products were sold separately.

With both pure and mixed bundling, sellers can extract more revenue from customers with strong preferences for just *one* of the goods in the bundle than if the products in the bundle were all sold separately. This becomes particularly clear with mixed bundling. To see this, note that the seller can fix the bundle price at the sum of the pre-bundling stand-alone prices. Now consider a slight increase in the price for one of the products. Customers who bought both products before are not affected by this move because they will now simply buy the bundle. But customers who before purchased only this component now have two options to react to such a price increase. They can either stop buying or they can purchase the bundle. For some consumers purchasing the bundle will be preferable because this yields the second product as an added benefit. However, had the bundled option not been available, these consumers would just have stopped buying the product. Hence, a seller loses relatively less customers from increasing stand-alone prices when he also offers a bundle of the two products. The seller can thus extract greater profits from buyers with extreme single product preferences but limit the loss in sales to buyers with more intermediate preferences. In addition, he will also extract greater benefits from customers who switch from purchasing just one product to purchasing both products. Pure bundling effectively only relies on the latter effect, because in pure bundling there are no stand-alone prices.⁹

⁸ We are using the terms “short-run profit maximizing” and “long-run profit maximizing” simply as a means of organizing the discussion of different theories of bundling. What we refer to here as short-run profit maximizing behaviour can also be described as “non-strategic behaviour”, and likewise what we describe as long-run profit maximizing behaviour can be described as “strategic behaviour”. Whether we use one set of labels or another, the fundamental difference between alternative explanations of bundling is whether or not bundling is used to influence the future intensity of competition.

⁹ One can think of pure bundling as a special mixed bundling strategy in which the prices for the stand-alone product are set above the highest valuation of any customer.

However, bundling does not only allow the seller to extract more revenue from buyers with strong preferences for a single component. It also makes it profitable to lower the price for buyers with intermediate preferences by offering the bundle at a lower price than the sum of the stand-alone prices that would have been charged without bundling. To explain why, consider the situation of a monopolist selling two components, A and B. If the multi-product firm lowered stand-alone prices (but did not bundle), more customers would purchase A and B and there would be more customers buying both A and B. But, if the initial stand-alone prices of A and B were profit-maximizing, then the profit from these added sales must be outweighed by the reduction in revenues from the across-the-board decrease in prices.

Mixed bundling allows the multi-product monopolist to solve this problem. Mixed bundling allows the multi-product monopolist to avoid giving “unnecessary” price cuts to customers with extreme preferences. If the monopolist offers lower prices only if a customer buys both products, customers with extreme preferences (e.g. high valuation on A and low valuation on B) will find it preferable to continue purchasing only this one product (A) at the stand-alone prices. Thus, by using mixed bundling, the multi-product monopolist can increase revenues by, in effect, offering targeted discounts to customers with intermediate preferences (inducing more of them to purchase both products) without losing revenues by “unnecessarily” cutting prices to customers with extreme preferences.

Note that in welfare terms there is a trade-off between two groups of consumers: buyers with extreme valuations suffer from higher prices, while those with intermediate valuations benefit from lower prices. As in all of the price discrimination literature, there is an ambiguous in welfare effect. Practically, it is impossible to predict the welfare effects of such bundling.

It should be noted that bundling brings no advantages under monopoly when the bundled components are *perfect complements* for all consumers¹⁰. In this case there are no consumers who would wish to take the stand-alone product and the incentive for bundling, namely the discrimination between customers with strong willingness to pay for only one of the two products, and consumers for whom the valuations of the two products are similar disappears.

2.1.1.2 Bundling in the presence of competition

The incentives for bundling are not fundamentally different when there is competition between a multi-product firm and other firms that offer the same range of components. However, one has to take some care in interpreting the model. Given the prices firm A expects its rivals to set, the distribution of buyer preferences over all possible combinations of the products induces a distribution of reservation prices for customers over the goods supplied by firm A. Again, firm A’s bundling strategy will be driven by the incentive to extract greater revenue from buyers that have high valuations for only one component. For example, a buyer that has a strong preference for one component from one firm, but a strong preference for the other component from its rival, would have extreme preferences in this setting. By bundling, more revenue can be extracted from the customers with strong willingness to pay for only one of the firm’s products.

¹⁰ Products are “complements” when an increase in the price of one decreases the demand for the other. Products are “perfect complements” when they are used in fixed proportions. The case of perfect complements to all consumers is the special case in which the so-called “one monopoly profit” point holds – i.e., it is the special case in which a monopolist in one product has no incentive to monopolise the market for the complementary product.

However, it should be noted that there is an important difference from the monopoly case. Even if two components, A and B, are perfect complements, consumers might prefer component A from one firm and B from the other. Hence, there may be consumers who would be willing to pay a high price for just one of the components offered by the firm. Then the incentive to price discriminate remains, despite the perfect complementarity of the two components.

It will still be the case that with bundling in the presence of competition there are incentives to lower the bundle prices below the component prices in the absence of bundling. In a setting where there is competition, this has a pro-competitive effect. Knowing that bundling leads to incentives to lower the bundle price, competitors will have an incentive to set *lower* prices when they anticipate a bundling pricing strategy (relative to the situation with linear pricing). This is a well-known phenomenon in the non-linear pricing literature. Discounting practices quite generally allow the firm to aim discounts at marginal customers, which will tend to increase price competition. When a competitor firm offers the same kind of product line the bundling opportunity has been shown to have the benefit of intensifying price competition (see Matutes and Regibeau (1992) for an example).

Finally, it should be noted, however, that these bundling incentives rely on some product differentiation between the product line components of rivals. The more homogeneous the components are, the fiercer price competition becomes component by component and the benefits of a bundling strategy become minimal. In other words, real benefits to bundling only exist when a firm has sufficient market power to charge stand alone prices significantly above marginal cost. Such market power arises in the literature from product differentiation, but could equally be generated by capacity restrictions of rivals.

2.1.1.3 Bundling of complements and the “Cournot effect”

As shown by Nalebuff (2000), considerable price increasing effects from bundling can be generated when firms do not sell symmetric product lines of complementary components. His argument is based on the so-called “Cournot effect” that arises because of a *coordination problem* in pricing on the part of the rival firms offering complementary products.

The Cournot effect originally refers to the observation that a single monopolist of several complements would set a lower price than separate monopolists each selling one of the goods. The reason is that each individual firm ignores that a price cut would increase the demand for the complementary products of the other firms. This effect disappears when there is competition for each one of the complementary goods, such as the competition that would exist if the single-product firms faced competition from a multi-product firm that sold its products separately. Then Bertrand competition in the market for each of the individual products would drive prices to marginal cost and the Cournot effect would disappear.¹¹

Nalebuff (2000) shows that the Cournot effect re-appears and can be remarkably powerful if the multi-product firm practices pure bundling. Suppose one firm can offer all complementary goods and faces competition for each component from one firm. First, consider a situation in which no bundling is

¹¹ In the real world, we would not expect literal marginal cost pricing. However, competition component by component would reduce margins so much that benefits from bundling would be minimal. In practice we would not expect to see bundling when its effects are small, since there are significant costs of devising a bundling strategy due to its complexity. The theoretical literature should therefore be interpreted as predicting that competition reduces bundling incentives sufficiently to make bundling unlikely.

allowed. Then there is price competition component by component and customers purchase each component from the firm that offer the best deal on that component.

Now consider the case in which the firm with the full product line switches to a pure bundling strategy. Under these circumstances, a price cut by one of the single-product firms will make marginal customers switch from buying the bundle of the multi-product firm to buying the whole suite of components from the individual competing firms. The reason is that it cannot replace just one component anymore. Hence, part of the benefits of inducing consumers to switch is gained by *other* single-product firms. This means that the individual firms have less of an incentive to cut prices and win over demand from the bundling firm than if all competitors with complementary products would be producing as a single firm. The Cournot effect reappears as a result of the bundling because competition now takes place between the bundle and a combination of individually produced complements. Competition was effective without coordination because in the absence of bundling it took place component by component. With bundling, the coordination problem reappears and prevents an aggressive competitive response to the prices of the bundling firm.

Indeed, there is an aspect to this effect that directly implies that there can be significant price increases as a result of the bundling strategy. For a given price cut one separate firm will not win over as many customers, because buyers with a strong preference for one or more of the other components offered by bundling firm would have to make a switch to a less preferred component to take advantage of this price cut. As a result, there is an anticompetitive effect insofar as *the price-cutting incentives of the single-component firms are blunted by bundling of the multi-product firm*. Bundling can therefore result in a significant reduction in price competition and hence a significant increase in all prices.

Nalebuff (2000) has shown that with complementary products, this price increasing effect is more pronounced, *the more items are bundled together*, i.e. when there are *appreciable asymmetries in the length of the product line between the bundling firm and its single-product rivals*. This result is of particular interest to the Microsoft cases because software markets can involve the bundling of many complementary products. The impact of the Cournot effect is that single-component firms tend to concentrate in their pricing strategy on niche markets for customers with very strong single component preferences. As a result price competition for customers with intermediate preferences is eroded.

Note that the anticompetitive effects that can arise from these asymmetries in product line length are not necessarily the result of an anticompetitive strategic *intent* by the bundling firm to influence the shape of future competition. The incentives to bundle arise from *standard price discrimination incentives*. Nevertheless, *the impact of bundling can be anticompetitive when bundling is anticipated by the competitors*. To the extent that such bundling possibilities by a dominant firm with a much longer line of complementary products may lead to significantly higher prices, there may be a legitimate competition policy concern.

2.1.2 Commitments to future bundling

Economic analysis has established a number of ways in which bundling can lead to less intense competition in the market, whenever a firm can *commit* to a bundling policy in the future. This may be in a setting where there is commitment to a bundling pricing structure and prices are set in the future. But in some models there is even an assumption of commitment to given prices. These models come in

two flavours. One type points out the ‘product differentiation’ effects of commitments to bundles, while the other focuses on the potential ‘entry deterrence’ effects of bundling policies.¹²

The difficulty with all of these models is that they assume a *pre-commitment* to specific bundling strategies. In practice, a review of the literature suggests that all examples of credible pre-commitment to a bundling strategy effectively involve a *physical link* between the products – in other words, some form of *technical* bundling. Contractual bundling would not achieve the desired effect because there is no guarantee that, at the time of price setting, the bundling configuration would not be changed as well.

2.1.2.1 The ‘product differentiation’ argument

The ‘product differentiation’ argument has been put forward in papers by Carbajo, de Meza and Seidman (1990), and Chen (1997). Both papers present essentially the same mechanism, although in slightly different settings. The basic idea can be gleaned from Carbajo *et al.* Suppose there was one producer of products A and B, and a competing producer of product B. And assume there was no product differentiation between the firms on product B. Suppose also that customers’ valuations of A and B are perfectly correlated (i.e. customers who have a high valuation for A also have a high valuation for B, and vice versa). If the first firm sells A and B separately, the price for B would be competed down to marginal cost. However, if the first firm can commit to bundling A and B while the other sells B alone, the first firm will sell to high-valuation customers in equilibrium, while the second firm will sell to low-valuation customers. Competition is softened as in standard vertical product differentiation models (see Tirole 1988) and, in this case, the single-product producer of B will be able to charge a price greater than marginal cost to “its” segment of the market, i.e., the low valuation customers.

What is typical for this class of models is that firms share customers by targeting those with different characteristics through the bundle design. This is in essence a variant of models in the (vertical) product differentiation literature. However, for these arguments to work there cannot be perfect complementarity between the components A and B. With perfect complementarity there would be no customers who would wish to buy the stand-alone product B. This literature is therefore less relevant to the evaluation of the competitive impact of bundling in markets with strong complementarities, such as the bundling of operating systems with applications.

2.1.2.2 Entry deterrence arguments

The seminal work on this issue is Whinston (1990). His main contribution is to demonstrate the theoretical possibility of leverage through bundling. Whinston’s model assumes away all price discrimination incentives for bundling. Bundling is a commitment to sell in the future only in a bundled form. As in bundling models with competition, this increases the intensity of competition with future rivals. This may make it unprofitable for future rivals to enter the market, so that bundling becomes an effective entry deterrence device.

¹² We use the term “entry deterrence” here as a shorthand both for the reduction of *de novo* entry into the industry, and the contraction in investments of firms already in the industry (whether this causes exit or not). Note that sometimes it is erroneously claimed that there is foreclosure only if exit occurs or entry is deterred. Such a claim would be wrong and is not implied by our use of the word “entry deterrence”.

Whinston's work is not, however, a strong basis for antitrust policy. A claim that a firm is committing to 'excessively competitive' behaviour is problematic in an antitrust setting. In Whinston (1990) the bundling firm never prices below marginal cost. As a result, rivals with equal or lower marginal cost on one of the products are excluded only if they face high enough fixed costs of entry. If fixed costs do not deter entry, then the bundling strategy is *pro*-competitive and leads to lower prices for customers because entry into the tied good market occurs *and* the bundling firm by assumption carries through on its commitment to compete aggressively in the tied good market. It is therefore difficult to argue based on this theory that a firm is bundling for exclusionary reasons, since this would require proof that it *knew* that entry costs were above the relevant level. In addition, the theory gives little insight into the bundling of complementary products: under perfect complementarity the outcome is the same whether bundling occurs or not, and therefore the theory has little bite when applied to markets like those for software. This is because, with perfect complementarity, the one-monopoly profit point holds. With perfect complementarity, the monopolist in one of the components can realise full monopoly profits through appropriate pricing of that single component and there is no gain from bundling.

Nalebuff (1999) develops a variant of the Whinston model for perfectly *complementary* products that attempts to argue that even in this case there is more effective entry deterrence through bundling. In Nalebuff's paper there is not only pre-commitment to bundling, but also to the actual bundled price. This is important in his model because it is assumed that the incumbent monopolist is uncertain whether the entrant will produce component A or B, but the incumbent is forced to set prices before this uncertainty is resolved. As a result, the incumbent sets relatively high prices in both markets with independent prices, in order to exploit the situation should he have a monopoly position in that market. Through this modelling device, Nalebuff generates the same result as Whinston: price competition is enhanced through the commitment to bundling. The entrant's profits are greatly reduced and thus foreclosure is more likely for given fixed costs of entry. Unfortunately, this result breaks down when pricing decisions can be made *after* the entrant's product choice is revealed – as would be a more realistic assumption. Then price competition in the market in which entry occurs drives prices down to marginal cost, and bundling is irrelevant for entry deterrence. Nalebuff (1999) therefore appears to give little tangible support for competition policy intervention against bundling.

A variant of the Whinston (1990) argument for perfect complements is also developed by Choi and Stefanadis (2001). Here the (partial) entry deterrence result is generated through a market share effect of future pure bundling. Anticipating that an incumbent will use pure bundling in the future, rival firms know that a cost reducing innovation on one component will never be sold with the other component of the bundling firm. However, in the absence of bundling, the cost reducing innovation would always be sold in equilibrium. As a result, the incentives for innovation are reduced in this model if an incumbent can commit to future bundling and competitors invest less in R+D. Note, however, that this possibility of partial exclusion through the reduction of R+D does not necessarily generate the incentives to exclude for the incumbent. If a component is replaced by a better one of a rival, the profits for the incumbent may well go strictly up. The reason why the incumbent may want to limit R+D by others is that he wants to reduce the possibility that *all of his components are replaced*. As long as there is one component of the system that is expected to remain a monopoly component with high probability in the future, the model does not provide strong bundling incentives at all.

Note also, that this theory heavily relies on commitment to future bundling before competitors invest in R+D. The reason is that there are no benefits of bundling once R+D results have been realised. The

incumbent can only lose in terms of profits by not having a better or cheaper complement pull his sales. This means that this theory is probably only of relevance for cases of technical bundling that is costly to reverse.

Overall, models with commitment to bundling in the future to deter future entry appear to be too fragile to provide a firm foundation for competition policy intervention at the moment. Especially in markets with complements, these models give only limited support for intervention against bundling practices.

2.1.3 Effect of current bundling on the future competitiveness of rivals

A third class of mechanisms that can lead to anticompetitive effects from bundling relies on two elements. First, it requires that bundling *shifts demand* away from the competitor of the bundling firm. Secondly, it requires that this demand shift lead to the bundling firm facing less intense competition *in the future*. The key issue in establishing whether such theories are relevant to a particular product market is whether there are plausible mechanisms that can generate such a link from current market share to future advantage.

2.1.3.1 Complementary products that facilitate future substitution

The most important paper exploring future competition effects in the context of bundling is Carlton and Waldman (2000).¹³ They develop several models that are based on the same conceptual principle: complements to current products may develop into or facilitate the entry of substitute products of current or future products of the dominant incumbent firm. By reducing the market presence of the current complement by bundling a tying product with its own complement, the incumbent can prevent the emergence of serious competitive threats in the future.¹⁴

There are several models of this flavour contained in Carlton and Waldman. We will here only discuss the first model, which relies on what is known as defensive leveraging. It has a similar trade-off as the Choi and Stefanadis model: while an incumbent monopolist benefits from a competitor developing a better component, he will try to avoid the replacement of the whole system. In their model a competitor can produce a single complement in period 1 developed by a competitor. If this complement is produced then in period two there is sufficient demand for an investment in the development of a competing primary product (allowing for system substitution). If the first period complement is not developed one can generate parameters for which no further investment takes place. By bundling in period 1 the incumbent can reduce the profitability of the development of the complement, which then would not be developed. As a result, systems competition does not arise in period 2. This has some cost to the incumbent because the complement of the competitor would have enhanced the value of the market in period 1 to the incumbent.

¹³ Bernheim and Whinston (1998) have explored these issues earlier in the context of vertically related market where exclusive dealing in the vertical chain is analogous to bundling between complements.

¹⁴ This basic set of mechanism includes what is generally known as “defensive leveraging” as well as the “passing off monopoly positions” story, in which the the monopolist bundles in order “to ‘swing’ or transfer its monopoly to the newly emerging market in a setting in which the newly emerging market is associated with the same complementary good as the monopolist’s primary market”. Carlton and Waldman (1998), page 212. These monopoly-extension models rely on essentially the same mechanisms as the defensive leveraging models and we therefore do not discuss them separately in this paper.

This model depends on a delicate interlinkage of investment incentives that will be of relevance only for specific parameter settings. This therefore seems to be a weak intertemporal link supporting potential foreclosure because the conclusion depends on data that is realistically not verifiable. The other models in Carlton and Waldman are similar in spirit in the sense that the development of a first period complementary good makes investment into a second period good profitable that would compete with some current or future product of the incumbent.

While the insight of Carlton and Waldman that strong foreclosure incentives can be generated when current complementarity generates future substitutability, theories based on such ideas do not have to rely on assumptions that are as fragile as the assumptions of their models. Indeed, complete exit of the potential competitor or commitment to bundling in the future are all elements that can be dispensed with in some versions of these theories. The dependence of the Carlton and Waldman arguments on delicate interrelationships between demand parameters and investment costs is not a characteristic of all possible models of intertemporal linkages between current bundling and future competition. We discuss a more powerful version of their argument based on Kühn (2001) in the next section.

Since there can be innumerable potential variants to these types of theories, we will discuss them specifically in the context of software industries. This also illustrates the extent to which the software industry is rather unique, in that it allows for strong and credible exclusionary mechanisms. This is in sharp contrast to some other important cases involving bundling. In *GE/Honeywell* and *Tetra Laval/Sidel*, for example, the Commission used bundling theory to argue that rival sales might be reduced in the short run, but did not specify any mechanism by which such short-run market share reductions would lead to benefits in future market power. The software industry is special in the sense that some very powerful mechanisms can be clearly identified whereby short-run strategic decisions can have likely long-run anticompetitive effects. We will first discuss the best known example in the software industry: applications network effects.

2.1.3.2 A leading example: applications network effects

As discussed, a major weakness of bundling theories in providing support for concerns about market exclusion is that it is typically hard to find a credible link between bundling “today” and competition “tomorrow.” This is not true in the software industry. What is distinctly different in the software industry is the existence of types of software that provide “hooks” between application software and the operating system. These are programmes (including the operating system itself) that expose the application programming interfaces (APIs) to which the developers of applications can write their software.

In today’s world APIs are not always standardised, and instead are frequently proprietary. This means that, in many circumstances, a software company must either write several versions of its applications, or write its applications for one specific set of proprietary APIs. The first strategy is widely considered to be prohibitively costly. Given this, it is, ceteris paribus, most profitable to write for the system that is most widely distributed. As a result, investment incentives of applications developers will lead to much greater availability and diversity of applications for the operating systems with the largest market shares. In turn, users will have an incentive to choose the operating system that provides the greatest variety in applications. This creates a self-reinforcing network effect. More buyers will go to an operating system with many applications and given that such an operating system will have higher

market share, applications developers will have an even greater preference for writing applications for that operating system. This problem has become universally known as the “applications network effect”, or the “applications barrier to entry” into markets for operating systems and is seen as the leading reason why markets for operating systems are thought to be likely to “tip” towards monopoly.

An effective monopoly in operating systems however is not inevitable, even when there are strong application network effects. If application developers could write to one set of APIs common to all operating systems, effective competition between operating systems could be sustained. Even in the absence of standards, effective standardization of interfaces across platforms could be achieved through some applications software. If such software exposes a rich set of APIs to programme developers, these developers could write their software directly to the APIs exposed by these applications (often known as “middleware”). There are several ways in which this could generate competition between operating systems. First, if the middleware has been written for all major operating systems these would become competitors for each other, because they would all be capable of running a similar set of applications. But innovative operating system functions could also be embedded in the middleware so that users would never have to update their underlying operating system. In this way, middleware could develop into a substitute for future versions of the underlying operating system.

There are two conditions that would make such substitution possible and credible. First, such middleware programmes would have to expose (or have the potential to expose) a rich enough set of APIs to applications developers to be a viable alternative. Secondly, if such middleware were capable of running on different underlying operating systems, it could potentially generate even greater network effects for applications developers, by providing access to a range of operating systems including Apple and Unix. This could have clear efficiency benefits by achieving standardisation through middleware. Both Internet browsers and media players have several basic characteristics that make them highly plausible as forms of middleware. There are strong incentives for the developers of such programmes to encourage the development of plug-ins, which in turn generates incentives to expose a rich set of APIs. Secondly, as was the case with the Netscape browser, the ubiquity of such software across different consumer groups generates sufficient incentives to develop the software for different operating systems. For this reason, standardisation of APIs across platforms can be achieved through such programmes.

Application network effects are a powerful mechanism by which leveraging strategies from one period can have permanent effects in the future. This has been modelled by Kühn (2001) for the case of interoperability, but the analysis can be easily extended to bundling. Essentially, by bundling the operating system with its own Internet browser software, the operating system monopolist can generate a sunk cost effect on the consumer. The consumer will only purchase the rival software in addition to the bundled product if the price is less than the value to him of the quality differential. However, in an unbundled market, the consumer would be willing to pay the marginal cost of production plus the perceived quality differential to the rival firm. This means that the price that can be extracted by the rival is lower, and – in most models – the sales quantity is reduced. This means that the proportion of people already owning the rival software is reduced, and applications software offered in the future is more likely to be developed for the incumbent operating system. This in turn will reduce the value of owning the rival middleware, reinforcing through expectations the market share effect. Indeed for middleware that relies on third party plug-ins there is a point at which the expectations about applications network effects can generate catastrophic effects because consumers (and applications developers) no longer believe that the software will be upgraded in the future. This means that

relatively small disadvantages to rivals generated by bundling can have very large effects on excluding competition. Carlton and Waldman's (2000) model of network externalities is essentially along these lines. However, they choose to model network externalities exogenously, and do not explicitly consider the incentives of application developers. For this reason it does not become clear in their exposition that, through the effect on expectations, dramatic market share shifts can be generated.

Whether the exclusionary mechanism is strategic bundling or degradation of interoperability, it is important to emphasise that these exclusionary mechanisms lead to an *artificial* monopoly position. If standardisation of APIs could be achieved in some way – either directly, or indirectly through middleware – artificially created brand-specific network effects would turn into industry-wide network effects. The result would be divided technological leadership, which could be expected to generate considerably more innovation in the industry (see Bresnahan, 2001).

2.1.3.3 The “Media Player” story: network effects in two-sided markets

While the applications network effects are the best known way in which network externalities provide a link between bundling and future competition, there do exist other such powerful mechanisms. The media player part of the recent European Microsoft case provides a particularly interesting example.

When studying potential foreclosure on media player markets one has to consider two markets. One is the market for the actual media players that run on the desktop of personal PCs. The other is software that firms like Real, Microsoft, or Apple sell to content providers that allow them to encode their content in a format that allows it to be delivered efficiently across a network to a desktop user. This is a particularly difficult task for media streaming, i.e. real time delivery of video and/or audio content. What connects the software for the desktop and that sold to the content providers is a specifically designed proprietary media format. The software that Real provides to a content provider will encode content in its proprietary media format while the RealPlayer on a PC will decode from the format into the media presentation on screen. Typically other proprietary file formats cannot be decoded by a rival company's media player. For example, when the RealPlayer presents a video in Windows Media File format the decoding is actually done by Windows Media Player in the background. Real Player could not play such a file without Windows Media Player being present.

Competition in the market for encoding software for content providers is subject to strong network effects. The more PCs that have a decoder for a specific format on them, the more attractive it becomes for a content provider to encode in that format. Encoding in multiple formats has been found to be fairly expensive, so that content providers prefer using only one format. If that is the case, and all media players had the same quality, every content provider should encode with the software for which there are most decoders present on PCs. Indeed, even the lowest quality format may be adopted by a content provider simply because ubiquity of the decoder allows him to reach more PCs.

It is then clear that bundling by a firm with dominance in the PC operating system market can in theory completely tip the market for encoding software to itself by technically bundling the operating system with its media format decoding software. In that case it achieves ubiquity on all PCs while the delivery of decoders for other formats will always be imperfect and is empirically of questionable efficacy. This is therefore another example of how bundling today can completely change competition in the market in the future by changing the basis for competition in the market for encoding software. It should be

noted that the dominant position in the operating system market is critical here for the anticompetitive effect of bundling.

Finally, it should be stressed that the negative effects of such bundling strategies can be very large. Media formats and encoding technologies are at the forefront of research for Internet technologies. There is great value from finding efficient encoding methods to increase the speed of delivery of content. Many Internet based activities are only feasible when they can take place at a reasonable speed. Eliminating all competition for alternative solutions to the encoding problem would without doubt reduce the quality of available software. Note that this does not require some of the media players to exit the market. It only requires that investments in their improvement of the technology are terminated. This is precisely what has been alleged in the media player part of the European Microsoft case.

2.1.3.4 Financial constraints as a “linkage mechanism”

In the prohibition of the merger between GE and Honeywell another potential linkage mechanism between bundling and future intensity of competition has played a role: financial constraints. We have already discussed that it is difficult to make a solid case based on reliable evidence that bundling leads to less investment and thus less competition in the future. Financial constraints have the potential to make such an argument more plausible.

With financial constraints the cash flows of firms will determine investment costs and therefore the degree of investments. If bundling can severely reduce cash flows by shifting market share and intensifying competition then it can influence the investment strategy of competitors. Financially constrained competitors would respond to bundling by limiting their investments making them permanently less competitive rivals in the future.

While this argument can be made theoretically water tight, there are important restrictions on what relevant evidence is necessary to make the case. For example, economists often incorrectly argue on the basis of the financial power of the bundling company. However, in all economic theories in which bundling would have the effect of tightening financial constraints and thus reducing R+D investment the only relevant question is whether rivals are financially constrained. One of the great shortcomings of the GE/Honeywell decision of the European Commission is that it fails to establish any relevant financial constraints for the competitors. But without the proof of financial constraints the case misses any evidence that this mechanism could lead to harmful effects from bundling. Even if such constraints were established it would still be necessary to show that the cost of capital is sufficiently increased through such financial constraints that bundling would have a significant effect on investments. This is a formidable task, compared to showing network effects that by themselves are known to cause large effects.

2.2 Potential efficiency benefits of bundling

The economic efficiencies potentially generated by bundling practices can be grouped into two main categories: those arising from benefits on the production side, and those coming from consumption. In essence, bundling efficiencies derive from some form of economy of scope (either on the production or the consumption side), yielding an inherent advantage to supplying the goods together rather than apart. Economies of scope however are necessary but not sufficient to provide an efficiency justification for

bundling. Benefits from economies of scope frequently can be realised without any need for technical or contractual bundling. There is therefore a very limited set of valid efficiency defences for bundling practices. In many cases superficially plausible efficiency defenses amount to entirely spurious claims. We show in this section with the example of the software industry that many potentially valid efficiency claims cannot be sustained after a closer look at the industry.¹⁵

2.2.1 Economies of scope in consumption

One potential class of bundling efficiencies arises from so-called “economies of scope in consumption”: i.e., where there are advantages for the customer in purchasing complementary products from the same company rather than from two separate suppliers. The leading motivation for bundling in this case is transaction cost savings.¹⁶ For example, software is physically bundled on the same disk so that consumers do not have to deal with multiple ways of obtaining software.¹⁷

Software is a good example of a case in which there are likely to be economies of scope on the consumer side, but in which technical or contractual bundling does not seem necessary to realise these economies. First, the existence of such consumer-side economies of scope does not require the programme codes to be intermingled, but merely to be supplied on a single disk. Second, even if there are economies from supplying multiple programmes on a single disk, it is not clear that these programmes need to be sold as a bundle. It would appear that most of the benefits attributed to bundling could be generated by physically placing all of the software that some customers may want to install on the same disk but without selling the software on a bundled basis. Since most commercial software requires registration in order for the programme to be activated, additional software could be purchased during the registration process. Indeed, this is already the case today for a lot of software preloaded by OEMs. Essentially, the customer obtains software for a trial period and can then purchase it. When there are strong concerns about anticompetitive effects of bundling, it is by no means clear that the efficiencies arising from joint distribution of software are significant enough to provide a strong efficiency defence of the bundling practice of concern.

Software that is pre-installed by an OEM might seem like a different case than software that the customer loads from a disk. In the case of software that is pre-installed, the customer does not have to take the time to install the software; the OEM has already done the installation work. But here again it is important to distinguish between economies of scope in distribution (which may argue for pre-installation by OEMs) and whether pre-installed software needs to be sold on a bundled basis.

¹⁵ Note, that this does not imply that we are sceptical that efficiency benefits can arise from bundling. There will be many cases in which bundling will have important efficiency benefits. The purpose of this section is to point out that efficiency arguments about bundling practices in antitrust settings are often unwarranted.

¹⁶ A common type of economies of scope on the consumer-side is generated by shopping costs. These generate the consumer side benefits of department stores or supermarkets (so-called “one-stop shopping”).

¹⁷ Cost savings of such a strategy may also arise on the side of the seller who may save on distribution costs. These are again transaction costs and exactly the same argument applies as in the case of transaction costs on the side of consumers. For this reason we do not discuss such distribution costs separately (although in this case the cost saving is to the supplier, and this justifies a discount for the bundle). However this kind of economy of scope in distribution differs from joint production in that the saving is specific to the customer taking both products (e.g. cable telephony and TV services, which are cheaper as a bundle).

There would appear to be two ways of allowing consumers choice between different software products without jeopardizing the benefits of pre-installation. First, the OEM could pre-install a number of competing products on all PCs shipped. The consumer could then choose on the desktop which of the programs to activate and could pay for the software chosen in the process of registration. Given that many software companies including Microsoft require registration to activate the pre-installed programs, allowing consumers choice on the desktop in this manner would not be very burdensome to consumers. This would then be an unbundled solution that realises all of the pre-installation efficiencies the consumer obtains by not having to go through the process of inserting disks and waiting for the installation process to finish.

A second possibility of allowing full choice among unbundled programs without foregoing pre-installation efficiencies is by having consumers choose among the major programs they want to purchase at the time of purchase of the computer itself. This is, in fact, already current practice, albeit with a limited set of choices. Consumers are typically given the choice of pre-installation of a range of Microsoft products and also some non-Microsoft products when ordering from OEMs. If Internet browsers or media players were unbundled there would be no problem in allowing consumers a choice between the products of competing companies for each one of these product groups (unless exclusivity contracts between software producers and OEMs undermined such choice). There would be only a single payment to the OEM of the computer. The computer would come delivered with the preferred programs installed. Again all the pre-installation benefits would be realised but without bundling.

Other arguments about consumer benefits from software bundling are similarly poorly supported. For example, it is sometimes claimed that efficiencies could arise from higher expected quality or functionality when components have to function together. Consumers may think that using the web browser produced by the software company that produces the operating system would be less likely to crash than that of a competitor less familiar with the operating system. However, while this may be an argument for consumers to purchase both products from the same software company, it does not imply that bundling is necessary to realise these possible efficiencies.

2.2.2 Production-side economies from bundling

Since bundling is primarily a sales strategy, most of the potential efficiency effects should arise on the customer side (or, more generally, in distribution). This means that it is highly unlikely that production-side economies can be a justification for bundling unless consumers have an interest in buying the products together.

There could be a case for technical bundling when there are economies of scale in the assembly of complementary parts of a product. For example, in the assembly of a car the production technology used by a car manufacturer can assemble the parts at much lower cost than an individual customer purchasing the parts separately. But even this does not always constitute sufficient reason for bundling: often the customer can choose the components separately and then have the manufacturer do a custom assembly. However, given the costs of product design there are often only limited possibilities to do this cheaply. Cases for efficient bundling are therefore relatively easy to construct under such circumstances, although it is not always a foregone conclusion that economies of scale in assembly will necessarily lead to bundling at the sales stage.

In software markets it is more difficult to understand how economies of scope in production require bundling in the sale of software. For example, there may be economies of scope from developing code for related programmes within a single firm, but it is not obvious that programmes need to be sold together to realise the benefit of these economies of joint development.

One possibility is that there may be economies from intermingling the code of different programmes and this therefore requires technical bundling (“integration”) of the programmes. Microsoft has argued the technical bundling of its Internet Explorer browser and its Windows operating system is an example of this. We are not software engineers, but we accept that designing programmes to share code between two products could theoretically have potential benefits, if the performance of the programmes would be enhanced. However, there is a question whether intermingling of code would have this effect for large pieces of software. As we understand it, there is also a potential economic inefficiency associated with such software structures: by intermingling codes rather than constructing software in a modular fashion, it may be more difficult to trace programming problems.

Ultimately the question of the efficiencies of particular software structures can be resolved only by gathering and assessing factual evidence. However, as we discuss in more detail below, in considering this question, it is important to adopt an *ex ante* perspective. In the case of Internet Explorer and Windows, the relevant question is whether these programmes had to be *designed* in an intermingled manner in order to realise efficiencies. If there were no design reasons to intermingle the code, then it would create perverse incentives if Microsoft were allowed to defend an *ex ante* exclusionary design decision on the grounds that *ex post* it would be difficult to separate its browser programme from its operating system programme.¹⁸

¹⁸ Yet this appears to be Microsoft’s argument. In the US antitrust case, Microsoft spent considerable effort on trying to prove that it could not separate the browser from the rest of the operating system without damaging the functionality of the OS. Experts for the US government contested this claim. However the more important point is that even if Microsoft had proved that it would be difficult to separate Internet Explorer and Windows *ex post*, that would have not in any way proved the existence of strong economies *ex ante* in *writing* the operating system and the browser programmes together in such a way that the code is intermingled in the first place.

3 Some errors in the interpretation of economic theories of bundling, and their policy consequences

When discussing the insights of economic theory on the competitive effects of bundling practices, errors are frequently made in interpreting the theory and its implications for policy. This is so both for those who try to create the impression that competition policy should never address bundling at all; and for those who advocate an overly restrictive policy towards bundling. We will discuss the first set of arguments with reference to the paper by Ahlborn, Evans and Padilla since their contribution contains several fallacies of this kind. On the other hand we will use recent decisions by the European Commission to show how an overly restrictive policy is unwarranted as well. The first view essentially relies on a blanket assertion of efficiencies while downplaying the applicability of anticompetitive theories of bundling. The second downplays efficiencies and relies simply on the theoretical possibility of anticompetitive effects in some models to claim anticompetitive effects in specific cases. Both approaches cannot be a basis for a sound competition policy towards bundling.

3.1 Errors in attributing efficiencies to bundling

We will first show how the fact that bundling can entail efficiencies can be abused for sweeping claims about policy. There are several kinds of erroneous arguments. First, efficiencies that are attributed to bundling often can be achieved without bundling. Second, efficiency claims for technical bundling are given with reference to examples where this occurs. At the same time the abundance of examples in which such potential joint production does not occur is suppressed. Third, theories are misinterpreted to lead to efficiency effects of bundling when these theories do not imply such conclusions at all.

The most common example of the first error is the joint production fallacy. For example, Ahlborn, Evans and Padilla claim that tying can make economies of scope possible, giving as an example that “machines may be may be utilized to manufacture two or more products, allowing the producer to reduce the size or complexity of its factories”. As we have already explained, there is no reason why products that are jointly produced should necessarily be sold together. There are countless examples of products that are jointly produced but are sold to different customers. An example could be the refinery output of different crude oil derivatives. General claims on efficiencies generated by bundling ignore the point that any efficiency enhancing bundling must be driven by preferences for joint consumption (i.e., complementarity between the goods). But even when there is a preference for joint consumption, it is not necessary for complements to be *sold* on a bundled basis, unless this action itself leads to real economies.

The second error in dealing with potential efficiencies of bundling is to selectively focus on some markets that seem to support efficiencies. Ultimately such examples say little more than that it might be cheaper for a firm to combine complementary parts, than for a consumer to do so. While this may sometimes be the case, we cannot ignore the many counter-examples to this claim. Children’s toys frequently have to be assembled by the buyer. For furniture it is very common that assembly has to be done by the buyer. Indeed, the IKEA business model relies on the fact that, for some customers and some products, there are efficiency gains when the customer assembles the furniture. Indeed, the actual complexity of the tasks of assembling children’s toys or furniture is arguably greater than it is to attach a plug to an electrical appliance (A leading example cited by Ahlborn, Evans and Padilla for consumer

benefits from product integration.) Basing strong conclusions on casual empiricism is a dangerous exercise. There is no basis for going from the fact that product integration *sometimes* produces consumer benefits to the conclusion that product integration almost invariably produces consumer benefits.

Some claims for the general efficiency benefits of bundling also arise from simple misinterpretation of theory. For example, Ahlborn, Evans, and Padilla claim that bundling allows the realisation of the so-called Cournot effect (Cournot 1838, see also Nalebuff 1999). The “Cournot effect” refers to Cournot’s observation that it is better for a single multi-product monopolist to sell all complementary parts of a system, than for all parts being sold by single-component monopolists. This observation is no justification for bundling or product integration. The price effect is achieved simply because all of the products are sold by the same firm: *but it does not depend on bundling at all*. For instance, when a monopolist sells complementary products it will set lower prices than independent producers: this is due to internalisation of the complementarity between the products, and *has nothing to do with bundling*. The effect will also be of little impact if there is significant competition in the markets for all parts. Indeed, as discussed earlier, Nalebuff (2000) shows that bundling of parts by one firm with market power will typically *increase* prices when there are independent competitors for individual parts – at least if there are enough parts. As explained above in Section 2, this result is driven by precisely the same Cournot effect.

The essential underlying error in approaching bundling from a claim of large, generalized efficiencies is that there is no theoretical or empirical underpinning that can justify such an approach. Whether there are efficiency effects to bundling or not will always have to rely on a careful analysis of the specific industry. But it should be noted that the scope for valid efficiency claims is much narrower than some authors want us to believe.

3.2 Efficiency claims that are irrelevant to competition analysis

One strategy to talk up the efficiency effects of bundling in competition cases is to discuss efficiencies in the context of industries in which there would never be a competition concern in the first place. For example, sometimes the efficiency claims that are made are in fact irrelevant to what tends to constitute “bundling” in the competition literature. It simply does not inform competition analysis to point out that one can think of almost any product as a bundle of its inputs. To imply through examples that such “bundling” would have violated US antitrust law (in the days of the *per se* prohibition against bundling) is highly misleading. Even historic *per se* prohibitions have been conditioned on essential elements such as strong market power of the bundling firm over a component part, and – as a consequence – significant asymmetries between competitors in the length of the product line of complementary components.

Once this is taken into consideration, some of the efficiency arguments fall apart. For instance, Ahlborn, Evans and Padilla claim that only by allowing bundling can industries achieve product innovations such as Apple-Cinnamon Cheerios, and the minivan. The key point is that none of the components of these products appear to be even near monopolised. It is true that there is product innovation in both of these products: no one had previously thought of putting the components together

in quite this way.¹⁹ The implication the authors draw is that such innovation could not take place were bundling prohibited. But there is no basis for this conclusion.

To see that the conclusions may well be reversed, consider the following hypothetical example. Suppose there was a worldwide monopoly supplier of wheat flour, which sells only baked products and refuses to sell flour to other bakers. The monopolist never thought of making apple pie and, when Aunt Millie had the idea, she realised pretty quickly that she could not get the flour to make it. In this example innovation can only be reduced by technical bundling. There is no efficiency benefit here in the sense that “product integration” does not help innovation.²⁰ There is no point in making efficiency claims with reference to market structures that are implicitly perfectly competitive, when competition policy intervention both in the US and in the EU have been premised on the presence of significant market power.

3.3 Ignoring the presence of robust effects in the theoretical literature

Proponents of a more lenient policy towards bundling tend to quickly dismiss the available body of theoretical literature as irrelevant to their claims. For example, Ahlborn, Evans and Padilla write: “(...) any game theoretic analysis [...] is notoriously fragile” (e.g. p. 50). Such a claim is not supportable. It is true that certain theories are only valid under certain market conditions. But one can make clear statements about the relative robustness of different theories, as we have indicated in the previous section and specify the circumstances under which the theory is more likely to apply. To claim that a laissez faire Chicago School analysis, that is not game theoretic, is more robust would be similarly incorrect. It is now well understood that Chicago School modelling tends to ignore the elements that are crucial for generating anticompetitive effects of contracting practices (see Bernheim and Whinston 1992). The challenge for the formulation of policy prescriptions from theory is to identify the features of models that are robust across different modelling approaches and to identify observable characteristics of markets that have a large impact on whether anticompetitive effects can be expected or not. The theory of bundling surveyed in the previous section can serve precisely to accomplish this task.

Unfortunately, discussions of policy towards bundling often either ignore robust effects focussing excessively on the intricacies of specific models or use sweeping generalizations drawn from specific models that ignore the relevant restrictive assumptions. What is typically missing from these treatments is an emphasis on what is robust. Our discussion in the previous section does capture three robust features of bundling theory that are typically not mentioned by laissez faire proponents.

Among the robust effects generally ignored by economists advocating a laissez-faire approach is, for example, Nalebuff’s observation that prices tend to increase with the relative length of the product line

¹⁹ To call Apple-Cinnamon Cheerios a product improvement and praise its health benefits is in any case somewhat overstated. Most economists would see this rather as an example of horizontal product differentiation. The quoted study by Jerry Hausman (see Jerry Hausman, *Valuation of New Goods Under Perfect and Imperfect Competition*, in *The Economics of New Goods* 209, 234 (T. Bresnahan and R. Gordon eds, 1997) is also one of the most criticised pieces of empirical research in this field (see Bresnahan)).

²⁰ It may indeed be in the interest of the producer to sell flour to Aunt Millie in the simplest example. But as soon as we add price discrimination incentives or other valid foreclosure mechanisms the flour monopolist might not.

of the bundling firm because of the Cournot coordination problem among the competing complementary goods producers. This a robust effect across any modelling approach one may take.

Similarly, the robust element in Carlton and Waldman (2002) comes from the basic structure of generating exclusionary effects. Their mechanism is closely analogous to that put forward by Bernheim and Whinston (1991) in an exclusive dealing context. The key feature of these contributions is to show how short-run inefficient exclusionary behaviour can, through some intertemporal link, lead to anticompetitive effects. This is the robust feature of all such models: they are driven by some direct intertemporal link between restrictive practice in one period, and the rivals' ability to compete in the future. There are a number of conceivable practices that provide such a link, and it is the plausibility of those features *in each particular* case that needs to be assessed.

Another clear conclusion from the theory that is often ignored is that network effects provide the single most plausible link between market share shifting through bundling today and future reduction in competition in the future. The "applications network effect" in the software industry has been long identified as a particularly robust mechanism by which foreclosure can occur. Yet these important qualitative implications of the theoretical literature are not even mentioned. Similarly, the European Commission has tended to ignore this large qualitative difference between the Microsoft case and its controversial merger cases that were based on bundling concerns. It is clear that network effects can much more easily lead to large anticompetitive effects of bundling than, for example, financial constraints can.

A lack of focus on the distinction between robust and specific elements of theory has also hampered competition policy in Europe. The approach by the European Commission in cases like Tetra Laval/Sidel or GE/Honeywell has been to provide a laundry list of possible anticompetitive mechanisms of bundling without a clear specification whether the conditions for which the theories yield anticompetitive effects could be verified in the industry. For example, there are suggestions in the European Commission's decisions in GE/Honeywell and Tetra/Laval that anticompetitive effects can arise for reasons related to financial strength, but the precondition of financially constrained *competitors* is never discussed. Instead there is only mention of the financial strength of the company that might bundle the products – which, as discussed above, is not the right question.

Building a case based on anticompetitive theories of bundling without careful analysis of whether anticompetitive bundling is likely given the specific characteristics of the relevant markets is just as bad from a policy perspective as overly broad claims that competitive effects of bundling are invariably innocuous.

3.4 Errors in the theory of policy

One of the most fundamental errors made in recent discussions about the design of competition policy towards bundling concerns the design of "optimal" policy. The so-called "Decision Theoretic approach" to competition policy design developed by Hylton and Salinger (2001) has been used to argue for an approach that effectively results in per-se legality of bundling. However, the analysis by Hylton and Salinger (2001) is cannot be used as a sound basis for policy making: First, and most importantly, it applies decision theory incorrectly to the competition problem at hand. Secondly, it is based on an implicit assumption that the cost of anticompetitive behaviour is small.

Hylton and Salinger (2001) argue on the basis of examples from many competitive markets that bundling without anticompetitive effects is so prevalent, that the probability of anticompetitive effects arising is very small, and that one's prior belief should therefore be that bundling is not anticompetitive. This argument is entirely misplaced. The issue is *not* the *ex ante* probability that a given instance of bundling is likely to be anticompetitive. What matters for a competition authority's decision to pursue a case further is a *conditional* probability. As outlined above, and discussed further below in more detail, the economic literature on bundling suggests an initial set of conditions that can be used as a preliminary filter, to identify cases in which bundling should never be challenged. For example, absent very significant market power by one firm, bundling cannot have serious anti-competitive effects. The relevant question then is: How likely are anti-competitive effects if all the conditions that would guarantee that bundling is benign are absent? *This probability may in fact be relatively high.* At a minimum, the relevant probability cannot be assessed just from the observation that bundling is "common".

But a proper decision theoretic analysis does not only assess the appropriate probability of anticompetitive effects but also the probability that bundling has efficiency enhancing effects and the magnitude of such effects. At this point the per-se legality argument becomes especially obscure. Nowhere do the authors discuss how to assess the potential costs of permitting bundling. Implicitly their policy conclusion can be justified only if these costs are expected to be small relative to the efficiency benefits. However, as we have discussed above, claims of efficiencies are fragile in the sense that they do not fit every industry equally well, and can often be achieved without product bundling. On the potential social costs of anticompetitive effects nothing is said. But in the case of the computer industry, the cost may be the complete monopolisation of one of the most important backbone industries of the economy.

The arguments made on bundling by Hylton and Salinger and other supporters of a "laissez faire" approach to bundling are not better grounded in theory because they refer to "decision theory". Indeed, "decision theory" would prescribe something much more intricate, namely some sequence of relevant evidence that a competition policy authority should follow in its investigations with the goal that an investigation can be stopped when anticompetitive effects do not seem likely enough. For example, in any complaint a competition authority may first look for characteristics like market power that are necessary conditions for anti-competitive effects to be present. If it does not find the conditions to be present it can simply stop the proceedings. If strong market power is present it may study the industry further to find out what reasonable anticompetitive mechanism could be at work. If some evidence strongly speaks against this mechanism, the investigation could be stopped, etc. This means that an optimal policy should always be thought of as an optimal stopping rule for investigations. Our policy proposal below is in this spirit.

4 Criteria for a competition assessment of bundling

An effective competition policy assessment of bundling practices should focus on those specific features that economic theory identifies as necessary for generating anticompetitive effects. In order to create a reasonable decision rule based on bundling theories, we need to go further than presenting a long “laundry list” of assumptions from models that have generated exclusionary effects. In the spirit of an optimal stopping rule for investigations we want a rule that starts with characteristics that are most easily observed and/or can quickly filter out obviously innocuous cases of bundling thus saving enforcement resources. We believe the following three-step approach for determining when intervention against bundling is in this spirit and fully uses the theoretical insights the economic literature has provided. An effective decision rule needs to satisfy three functions:

- First, it needs to create a ‘safe haven’ for circumstances in which bundling should not generate any competition concerns;
- Second, it should produce criteria that make it possible to decide whether bundling is sufficiently likely to have anticompetitive effects, so that intervention should be justified;
- Third, it needs to consider efficiency-enhancing effects that might provide a countervailing effect to the competition analysis.

The safe haven rules allow for a quick closing of cases that are of no concern. Indeed, such safe haven rules will guarantee that there will be no complainants in such cases in the first place. Conditional on passing the safe haven test a careful analysis of the industry is required, to assess whether there is a coherent and plausible mechanism for anticompetitive effects. Only if this argument can be made should one go the further step to assess the efficiency claims for bundling, which are much harder to evaluate.

4.1 “Safe haven” rules

The economic literature implies that the following observable criteria can be employed as initial filters to determine when bundling should never be challenged. Bundling should never be challenged unless all three of the following conditions are satisfied:

Market power in one of the bundled products. This is an obvious condition that accords with current EU policy. Because intervention against bundling (especially technical bundling) is a significant regulatory action, there is a clear case for the competition authorities only to be interested in cases in which market power is strong, i.e. the firm must have achieved clear dominance in the market for at least one of the bundled products.

Complementarity. The economic literature reviewed above implies that *complementarity* between different components of a bundle is an essential ingredient for all robust theories of anticompetitive harm through bundling. The implication is that when such complementarities do not exist, it is probably appropriate to exclude bundling from antitrust scrutiny.

Asymmetry in product lines. The economic literature also suggests that a strong *asymmetry* between the product range of the bundling firm (what economists call the ‘length of product line’) and that of its competitors is more likely to be problematic. Where more products can be offered as part of the same bundle, there are greater opportunities for “Cournot effects” to arise, and this in turn greatly increases the likelihood of anticompetitive bundling (as shown by Nalebuff (2001)). Indeed, all theories of foreclosure through anticompetitive bundling rely ultimately on some such ‘product line asymmetry’ between the dominant bundling firm and its rivals.

Conversely, where components are offered in a bundle by *all* firms in the industry, we typically do not even talk about bundling at all: for instance in the car industry, all manufacturers routinely sell a combination of wheels, steering wheels, motor and chassis, and this is not generally described as ‘bundling’. The term ‘bundling’ tends to be reserved only for cases where a manufacturer includes some special features in his standard models that others sell as independent upgrades, or not at all. Concerns about anticompetitive bundling are also weaker when the bundled extras are of minor economic importance relative to the value of the bundling product (which is typically the case with cars). Thus references to the bundling of components in the car industry²¹ are misleading as they overlook the central point that significant asymmetries in product line (especially in terms of value) are a central criterion for bundling to assume relevance in competition terms – and to generate antitrust concerns.

Absent these three characteristics, bundling will fail to produce substantial anticompetitive effects, and the authorities’ investigation should not proceed. Significantly, note that the examples cited by advocates of a laissez-faire approach to bundling (e.g. cars and electric plugs) all fail to satisfy one of these conditions. These would therefore fall under a safe haven provision.²²

Conversely, *all three of these criteria are met in the software industry*, and are specifically relevant for assessing bundling practices between operating systems and products such as browsers or media players. On this basis, at least *prima facie* concerns are justified in the market for media players, which was one of the targets of the Commission’s decision against Microsoft.

4.2 Determining whether anticompetitive effects are likely

Establishing that the initial screening criteria are met should not be enough to justify intervention against bundling. Once concluded that the safe haven rule does not apply, a good competition policy rule should aim to discriminate as systematically as possible between truly anticompetitive cases, and innocent bundling.

²¹ See e.g. Ahlborn, Evans and Padilla at 3, 38 (“there is no such thing as an unbundled car”).

²² Note also that the availability of an easily verifiable “safe haven” rule also makes clear why the “decision theory” arguments of Hylton and Salinger are highly misleading. With reference to a number of ‘innocent’ tying cases, Ahlborn, Evans and Padilla and Hylton and Salinger argue that the probability of anticompetitive bundling should be taken as extremely low. But that ignores the fact that a safe haven rule completely excludes the trivial bundling cases from consideration. Once the obviously innocent cases are filtered out, the *ex ante* probability that bundling may have anticompetitive effects may be quite high. Given the low cost of verifying these screening conditions, all that should matter for the decision rule adopted by the competition authority should be only the conditional probability, given this information. Given that this probability can be quite high, there is no basis for a modified *per se* legality rule..

In practice, such a decision rule cannot be based on a set of pre-determined market characteristics, as there are numerous theories of bundling that can yield possible anticompetitive effects, and the conditions under which they apply may differ considerably. Indeed, as it is not possible to specify in advance all strong, plausible foreclosure theories that might arise in future, it is also impossible to provide a coherent and comprehensive list of features that would need to be checked in order to decide whether bundling is anticompetitive. In each individual case it will be necessary to show that *there exists a coherent theory, broadly fitting the easily observable characteristics of the industry, which demonstrates that foreclosure effects – not limited to exit – are plausible*. This part of the investigation should specify a clear exclusionary mechanism, which should then inform the subsequent search for appropriate evidence.²³

Effects that depend on a strong intertemporal mechanism, by which bundling today affects the competitiveness of markets tomorrow, tend to be the most robust, and in that area there is greater scope for finding convincing evidence. Thus in order to establish whether certain bundling practices have a significant impact on competition, it will be necessary to show that in the specific market in question there exists *some credible mechanism linking bundling in one period to competitive conditions in the next*; and this will inform the determination of whether *there is empirical evidence suggesting that the theory is relevant to the industry*.

A number of mechanisms linking bundling today to competition conditions in the future can be identified in the software industry, some of which we have discussed in Section 2. We cannot discuss all possible theories, but will focus in particular the most powerful such mechanisms, those based on network effects. These are understood well enough today, and create one of the most robust linkages between current bundling practices, and future intensity of competition. Our discussion of this mechanism provides an example of how qualitative predictions from theory can be used to identify informative evidence on the relevance of the mechanism in the specific market considered. There are other pieces of evidence that can also help establish whether bundling can have anticompetitive effects. These are discussed further below.

4.2.1 Assessing network effect based mechanisms

Let us first consider ‘applications network effects’. As discussed in Section 2, an ‘applications network effect’ can lead to robust intertemporal linkages (i.e. linkages between actions today and effects tomorrow) that can produce credible anticompetitive effects. Of course, not all software products can generate such effects when bundled with an operating system. Two essential conditions must hold:

- first, it must be necessarily the case that the ‘applications network effect’ occurs *at the level of a given brand*, rather than the whole industry; that is, that the value of adopting a particular product increases with the number of other adopters of the *same brand* (otherwise the network effect could not be used by a dominant firm to exclude rivals, as all would benefit from it). In most cases, brand-specific network effects arise due to the use of proprietary standards;

²³ This has the advantage of conditioning the costly part of an investigation – the search for evidence – on the specific prescriptions of the theory. It has also the advantage of allowing for an investigation to be closed early on, where there is no theory of anticompetitive bundling that appears plausible enough for the industry in question

- secondly, it must be the case that the products in question *expose or have the potential to expose a rich set of APIs* to applications software developers. That is to say, the applications network effects can justify intervention against bundling only for the bundling of software that has the potential for developing into *middleware*.

These are two very clear criteria for further identifying cases where there should be no concern over anticompetitive bundling, and those where concerns are instead legitimate. Indeed this approach excludes intervention against bundling in the great majority of markets, and ensures that policy against bundling does not interfere with product design, particularly in sectors with a system of industry-wide compatibility standards.

Now consider network externalities from two sided adoption as in the media player example. In this case it is necessary to identify what the proprietary standard is that needs to be adopted. Furthermore it needs to be verified that it is costly for content providers to encode in multiple formats. Finally, it needs to be established that the bundling practice can in fact change the market shares in the relevant market.²⁴

But the network effect based theories of anticompetitive harm from bundling do not only generate criteria for eliminating cases from consideration. They can also point to the type of evidence we should be looking for, to conclude it is highly likely that bundling has anticompetitive effects. Network effects based theories point to a very informative piece of empirical evidence. As explained in Section 2, anticompetitive effects will be particularly strong where applications developers take bundling as a signal that network effect will make competing middleware lose significant market share over time. If this is the case, market share can swing dramatically to the dominant firm. The *expectations of applications developers are therefore crucial to the operation of the mechanism*. Applications developers themselves can be *surveyed* on this point. Suppose that, in answer to appropriately framed questions, the competition authority was to find that there is significant consensus by a large proportion of the developers' community that the competing software will fail as a result of bundling by the dominant firm. This should provide strong evidence that anticompetitive effects are very likely. Such conclusions could be supported by empirical evidence that development activity is already shifting away from the competing products. Forward-looking and incipient evidence of this kind should be given particular weight in cases where the concern is to prevent lasting harm: if the requirement for antitrust intervention was finding *direct* evidence of exclusion, then potentially irreversible anticompetitive harm would already have been done before any intervention took place.

In summary, when there are demonstrable strong network effects, it will be safe to conclude that anticompetitive effects are likely. These effects are understood well enough today, to make it possible to conclude that they create one of the most robust linkages between current bundling practices, and future intensity of competition. Of course, the plausibility of these effects being at play in each specific case must be carefully verified.

²⁴ The European Commission has developed evidence on all of these factors in its investigation of the media player part of the Microsoft case.

4.2.2 Evidence about likely effects: the role of investment and R&D

Another forward-looking criterion for assessing the possible anticompetitive effects of bundling should be the *R&D and investment behaviour of firms developing competing software* to that of the dominant bundling firm. Economic theory predicts that, in anticipation of network effects, competitors' investment in the development and improvement of middleware products should *decline as a response to bundling*. While it is very difficult to interpret raw investment data, there can be circumstances where it is quite clear that competitors' investments and R&D are being undermined, and this should generate a compelling case for anticompetitive effects. For instance, if competitors could produce boardroom and other internal documents showing that management has taken strategic decisions to limit product development, specifically as a consequence of the dominant firm's bundling strategy, this would serve as strong evidence that bundling is producing significant exclusionary effects. This should be relatively easy to distinguish from discussions that the product was simply not popular enough for other reasons.²⁵

4.2.3 Evidence of intent to exclude

A further important element for assessing the anticompetitive scope of bundling practices would be any *available evidence of the intent* of the bundling decision. A useful analogy can be drawn here with policies against collusion. In determining whether to punish firms for collusion, competition authorities today do not generally seek to prove that prices are higher than they would otherwise have been: this is technically very difficult to infer just from market data. They tend to focus instead on evidence of communication between firms about prices. As there are no good efficiency reasons for communicating on prices, the finding that such communication takes place is deemed as sufficient evidence for the existence of anticompetitive practices, with likely anticompetitive effects.

Bundling is of course somewhat different in that there is at least the possibility that it may generate efficiency benefits (while it is difficult to see any efficiency reasons for rivals to be talking about price). But evidence about what decision makers thought they were doing when taking a decision should still be relevant. Showing 'intent' will not just involve some evidence that managers talked about the exclusionary effects of bundling. However, documentation that exclusion was a motivation, together with the absence of documents demonstrating significant discussions of efficiency gains, should be taken as compelling evidence of intent. An important reference point for a policy rule here can be the way that evidence of intent was used in the US case against Microsoft. There was evidence from Microsoft's internal communications that the only reason for technical bundling of its browser with the operating system – i.e., the intermingling of the code – was to exclude Netscape from the market (see Bresnahan 2001). Such evidence appropriately played an important role in the case.

Overall, if the theoretical criteria for bundling to have plausible anticompetitive effects are satisfied, strong evidence of intent should be sufficient to convict a firm of anticompetitive bundling. Thus any documentary evidence of executives discussing the deployment of certain strategies to exclude competitors, combined with a plausible theoretical mechanism, should be sufficient for finding an antitrust violation.

²⁵ One of the problems in the EU merger cases is that such evidence could not possibly be available because bundling was not practiced pre-merger. As a result the body of evidence that can be used in a merger case that attempts to block a merger because of anticipated future bundling is dramatically reduced relative to an abuse case. See Kühn (2002) for a critique of bundling arguments in merger cases based on this observation.

4.2.4 Absence of efficiency motivations

Advocates of a laissez-faire approach to bundling often present an efficiency defence as a countervailing argument to antitrust concerns. In practice, however, it is difficult to implement a suitable trade-off calculus, properly 'offsetting' anticompetitive effects against efficiency benefits. A more realistic approach is to recognise that evidence for efficiencies and, conversely, the absence of convincing efficiency arguments, contains primarily *qualitative* information about firms' intent (see Kühn (2002), and Neven and Seabright (2002)). The absence of convincing efficiency arguments should be taken as evidence that these are unlikely to be significant, and that bundling is more likely to have been driven by anticompetitive motives.

For instance, in the Microsoft browser case in the US, Microsoft provided virtually no evidence that there were real efficiency benefits of intermingling code. Microsoft argued instead that its operating system could not function properly if the browser were separated. However all that this proves is that, *once in place*, it is costly to 'undo' technical bundling. It does not show at all that technical bundling was an efficient strategy at the time of planning the software architecture. Indeed, given the additional documentary evidence on Microsoft's exclusionary intent of the strategy, it may well be the case that Microsoft actually chose an *inefficient* software construction to further its anticompetitive aims. *It is only ex ante efficiencies that should matter for the antitrust assessment.* High costs for *ex post* unbundling should be viewed simply as a penalty on the firm for having used anticompetitive bundling in the first place.

4.3 Assessing efficiency defences

As bundling *can* generate efficiency benefits, these should be taken into consideration even when the conditions for justified intervention developed in the previous subsection are satisfied.

However, in assessing efficiency defences a substantial problem arises: the firm that claims the efficiencies typically has much better information about the true nature of such claims than the antitrust authority. This does not only apply to the general nature of such efficiencies, but also to how they should be demonstrated. Any efficiency defence rule will inevitably have to deal with these problems. It is therefore reasonable for the competition authority to do two things: first, to consider only those efficiencies that are *explicitly claimed* by the bundling company. Secondly, because the company has private information about how it achieves these efficiencies, to *place the burden of proof on the defendant*. Note that these costs should not be regarded as unreasonable, in circumstances where an initial investigation has established a high probability of competitive harm. This is also the reason why efficiency claims should only be explored *after* the competitive assessment. If there is no reasonable anticompetitive theory, there should be no reason to impose the burden on the firm to demonstrate efficiency effects.

When a coherent theory of foreclosure has been developed, and there is evidence that the mechanism in question is indeed operating in the market, the costs of providing the necessary information appear relatively small against the potentially large social losses from foreclosure. Placing the burden of proof on the defendant has the desirable effect of avoiding 'wrong' convictions for anticompetitive bundling. Note also that the costs of trying to come up with an efficiency defence will tend to be higher for a firm that does not truly create them through bundling (see Kuhn (2002) and Neven and Seabright (2002)). In

this way, efficiency defences can be used as a further screening device to discriminate innocent from anticompetitive bundling in actual cases.

Economists advocating a laissez-faire approach to bundling propose a different rule (that the burden of proof for efficiencies should be placed on the competition authority) that does not appear at all sensible when one is really concerned about “minimising errors” (i.e. reducing the risk that wrong decisions may be taken). Given the private information of the company about efficiencies, putting the burden of proof on the competition authority will lead to less information being revealed, and therefore a more random decision rule. Allocation of the burden of proof to the plaintiff would only reduce the probability of an anticompetitive finding; but it would *not* reduce the probability of error. It is therefore clearly not an optimal rule for the assessment of efficiencies.

5 Conclusions

In this paper we have reviewed the key insights and policy implications of modern bundling theory, in response to the ongoing debate about the competition policy treatment of bundling. We have shown that the radical claims made by some economists supporting per-se legality of bundling do not find support in a careful reading of economic theory. We show, in contrast that there are clear economic criteria to identify industries where anticompetitive bundling can be an issue and point to clear empirical criteria for a finding of anticompetitive bundling. Under the rules we suggest most innocent bundling would never come under scrutiny, but truly anticompetitive practices with substantial social costs could still be successfully pursued by the competition authorities.

The competition policy procedure that we outline is conservative. It excludes some potential cases of anticompetitive bundling from scrutiny, but only those for which it appears impossible to provide sufficient evidence for a case. Our safe haven rules ensure that most instances of bundling go undisturbed. Even when an instance of bundling falls outside the safe haven provisions, the procedure we outline requires considerable theoretical and evidentiary work by the competition authority before intervention can be justified.

Against this background of a conservative policy carefully derived from economic theory, we reject the suggestion made by some economists that justifying intervention against bundling necessarily requires a delicate assessment of the parameters of some specific economic model. As we have shown in this paper, under certain identifiable circumstances, bundling can have serious anticompetitive effects via robust mechanisms that do *not* depend subtly on the parameters of a specific economic model. We believe it is highly desirable to be cautious in designing competition policy towards bundling. But this desire to be cautious cannot justify the adoption of an approach of “(modified) per-se legality”.

We have also attempted to clarify how European Commission policy measures up to the policy outlined in this paper. We believe that in the recent case against Microsoft, the Commission has taken an approach consistent with that outlined in this paper. We see this in sharp contrast to earlier cases in which the Commission refused to specify a specific mechanism which would lead to anticompetitive effects of bundling and in which, as a result, the evidentiary test for anticompetitive effects remained unclear.

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