LUISS GUIDO CARLI

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TESI FINALE

"L'industria Aeroportuale Italiana Tra Incertezze del Passato e Sfide del futuro"

"Law and Economics of Bundling By Non-Dominant Firms"

"Awarding Provision Through Competitive Tendering: Lessons For and From the Italian Experience with Local Public Services"

Supervisor:
Prof. Roberto Pardolesi

Candidato:
Giovanni Formica

Introduzione Alla Lettura Della Tesi

Ai fini del completamento del percorso di studi e ricerca, il Consiglio di Dottorato ha concesso ai dottorandi del Ciclo XXII, sin dal primo anno di attività, la possibilità di scelta tra un unico lavoro monografico e tre *working paper*.

Avendo optato per quest'ultima possibilità, seguono i tre lavori presentati per la discussione, dei quali i primi due già pubblicati su riviste specializzate in tematiche di Diritto ed Economia.

Coerentemente, il testo che segue è diviso in tre sezioni, ciascuna corrispondente ad un paper distinto. L'organizzazione delle sezioni/articoli segue l'ordine cronologico di predisposizione: primo anno (Sezione I), secondo anno (Sezione II) e terzo anno di dottorato (Sezione III).

In particolare, di seguito si descrive in estrema sintesi il contenuto e le finalità principali di ciascuna paper:

1. Sezione I: "L'industria Aeroportuale Italiana tra Incertezze del Passato e Sfide del Futuro"

   Il contributo analizza gli assetti strutturali e regolamentari dell'industria aeroportuale italiana, evidenziandone le principali linee di tendenza, *in primis* la crescita progressiva del grado di concorrenza e la difficile ricerca di regole certe, presidiate da istituzioni forti e credibili. Si suggeriscono poi coerenti indirizzi di riforma.
   Il testo è stato pubblicato nel primo anno di dottorato come Formica G. (2007), "L'industria aeroportuale italiana tra incertezze del passato e sfide del futuro", in *Mercato, Concorrenza, Regole*, n. 2, agosto 2007

2. SEZIONE II: "LAW AND ECONOMICS OF BUNDLING BY NON-DOMINANT FIRMS"

Il lavoro contrasta l'approccio dominante nella letteratura gius-economica, secondo il quale le vendite gemellate (*bundling*) sono idonee ad inibire la concorrenza ed il mercato solo ove praticate da imprese (quasi) monopolistiche. Le principali conclusioni teoriche (entro specifiche circostanze il *bundling* potrebbe danneggiare il consumatore, anche in contesti maggiormente concorrenziali) sono *indirettamente* supportate da una ricca casistica antitrust su ambedue le sponde dell'Atlantico.

L'articolo, premiato come miglior tesi del percorso di studi all'estero previsto per il secondo anno di dottorato, è stato pubblicato in rivista collegata come Formica G. (2008), "Law and Economics of Bundling by Non-Dominant Firms", in *German Working Papers in Law and Economics*, volume 2008, paper n. 16, Berkeley University Press.

3. SEZIONE III: "AWARDING PROVISION THROUGH COMPETITIVE TENDERING: LESSON FOR AND FROM THE ITALIAN EXPERIENCE WITH LOCAL PUBLIC SERVICES"

Il contributo, di taglio monografico, prende le mosse dalla recente riforma italiana dei servizi pubblici locali (art. 23bis L. n. 133/08, come modificato dall' art. 15 D.L. n. 135/09, "Decreto Ronchi"), ispirata al principio generale della concorrenza (per il mercato), anche in coerenza con scelte analoghe operate all'estero. Il lavoro ha però vocazione generale: si dimostrano i benefici attesi, ma anche i possibili rischi implementativi del meccanismo della gara ad evidenza pubblica. Le predizioni teoriche sono poi confermate dall'esperienza italiana più recente, in alcuni tra i principali settori interessati dalle proposte di riforma. Segue una coerente formulazione di *guidelines* per l'ottimo design delle gare per servizi pubblici locali.

INDICE GENERALE

SEZIONE II

"LAW AND ECONOMICS OF BUNDLING BY NON-DOMINANT FIRMS[66]"

Law And Economics Of Bundling By Non-Dominant Firms

Giovanni Formica

I. Introduction

Bundling refers to the ubiquitous practice of offering a product under the condition that another product is also bought. In particular, one should distinguish *pure bundling*, whereby a firm offers only the package, from *mixed bundling*, where consumers are allowed to choose between the entire system and the purchasing of single components. Instances of pure bundling are widespread: kitchens sold as a whole, bed-and-breakfast, newspapers with Sunday supplements, master programmes. Instead, fast food restaurants' practice of offering both fixed menus (drinks, fries and sandwich or pizza) and the opportunity to order *à la charte* is an example of mixed bundling.

A finer distinction in economics is that between *tying* and *bundling*, with the former differing from the latter in that refers to packaged sales whose components are sold in variable proportions, *i.e.*, consumers can choose the quantity of the tied good they are willing to purchase. A classical example is the joint sale of durable goods, replacement parts and repair services.

To be sure, courts and prominent theorists distinguish the two terms also on the basis of their (un)lawfulness, in particular describing tie-in as an illegal subset of the larger group of packaged sales (Hylton and Salinger, 2002). As a matter of terminology, in this work we will use the two terms as synonymous, although most of our conclusions just apply to fixed proportion bundles, *i.e.* to what a rigorous theorist would specifically qualify as (pure) bundling.

According to the so called *leverage theory*, as recently revived in a more convincing, game-theoretic fashion by Whinston (1990) to address Chicagoans' critiques, pre-commitment to tie the sale of different products provides a mechanism whereby a firm holding market power in the tying product can lever on this power to foreclosure -and thereby

monopolize- sales in the tied-product market[67]. Moreover, it's an undisputed principle in the law-and-economics scholarship that, for this mechanism to work and for bundling to be profitable (hence credible) and welfare-detrimental as an exclusionary practice, firms must hold a (quasi)monopolistic control of at least one component-market (Posner, 1976). The influential strength of this view is confirmed by the almost exclusive focus, in the economic literature, on bundling as means to extend or preserve market power[68]. More substantially, the "dominance hypothesis" has exercised large influence on competition law practice of both sides of the Atlantic, accordingly also inspiring some far-reaching proposals (*e.g.*, market share safe-harbour[69]).

However, following a recent stream of economic literature, only partially related to the issues addressed in this paper, we try to prove that the traditional view applies only under limited conditions, which are nevertheless not widespread in modern industries. To this end, we will survey some recent contributions in the bundling literature and we will put their outcomes in a common and workable frame, in order to draw consistent implications for competition policy. In particular, by focussing on asymmetric settings where a multi-product firm without dominance competes against specialist sellers of substitute components, we identify market circumstances under which a non-monopolist's commitment to pure bundling may be credible and harm social welfare. In this respect, we draw a basic distinction between *complementary* and *independent* components. Indeed, the profitability trade-off as well as the potential social welfare implications of non-dominant (pure) bundling vary with the nature of demand interrelation among components.

This paper should contribute to explain the widespread diffusion of bundling in more competitive settings, without exclusively resorting to efficiency or pro-competitive justifications. Indeed, it has been suggested that economies of scale (or scope) in production and provision, reduction of information costs, reputation protection or quality assurance should authorize presumptive justification for bundling in non-monopolistic industries (Kobayashi, 2005). In this paper, we argue that anticompetitive purposes may offer, under certain conditions, a complementary, yet sometimes sounder explanation for bundling by non-dominant firms.

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[67] Through technological or design integration, a monopolist pre-commits herself to behave more aggressively in the tied market, should a new firm enter the latter. Indeed, absent any pre-commitment, bundling would not be an ex post rational strategy, hence not a credible entry deterrent.
[68] For a comprehensive survey of the bundling literature, see Kobayashi, 2005.
[69] Motta, 2004.

The remainder of the paper is organized as follows. In Section II, we identify reasonability requirements for tying by non-dominant companies and we draw a dynamic social welfare impact-assessment, as a basis to infer economically founded recommendations for competition policy. In Section III, we analyse the current legal treatment of bundling in US and Europe, to show a certain "intolerance" -implicit in strained decisions or systemic inconsistencies- towards the dominance-assessment as a preliminary screening for illegality. Section IV sums up the main findings, while incorporating them into a consistent policy frame.

II. The Economics Of Bundling By Non-Dominant Firms

II.1. Bundling Of Complementary Goods

Production and distribution networks are often made of complementary components, typically available in rival brands, so that consumers are allowed to assemble their preferred system of *substitute complements*.

In this section, we discuss firms' incentives to engage in pure bundling in such market settings. In particular, through a generalization of the Cournot's model of duopoly-complements, we analyse profitability and social desirability of pure bundling by integrated sellers, in a context of specialist, imperfect competition by *substitutable complements*. These issues are not properly addressed in the industrial economics literature, due to questionable extension of influential arguments about non-profitability and ultimate irrationality of bundling in more competitive markets.

It can be demonstrated that once we depart from an idealized world of perfect or Bertrand competition to consider more realistic settings of product differentiation, final conclusions on bundling rationality may differ significantly, even absent any efficiency justification. Indeed, under a number of factual circumstances, a multi-product or generalist firm can exploit its market advantage over specialist competitors to force the purchasing by clients that in perfectly competitive settings would have otherwise oriented their choices or completely avoided the purchasing.

II.1.I CROSS-PRICE EXTERNALITIES: MONOPOLY VERSUS COMPETITION

Firms often tie for strategic reasons, regardless of their market position. In case of complementary goods, an efficiency justification relies on the internalization of complements' cross-price effects. As originally pointed out by Cournot in a seminal article of 1838, independent sellers of complementary inputs would charge the whole system higher than horizontally integrated monopolists or coordinated specialist sellers (*complementary oligopoly problem*). Indeed, a single decision-maker completely internalizes the external effect of the price-setting in one component-market on the demand for other complements, hence having incentives to profitably lower aggregate prices[70]. Therefore, bundling of complements, each supplied in a monopolistic setting, results in a *Pareto improvement*, whereby both consumers (lower prices) and sellers (higher profits) are better off (see proof, Appendix).

This result rests upon the uniqueness of each component or, more properly, on the uniqueness of their respective sources of supply. Indeed, as argued by Dari-Mattiacci and Parisi (2005), if firms compete *à la Bertrand,* the very existence of at least one (perfect) substitute for each item automatically counters the complementary-oligopoly problem and is conductive to market outcomes that are never worse -and generally better– than those of a (single or joint) monopoly [71]. Indeed, Bertrand competition leads to a race to marginal-cost pricing in each component-market (hence to the maximisation of social welfare), regardless of the integrated firm's bundling decision[72].

II.1.II IMPERFECTLY COMPETITIVE MARKETS AND NON-DOMINANT FIRMS' INCENTIVES TO BUNDLE

We have argued that perfect competition as well as homogeneous competing offering in oligopolistic component-markets end up with eliminating the price advantage of integrated

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[70] The *complementary-oligopoly problem* can be seen as the horizontal equivalent of *double marginalization* in vertical settings (Nalebuff and Majerus, 2003).

[71] However, this outcome does not occur when the multi-product firm is monopolist at least at one-level (see Appendix).

[72] Notice that different conclusions apply under Cournot-type competition. Dari-Mattiacci and Parisi (2005) find that, when firms compete *à la Cournot*, the presence of substituting component (regardless of their number) is welfare harmful. Firms' incentive to under-cut quantity supplied by competitors results in a "near disappearance of the market" (aggregate quantity falls to zero). An outcome not desirable on a social viewpoint.

firms. Unfortunately, this striking result no longer holds when removing the assumption of perfect substitutability and considering more realistic settings of horizontal differentiation. In effect, under imperfect competition, rivals do not counter effectively the complementary-oligopoly problem, since differentiation confers some degree of market power. If products are not homogenous, this provides a multi-component provider with an undisputed market advantage over specialist sellers of differentiated components. These arguments have been used to explain the original success of software-bundles, like MsOffice (Denicolò, 2000).

However, a generalist or multi-product firm does not always have rational incentives to exploit through bundling the market advantage stemming from its simultaneous (non-monopolistic) presence in each input-market. The eventual exploitation would come at costs, those of increased market pressure. Indeed, the very decision to bundle makes competition tougher, insofar reduces product differentiation and intensifies firms' incentives to undercut rivals.

At the end of the day, when facing imperfect competition in each component-market, multi-product firms' incentives to bundle lie on the trade-off between gains from price coordination and losses from stronger competition of independent sellers (Nalebuff, 2000). Indeed, on one hand, when deciding to bundle, a generalist firm can create an advantageous market position over uncoordinated component-sellers, because of the internalization of complements' cross-price effects (*internalization effect*). On the other hand, by reducing differentiation and strengthening incentives to undercut rivals, bundling also leads to tougher price competition[73] (*differentiation effect*).

The trade-off intuition suggests some *prima facie* inference on non-monopolists' rational incentives to bundle. One could easily guess that the larger the dimension of the bundle, the higher the vertical gains from price coordination, the larger the likelihood of profitable bundling. And equally, the lower the initial product differentiation, the weaker the relevance of the differentiation effect, the higher the probability of tie-in sales. Such a basic intuition will be confirmed by the outcomes of formal models presented in next sub-sections.

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[73] Bundling would contrast the *principle of differentiation,* according to which firms want to differentiate themselves as much as possible in order to relax price competition (Tirole, 1994).

As regards welfare impact, at first sight, one could argue that the short-term risible price reduction (that, in most cases, merely amounts to wealth redistribution between firms and consumers) is largely overweighed by restriction of choice, entry deterrence and dynamic inefficiencies. Then, the long-run impact could be even more serious, provided that the stable *first-mover-advantage* of the integrated bundler may result in progressive erosion of rivals' market shares, particularly when network effects or scale economies are at stake. These effects, including potential efficiency benefits, are described in depth in section II.4, as a starting point for drawing sound policy implications.

II.1.III   THE MODEL WITH COMPLEMENTARY GOODS

Following Matutes and Regibeau (1992) and Denicolò (2000), we use a model of imperfect competition with product differentiation, where a generalist firm (*A*), producing the two complementary components ($c = y, z$) of a system, competes in price against two specialist rivals (*B* and *C*), each selling only one substitutable component (*B* sells only *y*; *C* sells only *z*). This accounts to a Bertrand duopoly with differentiated products in each component-market.

In particular, we use a two-stage game in which, in the first phase, the generalist firm chooses between pure bundling and independent pricing, based on the anticipation of future profits it can get in the second stage of the game, where prices are simultaneously set on the marketplace. Then, by comparing generalist firm's profits with bundling and independent selling, under the ordinary assumption of specialist rivals' rational (*i.e.*, profit-maximizing) price reactions, we analyse the integrated suppliers' incentives to engage in pure bundling in the first place. This amounts to find, by backward induction, the *sub-game perfect equilibrium* of such a sequential game.

To make our theoretical frame flexible enough to fit a large number of real-life scenarios and effective in predicting an extensive set of market outcomes, we progressively remove restrictive assumptions on the degree of differentiation and on the size of systems involved. Therefore, the model allows to predict firms' likely choices in the highlighted trade-off between *internalization* and *differentiation effect*, proving in more formal fashion the basic intuition for which generalist firms' incentives to bundle depends both on the degree of differentiation and on bundle size.

We start the analysis with an extreme case of imperfect competition. For sake of simplicity and without any loss of generality, we assume zero stand-alone value for each individual item (*e.g.*, hardware has zero value without software) or, put differently, no outside option unless components are combined in the fixed ratio *1:1*[74].

We also assume full compatibility among components[75]. Thus, four alternatives are available on the marketplace, namely a *pure system* from firm *A* and other three *mixed systems,* obtained by assembling substitutable components of different brands. More formally, a single element *h* of the option set *H* is designed by $(f_1; f_2)$, which represents the consumption of a system made of component *y* from firm $f_1 = A, B$ and component *z* from firm $f_2 = A, C$.

We assume that the generalist firm can either individually sell each item or engage in pure bundling; in other words, we do not include mixed bundles in the available strategy set[76].

To consider product differentiation in both markets, we use a two-dimensional Hotelling model[77]. We start with the assumption of maximum differentiation in both markets: firm *A* is located at the origin, while *B* and *C* are respectively at the upper extremes of the *x*- and *y*-*axis*. Therefore, the locations of the four available systems draw the vertices of an unit square (Figure 1). Consumers, whose mass is normalized to one, are uniformly distributed over such a square. The location (*i.e.,* the brand preferences) of each consumer is denoted by $(x_1; x_2)$, where x_1 represents the consumer's distance from the variety *A* of *y* and x_2 her distance from brand *A* of *z*[78].
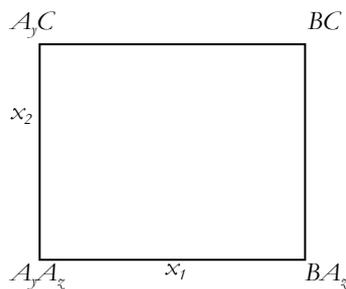
Figure 1

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[74] Components are *perfect complements*.
[75] Matutes and Regibeau (1988) and Economides (1989) find that compatibility is a (strict) dominant strategy when the demand for mixed systems is as large as the demand for pure systems.
[76] Stremersch and Tellis (2002) argue that mixed bundling is always dominated by pure bundling, when, as in our models, reservation prices for the same system do not vary across consumers.
[77] For complete treatment of spatial differentiation models, see Tirole, 1994. The author distinguishes between linear (Hotelling model) and circular location of firms (Salop model).
[78] Consequently, a consumer located at *(x₁;x₂)* is far *(1- x₁)* from firm *B* and *(1- x₂)* from firm *C*.

Without any loss of generality, marginal costs are all set equal to zero; thus, there are no economies/diseconomies of scale or scope. The net utility for a consumer purchasing a system made of the variety $i = A, B$ of the component y and the brand $j = A, C$ of the component z will be:

$$U_{ij} = w - t(d_{yv} + d_{zv}) - p_{yv} - p_{zv} \qquad (1)$$

where w represents the consumers' reservation price for the entire system (we assume rectangular demand, *i.e.* consumers evaluate equally all existing substitutable systems at the four vertices of the unit square), t the parameter of consumers' disutility from purchasing a product that is somewhat distant from her ideal configuration, p_{cv} the unit price of variety $v = A, B, C$ of the component $c = x, y$ and d_{cv} the consumer's distance from the brand $v = A, B, C$ of the component $c = x, y$.

We use linear transportation costs. Moreover, to further simplify the analysis, we assume $t = 1$, and we confine ourselves to cases where consumers are willing to purchase at most one system. Then, previous assumptions on perfect complementarity imply that the purchasing of individual items is irrational. Finally, to avoid unnecessary complications, we also imagine, as a first step of the analysis, that the reservation price (w) is high enough to have the potential market (the entire unite square) fully served at equilibrium, thus avoiding situations of local monopoly or partial competition[79]. However, the last assumption, which is irrelevant to the immediate aims of this section (namely, drawing the conditions under which bundling is the *Nash sub-perfect equilibrium* of non-monopolistic settings) will be relaxed afterward (see *infra*, section II.4).

Under the above assumptions, a rational consumer will choose the offering with the lowest *perceived expenditure,* where by the latter term we mean the sum of aggregate prices and transportation costs.

INDEPENDENT PRICING (NO BUNDLING). The baseline case is that in which the generalist firm *A* sells separately each item and competes *à la Bertrand* against specialist providers *B* and *C* of imperfectly substitutable, yet compatible components. In this case, consumers are allowed to *mix and match*. They will make their purchasing in a component-by-component

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[79] See Matutes and Regibeau (1992).

fashion, by both considering how far each rival brand is from their ideal configuration (*i.e.*, by considering the size of their transportation costs) and comparing prices of substitutes. Given the uniform distribution of consumers on the unit square and firms' symmetry, the market is equally split among the four available alternatives. In particular, the line $\overline{x_1} = x_{ind(1)} = (1 + p_B - p_{Ay})/2$ separates the location of consumers choosing different suppliers (A and B) of component y, and the line $\overline{x_2} = x_{ind(2)} = (1 + p_C - p_{Az})/2$ separates purchasers of different varieties (A and C) of z.

A_zB BC

A_yA_z BA_z

Figure 2
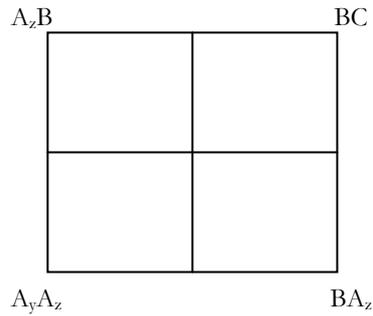
Proposition 1. *Under independent pricing,, equilibrium prices and profits are:*

$$p_{Ay} = p_B = p_{Az} = p_c = 1$$
$$\pi_{Ay} = \pi_B = \pi_{Az} = \pi_C = 0,5$$
$$\pi_A = \pi_{Ay} + \pi_{Az} = 1$$
$$\pi_B = \pi_C = 0,5$$

Proof. See Appendix

<u>PURE BUNDLING</u>. When A engages in pure bundling, only the pure system A_yA_z and the mixed system BC (obtained by assembling A's rival component brands), are available on the marketplace. At given prices P_{AyAz}, p_B and p_C a consumer located in $(x_1; x_2)$ will be indifferent between A_yA_z and BC iff:

$$w - x_1 - x_2 - P_{AyAz} = w - (1 - x_1) - (1 - x_2) - p_B - p_C \qquad (2)$$

Therefore, indifferent consumers will be located on the line:

$$x_2 = \frac{p_B + p_C - P_{AyAz} + 2}{2} - x_1 \qquad (3)$$

As we saw, under pure bundling, the integrated firm internalizes the positive effect of a decrease in the price of one component on the demand for the whole system, hence having

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incentives to under-price specialist competitors. Such an *internalization effect* implies that $p_B + p_C - P_{AyAz} = d > 0$. The price advantage of A ($d > 0$) makes the pure bundle significantly more attractive for customers.

Formally, under $d > 0$, consumers located in *(0,1)* and in *(1,0)* purchase the pure bundle A_yA_z (both vertical and horizontal intercepts of the indifference line *(3)* would exceed one) and the market is asymmetrically split as in Figure 3. The generalist firm, by under-pricing specialist competitors, will serve more than a half of the market. Its actual market shares are positively related to the dimension of the price difference or *internalization advantage* d.
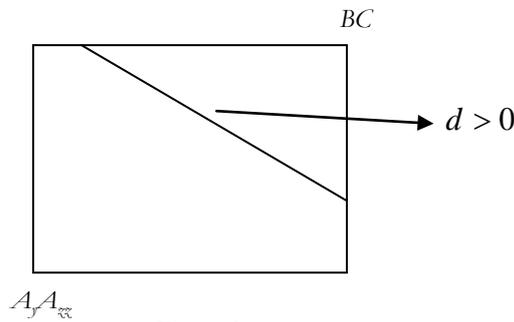
Figure 3

Proposition 2. *Under bundling, equilibrium prices and profits are:*

$$P_{AyAz} = 1,45$$
$$p_B = p_C = 0,86$$
$$P_{BC} = p_B + p_C = 1,72$$

$$\pi_A = 0,91$$
$$\pi_B = \pi_C = 0,32$$

Proof. See Appendix.

INTERPRETATION OF RESULTS. The comparison of profit figures under bundling (*Proposition 2*) and independent pricing (*Proposition 1*) suggests that firm A has no rational incentives to tie when both components are maximally differentiated. Intuitively, this happens because all firms' incentives to engage in price-cutting are stronger under bundling than under independent pricing, this implying lower profits for all. Indeed, when choosing to bundle, a generalist firm can fully internalise the beneficial effect of a price-cut in a component-market on the demand for the whole system, hence it has additional incentives to progressively lower total price (*internalization effect*). More formally, bundling makes its

reaction curve shifting downward. Conversely, specialist competitors' price reactions do not change, whether or not they face a bundling competitor, *i.e.*, their system reaction curve (obtained by aggregating their individual curves in each component-market) remain unchanged. Hence, they will answer with lower prices to firm *A*'s more aggressive pricing strategy. At equilibrium, all market players would lose from firm *A*'s bundling decision, including the latter (compare *Proposition 1* and *2*): the generalist firm has no incentives to strengthen competition through pure bundling.

Based on the above, one could reach the hurried conclusion that only efficiency motivations, which are admittedly outside of the predictive power of our formal frame, could justify the daily experienced large diffusion of bundling in many competitive settings. This statement contains an unquestionable truth (our outcomes should be interpreted with caution, because potential efficiencies are totally missed), yet it's only partial. In effect, *Proposition 1* and *2* rest upon the restrictive assumptions made so far.

By allowing for less than maximum differentiation and larger bundle sizes we will able to demonstrate that bundling by non-monopolists could be both profitable and welfare detrimental under a wide range of parameters (*i.e.*, a wide range of market circumstances).

<center>*VARIABLE DEGREE OF DIFFERENTIATION*</center>

In this section, following Denicolò (2000), we relax the assumption of maximum differentiation and we allow for variable degree of substitutability in one component-market[80]. In particular, to model variable differentiation, we assume that, on the *x-axis*, firm *A* is located in e and firm *B* in $(1-e)$, where the parameter $e \in [0;0,5]$ measures the degree of differentiation in the component-market for *y*. In order to assure the existence of a pure strategy equilibrium for any value of e, we use quadratic transportation costs[81] (*i.e.*, a consumer located in $(x_1; x_2)$ has to bear a cost of $t(x_1^2 + x_2^2)$ to reach a system located in $(0;0)$). We also assume $t = 1$.

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[80] Of course, the case of both homogeneous components coincide with the standard Bertrand result of marginal-cost pricing (see above).
[81] Tirole (1994) proves that the use of linear-cost models is not tractable where firms lie within the unit interval, due to discontinuities in individual demand functions.

INDEPENDENT PRICING (NO BUNDLING). Under independent pricing, the four available systems $A_x A_z$ (pure system) BA_z, $A_y C$ and BC (assembled systems) are located respectively in $(e;0)$, $((1-e);0)$, $(e;1)$ and $((1-e);1)$. As in the previous case of maximum differentiation, consumers choose component-by-component. The whole market is divided in four symmetric areas, each representing the demand served by alternative systems (Figure 4).

e,1	(1-e),1
AC	BC
AA	BA
e,0	(1-e),0
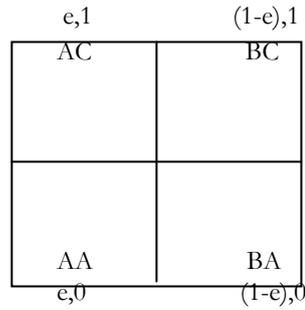
Figure 4

Proposition 3. *Under independent pricing and variable differentiation for component y, equilibrium prices and profits are:*

$$p_{Ay} = p_B = 1 - 2e$$
$$p_{Az} = p_C = 1$$

$$\pi_A = \pi_{Ay} + \pi_{Az} = 1 - e$$
$$\pi_B = 0{,}5(1 - 2e)$$
$$\pi_C = 0{,}5$$

Proof. See Appendix.

PURE BUNDLING. If A bundles, only the pure system $A_y A_z$ and the assembled package BC are available on the marketplace. A consumer will be indifferent between these two systems when:

$$(x_1 - e)^2 + x_2^2 + P_{AyAz} = (1 - x_1 - e)^2 + (1 - x_2)^2 + p_B + p_C \qquad (4)$$

Hence, after simple algebra, indifferent consumers lie on the following line:

$$x_2 = \tfrac{1}{2}[d + 2(1 - e)] - x_1(1 - 2e) \qquad (5)$$

where, as above, $d = p_B + p_C - P_{AyAz} > 0$.

Consumers located in the proximity of the vertex $(1;0)$ buy always the pure bundle.

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As observed in Denicolò (2000), the actual shape of demand areas depends on the choice of consumers located in $(0;1)$ and in its immediate neighbouring, which in turn depends on whether the expression $d + 2(1 - e)$ is greater than 2. The author distinguishes the following two cases:

a) if $d > 2e$, a consumer located in $(0;1)$ buys the pure system $A_y A_z$ and A's aggregate demand (Figure 5) will be:

$$D_{AyAz} = \frac{1+d}{2} - \frac{(d-2e)^2}{(8-16e)} \qquad (6)$$

b) if $d < 2e$ [82], a consumer located in $(0;1)$ buys the mixed system BC and the aggregate demand for the pure system (Figure 6) will be:

$$D_{AyAz} = \frac{1+d}{2} \qquad (7)$$

Needless to say, the demand for BC (hence, for specialist rivals' components) will be equal to the complement to one of D_{AyAx}, as the market is fully served by assumption.
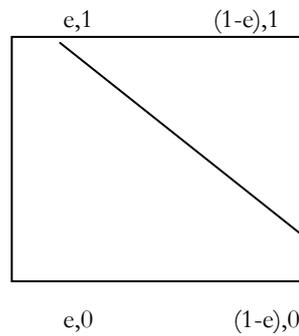
Figure 5 (case *a*))
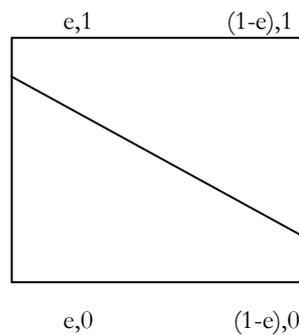
Figure 6 (case *b*))

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[82] Note that if *d = 2e*, a consumer in *(0,1)* is indifferent between the two systems and the right-sides of *(6)* and *(7)* coincide.

Proposition 4. *Case a) applies when* $e \geq \frac{1}{8}$ *(sufficiently high degree of differentiation). Equilibrium prices under bundling will be:*

$$P^1_{AyAz} = \frac{-6 + 6e + 4\sqrt{e^2 - 22e + 11}}{5}$$

$$p^1_B = p^1_C = \frac{1 - e + \sqrt{e^2 - 22e + 11}}{5}$$

Case b) applies when $e < \frac{1}{8}$ *(low degree of differentiation). Equilibrium prices will be:*

$$P^2_{AyAz} = \frac{5}{4}$$

$$p^2_B = p^2_C = \frac{3}{4}$$

Proof. See Appendix[83].

<u>CONCLUSIONS FROM PROPOSITION 4</u>. A comparison of equilibrium profits in *Proposition 4* suggests that a generalist firm may have incentives to bundle when competing varieties of at least one component are relatively undifferentiated. More specifically, when $e \geq 1/8$, the demand for a pure bundle $A_y A_z$ is $D_{AyAz} = \frac{1+d}{2}$ (case *b*)), where $d = (\frac{3}{4} + \frac{3}{4} - \frac{5}{4}) = \frac{1}{4}$. Therefore, generalist firm's profits would be $\pi^B{}_{AA} = \frac{25}{32}$ under bundling and $\pi^{NB}{}_{AA} = 1 - e$ under independent selling. By comparing profit figures, one easily gets that bundle is a dominant strategy as long as $e > \frac{7}{32}$ (indeed, $\pi^B_{AA} > \pi^{NB}_{AA}$ iff $e > \frac{7}{32}$), that is for low degrees of differentiation.

<u>INTERPRETATION OF RESULTS</u>. The interpretation of such a result is not straightforward. Recall that, in case of maximum differentiation ($e = 0$), firm A tends to be tougher under bundling, due to the internalization of cross-price effects; conversely, specialist rivals do

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[83] Note that with *e=0*, you get the same equilibrium outcomes of the previous model with maximum differentiation.

not change - in aggregate - their pricing strategies when facing a bundling competitor. All firms would lose from firm A adopting the most aggressive price strategy, as bundle $A_y A_z$ is a substitute for both B and C's components (see Appendix, reaction curves). Thus, under maximum differentiation, the equilibrium is one of *component-against-component*.

However, imagine that one of complementary components (in our case, *y*) becomes less differentiated (*i.e.*, $e \to 1/2$): firm A's incentives to cut prices under bundling tend to decrease proportionally with the reduction of potential rents it can extract from captive consumers for such an undifferentiated item. At the same time, the specialist seller B of a poorly differentiated component, by free-riding on consumers who are captive for C, tends to becomes softer[84]. In turn, this relaxed attitude ends up with negatively affecting firm C's sale figures, as B and C's components are perfect complements.

To sum up, when one component is less than fully differentiated, C is always affected negatively by A's decision to bundle. However, bundling decision has an ambiguous impact -both positive and negative- on A and B. The former effect tends to dominate as the degree of differentiation of y decreases. Beyond a certain threshold ($e > \frac{7}{32}$) the market outcome is one of *bundle against components*.

To conclude, our results contradict the generally accepted *differentiation principle* –firms wants maximally differentiate their products in order to soften price competition-, or at least provide with an additional instance of ambiguous incentives to differentiate. In this respect, it's worthwhile noting that the degree of differentiation is a matter of choice. Indeed, firms have the chance to choose their own location or to influence their consumers' quality perception via advertising (Tirole, 1994). This complication would change our model from a two-stage to a three-stage game, where firms choose location at the beginning of their interaction. Unfortunately, the final equilibrium of a game with endogenous decisions on market positioning is not easy to predict, and requires further specific research.

VARIABLE BUNDLE SIZE AND ELASTIC DEMAND

Until now, we have confined ourselves to bundles of only two (complementary) components. By extending the analysis to larger systems, one reaches the striking result

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[84] Technically, their system reaction curve moves downward under bundling (*i.e.*, price reactions are softer in aggregate).

that, even under maximum differentiation, bundling is a profitable strategy for a non-monopolist multi-market player. By using computer simulation and a frame similar to that of our original case (multi-dimensional Hotelling model, maximum differentiation, linear transportation costs, Bertrand duopoly in each component-market), Nalebuff (2000) demonstrates that bundling of systems made of *more than four items* is always a dominant strategy for a generalist firm facing specialist competition, even in case of maximum differentiation. The following tables illustrate equilibrium prices and profits under bundling and independent pricing for different system sizes.

Table-1. Independent pricing: equilibrium prices and profits

Number of items	Price (firm A) each market	Demand (firm A) each market	Total profits	Price (competitor) each market	Profits (competitors) each market
2^{85}	1	0,5	1	1	0,5
3	1	0,5	1,5	1	0,5
4	1	0,5	2	1	0,5
5	1	0,5	2,5	1	0,5
6	1	0,5	3	1	0,5
7	1	0,5	3,5	1	0,5
8	1	0,5	4	1	0,5

Source: personal elaboration from Nalebuff (2000)

Table-2. Bundling: equilibrium prices and profits

Number of items	Firm A's bundle price	Component price by competitors (each market)	Firm A's demand	Firm A's profits	Competitors' profits (each market)
2	1,45	0,86	0,63	0,91	0,32
3	2,09	0,88	0,7	1,47	0,26
4	2,84	0,92	0,76	2,15	0,22
5	3,63	0,94	0,79	2,88	0,19
6	4,48	0,96	0,82	3,69	0,17
7	5,4	0,99	0,84	4,56	0,15
8	6,36	1,02	0,86	5,48	0,14

Source: Nalebuff (2000)

[85] Note that when *n=2,* equilibrium outcomes coincide with those found under the hypothesis of maximum differentiation.

By comparing Table 1 and 2, the generalist firms is better off under bundling when the system consists of four or more components. For a three-component package, independent pricing is risibly preferred, yet there could be long-run strategic reasons for choosing tying strategies. The interpretation of this result is straightforward: as the number of components increases, the internalization advantage and the price gap d increases as well, hence the bundler's market shares and its additional profits.

A further extension could be figured out. So far we have considered inelastic demand settings, where, by definition, consumers' choices are just determined, apart from personal tastes, by the comparative price-convenience of market alternatives. In a positive elasticity setting, individual demands depend on both market price differences and own prices, so that a price decrease not only involves a *market share effect* to the decision-maker's advantage (although tempered by rivals' reactions), but also a *market size effect* (increase of aggregate demand at each location). The horizontal sum of both effects provides with growing incentives to bundle. Based on this, Chioveanu (2004) concludes that, in an elastic-demand setting, bundling of (perfectly differentiated) complements may become profitable even for smaller systems.

II.2.IV. CONCLUDING REMARKS

In this section we have adapted a number of recent papers addressing the issue of bundling feasibility and rationality in non-monopolistic settings into a consistent, yet useful for policy reasoning, frame. The conclusions we draw are at odds with the generally accepted view according to which tie-in sales might result in competitive harms only under the condition of the bundler's (quasi)monopoly in the tying product market. We argue that a non-dominant multi-product firm can credibly commits itself to pure bundling of complementary goods under a large set of market conditions.

However, given the large acceptance of the "dominance-hypothesis" in legal doctrines, these cases would be hardly challenged under the current judicial approaches, as we will diffusely discuss in the following. Differentiation confers some degree of market power, yet not sufficiently high to find dominance for legal proceedings.

As a final remark, a qualification is needed, also to avoid the impression of limited scope for our findings. In the whole paper, we have assumed a generalist firm facing specialist competition. However, our ultimate conclusions also hold in more symmetric settings, where all firms are horizontally integrated in each component-market. Indeed, once an integrated firm engages in pure bundling, it gets the same immediate and not replicable advantage over rivals described so far, provided that the best reaction (in terms of profits) for competitors is always one of independent selling: *bundle-against-bundle* would be too fierce competition (see proof, Appendix). This *first-mover advantage*, coupled with a sort of *winner-takes-all effect* in the long-run (see below), may activate a potential *race-to-bundling*, so that packaged sales could emerge also when they are both irrational for those who engage in it and socially harmful.

II. 2. BUNDLING OF INDEPENDENT GOODS

So far we have confined ourselves to systems of complementary goods. When turning the attention to bundles of independent products, some preliminary observations may be worthwhile.

At first sight, it might be tempting to argue that bundling of independent goods -where each individual item is also disposable in rival brands- should not raise competitive concerns, provided that consumers are in principle free to choose those brands which best suit their preferences and are no longer coerced to purchase the entire package (single products have a positive stand-alone value). The risk of *substitution* -whereby consumers with low valuation for the tied product may switch from the bundle to individual goods, separately sold by specialist firms- is supposed to discourage non-monopolists from engaging in a practice that, at the end of the day, may result in lower aggregate demand.

However, in contexts of imperfect competition, a generalist seller of independent goods may exploit, through bundling, its inherent advantageous positioning, to force the purchasing of undesired goods by consumers with strict preferences for its tying component (*forcing-purchasing effect*).

Therefore, incentives to bundle rest upon the trade-off between these conflicting effects. Intuitively, the final balance between forcing-purchasing and substitution effect will depend crucially on the degree of brand-fidelity in the tying product market.

These basic intuitions can be confirmed in a more analytical fashion, through a simplified version of the Kovac's model (2006). Once again, we consider an asymmetric industry -a generalist seller of two non-complementary goods y and z (firm A) competes *à la Bertrand* against specialist providers (B and C) of individual components- and a two-stage game, in which A commits itself either to pure bundle or to independent selling in the first stage and competes in price against specialist rivals in the second stage of the game. To model product differentiation we use the Hotelling approach. Good y is maximally differentiated (*i.e.*, A and B are located at the opposite extremes of the unit line) and is worth w to each consumer. Instead, z is differentiated only to a limited extent, with consumers having discrete valuations for it. In particular, a portion λ attaches a high valuation (v_h) and the remaining $1-\lambda$ a low valuation (v_l) to the consumption of such a good, with $0 < \lambda < 1$. The parameter $x \in [0;1]$, which describes individual preferences for the first good y, is uniformly distributed on the unit line; its value is independent from personal evaluation for z, whether high (v_h) or low (v_l). As in Kovac (2006), we further imagine that $v_l = 0$ and $v_h = 1$. Finally, we repeat our assumptions about constant and equal (for each firm and product) marginal costs (with $c > 0$), linear transportation costs, and unit individual demands (*i.e.*, people consume either one or zero units of each good). Therefore, the net utility for individuals purchasing a system made of the component y from firm $i = A, B$ and component z from firm $j = A, C$ will be:

$$U_{ij} = w + nv - t|a - x| - p_{yv} - p_{zv} \qquad (8)$$

where w represents the consumer's reservation price for one unit of y, $v = v_h; v_l$ the value people attach to the consumption of one unit of z, $n = 0,1$ the number of purchased units of z, t the parameter of disutility from buying y from a firm located in a (A is in 0, B in 1) by a consumer located in $x \in (0;1)$ and p_{cv} the price of one unit of variety $v = A, B, C$ of the component $c = y, z$. Finally, we assume w large enough to have the market for y fully covered at equilibrium.

INDEPENDENT PRICING. Given the assumption of sufficiently large w, consumers can choose between buying only y -disposable in brand A or B- and purchasing a complete system, whether entirely sold by A (A_yA_z) or assembled with rival, yet compatible, brands of components (A_yC; BA_z and BC).

Proposition 5. _Under independent pricing for non-complementary goods, equilibrium prices and profits are:_

$$p_{Ay} = p_B = c \qquad \pi_{Ay} = \pi_B = 0$$

$$p_{Az} = p_C = t + c \qquad \pi_{Az} = \pi_C = 0{,}5t$$

Proof. See Appendix.

PURE BUNDLING. When A bundles, consumers are allowed to choose among the following three alternatives: (only) y sold by B (_option-1_), the pure bundle A_yA_z (_option-2_) and the assembled package BC (_option-3_).

When $p_c \leq v$, _option-1_ is strictly dominated by _option-3_, so that rational consumers only choose between the last two alternatives. A consumer is indifferent between them when

$w + v - P_{AyAz} - tx = w + v - p_B - p_C - t(1 - x)$.

Contrarily, if $p_c > v$, consumers choose only between _option-1_ and _option-2_ (_option-3_ is a strictly dominated strategy). Once again, a generic consumer will be indifferent between them if $w + v - P_{AyAz} - tx = w - p_B - t(1 - x)$.

By combining these two cases, we get that only consumers located in $x < x^*$ will buy the pure bundle A_yA_z (_option-2_), where x^* is defined by the following equation:

$$x^*(v) = \frac{p_B + \min\{v, p_C\} - P_{AyAz}}{2t} + \frac{1}{2} \quad (9)$$

In order to analyse the relevance of the _forcing-purchasing effect_ we have to look at the sign of _(9)_ for consumers with low valuation ($v_l = 0$) for z: a positive $x^*(0)$ would imply that some consumers are forced to buy an item that is not worth for them. By simple maths, a forcing-purchasing outcome occurs only if $P_{AyAz} - p_B < t$, that is when the price difference is not large enough to compensate the consumers' disutility from renouncing to their own preferred variety (A) of y. Note that the unit transportation cost t is a measure of the

strength of competition for the same consumers or, in the language used so far, a proxy of the dimension of the *substitution-effect*[86]: the higher its value, the more the closest consumers become captive. This, in turn, provides generalist firms with a certain market power to force purchasing of undesired goods[87].

Calculation of equilibrium prices and profits of this game is a long, yet complicate, exercise. Indeed, Kovac (2006) finds six possible types of equilibria -depending on the sign of $x*(0)$ and on the value of p_c - and a region where no equilibrium actually exists.

For what is relevant here, under a large set of parameters bundling is found to be a dominant strategy for generalist non-dominant sellers, this depending on the interaction between two competing effects. Indeed, the author argues that bundling spurs both a *competition-softening effect* -whereby competition becomes softer in the market for the second good and firms get higher mark-ups on *z*- and the already discussed *substitution effect*. The ultimate profitability of bundling depends on the trade-off between the former positive and the latter negative profit-driver. In particular, the author identifies two cases of profitable tying, essentially based on the strength of the latter effect, hence on the possibility for bundlers to force consumers' demand of undesired goods.

A first case, involving $x*(0) > 0$, occurs when $c_z = c$ is low enough to have competition softened sufficiently in the market for the second (less differentiated) good and *t* large enough to reduce significantly the scope for the *substitution effect*. A second and more interesting case, whereby bundling is profitable in spite of the absence of forced demand (*i.e.,* $x*(0) \le 0$), may occur when the *substitution effect* (low level of *t*) is so strong to cause a structural change of competition in the second (relatively undifferentiated) component-market, namely a segmentation of the market for *z*. Indeed, by bundling *A* commits itself to serve only consumers with high valuation $v_h = 1$ for *z*, while leaving *C* with market power over consumers with low valuation for it. Then, such a segmentation of demand results in relaxed price competition (*i.e.*, strong *competition-softening effect*), to (all) firms' advantage and consumers' detriment.

Finally, in each of these two cases, although via different channels, the ultimate impact on both consumer and total surplus is negative.

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[86] In the extreme case of *t=0* there is no product differentiation: the standard Bertrand outcome will occur.
[87] Note that forcing undesired purchasing could occur unless unbundling and resale on secondary markets are possible. The opportunity of *arbitrage* would change rational incentives to engage in bundling in the first place or simply spur technological or design integration.

A final remark, suggested by studies of Behavioural Economics, may be worthwhile for further extensions of this analysis. As confirmed by several marketing researches, the mere presenting consumers with packages lowers their sensitivity to components' prices, hence increases their willingness to purchase. These outcomes could be justified with *prospect* and *mental accounting theory*: people tend to perceive multiple losses as more punishing than a single loss (Stremersch and Tellis, 2002).

The relevance of such arguments to our aims should be clear: the (perceived) value for the pure bundle $A_y A_z$ should be higher than the value people attach to the consumption of the mixed system BC or than the sum of stand-alone values for y and z. Thus, a stronger market advantage would accrue to generalist firms than that described in the above. In particular, this higher perceived or psychological value is likely to soften the *substitution effect*, while increasing the likelihood of forced purchasing.

II.3. WELFARE IMPACT-ASSESSMENT

II.3.I. INTRODUCTION

In previous sub-paragraphs we have demonstrated that, under a wide number of market circumstances, "bundle against component-selling" represents the Nash stable equilibrium of industries where a non-monopolist or non-dominant multi-product seller competes in prices against single-product differentiated suppliers. Therefore, while contrasting the uncritically accepted arguments of the mainstream literature, these conclusions should provide with an -hopefully convincing– complementary explanation for the widespread diffusion of bundling in competitive contexts, particularly in those which are more prone to be analysed within our theoretical frame (*e.g.*, telecommunication, banking, information industry).

Quality assurance, cost-savings and other efficiency reasons explain only partially the large diffusion of packaged sales in competitive settings[88]. More substantially, pro-competitive explanations present the sole good side of the coin. Less reassuring reasons for non-monopolist's tying should also be explored: bundling allows to exploit the simultaneous

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[88] For an overview, see Kobayashi (2005).

presence in each component-market to gain higher profits, absent sufficient entry opportunities, in a way that could make specialist rivals progressively fade out.

At this point of the analysis, the policy-oriented purposes of this work incite a radical shift from the descriptive approach adopted so far to a more normative analysis. Our ultimate objective is to assess social desirability of bundling by non-dominant firms, to make proper inference for competition policy. In particular, in this Section, we will try to answer to the following crucial question: "Is bundling by non-dominant firms a kind of anticompetitive behaviour to be condemned or mere aggressive exploitation of market opportunities?" Once again tools from economics will help us to distinguish between aggressive competition on the merits and anticompetitive unilateral practices.

To this end, it's worthwhile noting preliminarily that, in spite of diffused inconsistencies in antitrust actual practice -particularly in Europe-, the law-and-economics literature convincingly argues in favour of total welfare (*Kaldor-Hicks efficiency*) as the normative criterion to which competition policy should conform (Van den Bergh and Camesasca, 2004). Therefore, the legal treatment of bundling by multi-product non-dominant firms should be defined with reference to its ultimate impact on aggregate welfare, as sum of consumer surplus and industry profits.

When using this criterion, bundling by non-monopolists may result in socially undesirable market outcomes, both in the short-run and in the long-run (entry barriers, dynamic inefficiencies, progressive erosion of rivals' market shares). In particular, we will distinguish the case of complementary and independent components to show that in the latter hypothesis bundling could result in even more serious competitive harms, mostly when involving a certain degree of forcing-purchasing.

II.3.II. SHORT-RUN IMPACT

In the above we have assumed the same (*i.e.*, for all consumers) reservation price, large enough to have the market entirely covered at equilibrium. Under this assumption, coupled with that of no pro-competitive explanations, the welfare effect of bundling is always negative.

When market is completely served by assertion, the judgement on social desirability of different price strategies amounts to a mere comparison of total transportation costs. Indeed, the shift from independent selling to bundling does not change the sum of consumer surplus and industry profits, while resulting in mere redistribution of aggregate wealth.

However, the more limited the option set at equilibrium, the larger the aggregate amount of transportation costs (or, otherwise stated, the aggregate consumers' disutility of buying products not exactly matching their ideal configuration), the lower the total welfare. Ideally, aggregate wealth would be maximized under the hypothetical situation of "maximum choice", in which each individual consumer is provided with her ideal good, sold by sellers located exactly in the immediate proximity of her house[89].

Therefore, "bundle against component-selling" is social undesirable when compared to an equilibrium of "symmetric independent selling", because it involves a compression of choice opportunities, hence dissipative travelling costs[90]. Moreover, as suggested by Nalebuff (2000), in "bundle versus components" equilibria, since prices are no longer symmetric, some consumers that would have naturally preferred a certain other product "are induced to travel inefficiently in order to get the lower price on A bundle".

To sum up, because of choice constraints and wastes of resources (inefficient travelling), welfare balance is always negative in all "bundling versus component" equilibria identified in the above, thus suggesting more conscious policy intervention.

Finally, the welfare (negative) impact-assessment may be even more severe in case of non-complementary components, particularly when some consumers are forced to buy poorly desired products at an implicit price higher than their personal evaluation ($x*(0) > 0$). If this occurs and coerced consumers are by no way allowed to resell undesired items on secondary markets, the resulting *forcing-purchasing* outcome involves inefficient allocation of resources and harms consumers as well as social welfare.

II.3.III. LONG-RUN IMPACT

So far we have only discussed welfare short-run effects. However, when adopting a long-run dynamic perspective, the final balance could be even more alarming, although

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[89] In the two-dimensional Hotelling frame, this would amount to the ideal situation in which there is a firm at each point of the unit square.

[90] Limited choice is a cost for consumers not directly reflected in the system of market prices, hence not included in standard calculations of consumer surplus.

somehow more difficult to predict in its actual occurrence or simply hard to quantify. Indeed, tie-in sales may act as an entry barrier or as a constraint on innovation incentives.

First of all, bundling could work as entry-deterrent or means of market advantage protection, even when the generalist incumbent does not have (quasi)monopolistic control of any involved market (Nalebuff, 2000). When a potential competitor is considering whether entering a single component-market, the perspective of getting restricted market shares, coupled with the lower equilibrium prices under bundling, is likely to make its entry unprofitable. Indeed, the expected profits after entry (π^e) could not be sufficient to cover (sunk) fixed costs of stepping in (f).

As already demonstrated, expected profits are lower under the incumbent's bundling than under independent selling equilibria (see *supra*). They also depend on the simultaneous entry choices by further potential rivals[91]. Therefore, market entry, even by more efficient operators, could be impeded if the efficiency advantage over the incumbent is not sufficient to invert the negative sign of the incentive compatibility balance ($\pi^e - f$). Note that commitment to bundle is not an issue in this context, as in the Whinston's model (1990), since bundling is an *ex-post* rational strategy even when entry actually occurs; therefore, it represents by itself a credible deterrent.

Instead, multiple, simultaneous entry in each component-market would be unrealistic or irrational. The cost of entry f_{de} would be accordingly doubled or multiplied, while the expected profits would be depressed (for both firms), if the challenger comes in with its own pure bundle ("bundle versus bundle" is the fiercest form of competition -see Appendix-). Therefore, even when f_{de} is not prohibitive and multi-level entry could be -in theory– cost-justified, it's nevertheless always dominated by entering only at one-level (proof in Appendix), thus leaving stable and unchallenged the market advantage of the tying generalist firm.

Secondly, dynamic efficiency and, in particular, potential entrants' incentives to engage in innovative activities to develop new or improved processes/products could be frustrated as well. Firms are unlikely to engage in any innovative effort unless they can appropriate the value of their investments in R&D. In our setting, since it makes one-level innovation

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[91] Ideally, π^e is given by the weighted average of profits under all states of the world (*i.e.* with all possible numbers and identities of competitors in next stages of the game), weighted for their respective probability to occur.

almost useless, pure bundling by generalist firms may reduce drastically expected profits from commercially exploiting final innovative outcomes[92]. This implies that private incentives to engage in R&D may be misaligned with socially optimal ones, thus impeding some worthwhile innovation from occurring.

Hopefully, a simple example, based on Choi and Stefanidis (2003), could explain such statements and the relevance of the dynamic inefficiency issues. Let assume for simplicity that R&D efforts to launch a vertically differentiated variety of y and z can succeed or not and that $p(a_y)$ and $p(a_z)$ represent the probability of success in research when a firm invests respectively a_y and a_z for innovative improvements of products y and z. Then, π_y and π_z describe the respective profit figures for successful entry in each component-market, under the condition that both researches succeed. For simplicity we also assume that, when the innovator succeeds at only one-level, profits are zero under the generalist incumbent's bundling and respectively π_y and π_z under the incumbent's independent selling. Therefore, the expected profits for a firm engaging in R&D when facing a tying incumbent will be:

$$\Pi_B^{\ e} = p(a_y)p(a_z)\big[\pi_y + \pi_z\big]$$

Instead, expected profits when facing independent selling (*i.e.*, successful efforts at one-level can be appropriated, even if the success is not simultaneously achieved in the other market) will be:

$$\Pi_{IS}^{\ e} = p(a_y)p(a_z)\big[\pi_y + \pi_z\big] + p(a_y)(1 - p(a_z))\pi_y + p(a_z)(1 - p(a_y))\pi_z$$

One could easily observe that potential entrants' private incentives to invest in R&D are reduced by $p(a_y)(1 - p(a_z))\pi_y + p(a_z)(1 - p(a_y))\pi_z$ under the incumbent's bundling. A multi-product tying firm can reduce potential entrants' incentives to invest in innovation below socially optimal levels, particularly when chances of simultaneous success are quite remote[93].

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[92] In order to dispel potential doubts, a clarification is needed. We have argued that, even when costs are not prohibitive, a multi-level entry is not rational in case of incumbent's bundling. Instead, here we are suggesting that an innovator has strong incentive to succeed at multiple levels. The contradiction is only apparent. A horizontally differentiated entry just increases the number of diversified, yet penalised, bundler's rivals. Instead, innovative or vertically differentiated entry potentially involves the scratching of the tying incumbent's market advantage, through better or innovative bundles, when innovators succeed at each level.

[93] The assumption of zero profits in case of bundling and one-level success is without loss of generality. Indeed, you get the same qualitative conclusions by imposing that $\pi_y^{\ IS} >> \pi_y^{\ B}$ and $\pi_z^{\ IS} >> \pi_z^{\ B}$, where $\pi_i^{\ B}$ and $\pi_i^{\ IS}$ represent the profit figures for one-level ($i = y, z$) successful innovation, when respectively the incumbent bundles or does not.

Finally, in a forward-looking perspective, bundling may result in progressive erosion of specialist competitors' market shares. The *first-mover advantage* of a multi-product bundler may activate a self-reinforcing process of market power achieving (*market tipping*), particularly in settings characterized by network effects. In industries with network externalities, the utility people get from the consumption of a certain system of multiple components increases with the number of users of the same system. Pure bundling could be a subtle way to exploit such network effects to progressively monopolize sales, while also protecting oneself from potential entry. Indeed, as observed in previous sections, by pure bundling the generalist firm is able to get higher market shares than specialist competitors. This confers an initial position of leadership (larger customer-base), which allows to growingly control sales. As put forth by Motta (2004, p.84):

"once a certain system manages to gain a certain advantage in consumer preferences, then it may become more and more popular […] and its rivals might fade out".

MsOffice is a good example[94]. Since the late 1980s, Microsoft started to bundle, into the Office package, its word processor (Words) with other applications for oral presentations (PowerPoint), calculations (Excel), database setting (Access), etc., competing against suppliers of specific applications (*e.g.*, WordPerfect for word processors, dBase for database setting, etc.). Only subsequently, some specialist rivals started to sell their own (complete) systems. However, this occurred when the market position got by Microsoft through bundling had become too hard to scratch, because of a large customer-base in a market characterized by network effects and learning switching costs.

The same outcome (progressive monopolization) may potentially arise also when component-markets exhibit significant scale economies. By increasing market shares via tying, a multi-product firm can achieve a stable financial advantage over specialist rivals and progressively strengthen its superiority in a self-reinforcing process of sale-control consolidation.

To sum up, as in many formal models of anticompetitive tying, when economies of scale or network effects are present, bundling may allow depriving rivals of significant volumes of sales, thus weakening their future competitiveness. The finding of market mechanisms

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[94] Denicolò, 2000.

generating a reliable link between current shares and future competitive advantages is accordingly a crucial step to perform in an well-designed welfare impact-assessment.

II.3.IV. ADDRESSING POTENTIAL CRITIQUES AND EFFICIENCY EXPLANATIONS

Both in a short-run and in a long-run dynamic perspective, tying by non-monopolists is likely to harm social welfare, whether the bundle consists in complementary or independent components. However, such conclusions may be criticized as based on unrealistic or over-simplifying hypotheses. For instance, one could argue that the assumption of entirely served markets is too restrictive or that our models apparently ignore those various and widespread efficiencies stemming from tying.

In effect, we share the opinion that our *prima facie* conclusions should be interpreted cautiously and that policy inferences should be accordingly drawn with extreme prudence. Yet, we strongly support the idea that in most real-life situations our findings appear sufficiently robust. To be sure, we address each possible critique separately, to show that a case-by-case approach should prevail over extreme positions, whether drawn in a sense or another.

As regards the first remark, once relaxing the assumption of entirely served markets, as in Matutes and Regibeau (1988; 1992), to assume variable levels of reservation prices, there is a serious "risk" from bundling: some consumers may be excluded from the consumption, because of the restriction in the available option set, hence because of the increase in individual transportation costs. The authors argue that moving from bundling to independent pricing involves an upwards shift of industry demand or, otherwise stated, a higher demand at each individual location. In particular, the subsequent enlargement of the choice set enables consumers to assemble systems which are closer to their preferences (*variety-increasing effect*).

On the other side, one should also take into account that, under bundling, firms' incentives to cut prices are strengthened. As demonstrated in the above, this results in lower equilibrium prices when compared to independent pricing, hence in higher market coverage (*low-price effect*). Which of these effects is likely to prevail is an empirical question,

depending on the dimension of parameters and, in particular, on the level of *w*, to be answered in a case-by-case perspective[95].

The efficiency issue reserves special consideration as well[96]. In the above, we have voluntary isolated pro-competitive explanations, such as cost-savings or quality improvements, in order to simplify the analysis and merely focus on the potential for competitive harms. Yet, although not universally present in bundling cases, efficiencies matter, thus requiring specific consideration on the positive side of a Kaldor-Hicks assessment.

As regards cost-based explanations, one could argue that scale or scope economies cannot be associated *per se* with the very decision to tie. Apart from economies of joint provision, bundling by itself does not involve significant cost-reductions, provided that most economies result from the simultaneous production of different items, regardless of the way they are sold (*i.e.*, in bundle or separately). However, these conclusions no longer hold where tying does not amount to mere bolting together of separate products (*contractual tying*), but to an engineering or design integration of different items via bundling-specific production processes (*physical tying*). Empirical works confirm that marginal or fixed cost-savings may be substantial; such studies also show that, in competitive environments, firms tend to pass on consumers a significant share of these efficiencies (Evans and Salinger, 2004).

Finally, improvement of product quality, including protection against the risk of opportunism, reserves similar conclusions. Accordingly, some authors distinguish between *price* and *product bundling*, where the latter, differently from the former, involve some added value for consumers (Stremersch and Tellis, 2002). Once again, such an additional value (generating higher reservation price $v_h - v > 0$ for the package of the generalist firm) should be taken into account when drawing competition policy conclusions.

In this respect, it's worthwhile observing that efficiency defences are starting to receive growing consideration also before antitrust authorities and courts. To be sure, the US Supreme Court has recognized consumer benefits stemming from the product integration of Internet Explorer and Windows in the landmark *Microsoft III* decision, while also emphasizing the risk of frustrating valuable innovations under a strict *per se* standard.

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[95] A more sophisticated way to model the highlighted trade-off between *increasing-variety* and *low-price effect* could consist in modelling an elastic-demand settings, where firms' individual demands depend on *perceived expenditure*, including transportation costs, at each location.

[96] Hylton and Salinger (2001) have argued that beneficial tying is more frequent than harmful tying.

Differently, EC competition law has adopted a more conservative, poorly economics-oriented approach towards Microsoft's integration of Windows Media Player into its operating system. Yet, it remains appreciable the Commission's explicit opening to efficiency theories, also in spite of manifest assessment flaws in the case at hand.

In line with such desirable evolutions in legal practice, we think that welfare assessment and policy intervention should also conform to such pro-competitive explanations. We will better stress the point afterward.

II.3.V. CONCLUDING REMARKS

We have demonstrated that bundling may harm social welfare even when practised by firms lacking (quasi)monopolistic power. Tying allows generalist firms to raise profits and impede new entry or worthwhile innovation from occurring, while harming single-product competitors and discouraging them from offering competitive bundles or from coordinating their marketing strategies. This results in limited consumer choice, higher transportation costs, less than socially desirable innovation, constraints to efficient entry and progressively growing concentration of markets. However, the total welfare balance would be incomplete if potential gains from tying (*e.g.*, cost-savings, quality improvements) were not taken into account as well.

We suggest that conclusions on welfare-effect of non-dominant bundling requires case-specific evidence, to assess if involved benefits -where actually present– have the potential to offset related damages to competition. Admittedly, the fact-dependent nature of most pro-competitive as well as exclusionary effects makes extremely hard the task to draft statements of general application and common legal standards. At first sight, one could just argue that, when the demand is very elastic and bundling amounts to mere bolting together of products, absent any added value for clients, the total welfare balance is likely to be negative. Anyway, as often, "one-size-fits-all" conclusions resemble utopia.

III. THE LAW OF BUNDLING BY NON-DOMINANT FIRMS: US VERSUS EC COMPETITION LAW

III.1 INTRODUCTION

Both in Europe and in US, antitrust law governing tie-ins and bundling is largely far from being unambiguous and uncontroversial. Besides, the legal treatment of tie-ins represents, without doubts, one of the best instances of divergence. A comparison between the European and the US Microsoft case confirms our claim and, in particular, a different inclination in rooting the judicial interpretation of competition rules on the prevailing economic thinking.

A common feature in the international legal treatment of tying relates to the market power requirement, although, in its actual implementation, US courts and European authorities have followed peculiar, yet contradicting routes.

Purpose of this section is to analyse critically the history of bundling and tying case-law, with a focus on actual assessment of bundlers' market power. On this basis, we will try to convince the reader that a strict dominance-test has imposed straining and incongruence in the application of competition rules, as regards the definition of relevant markets, of dominance (Europe) or sufficient economic power (US), and even with respect to the interpretation of the very notion of market power. These findings will serve as an indirect proof of the soundness of our economic arguments as well as a basis on which inferring properly informed policy recommendations.

III.2. THE MARKET POWER REQUIREMENT UNDER THE US FEDERAL LAW

III.2.I. US TYING LAW

In US antitrust law, tying arrangements are commonly challenged under the Section 1 of the Sherman Act (contracts or conspiracies in restraint of trade) and the Section 3 of the Clayton Act (conditional sales). The underlying rationale is straightforward: tying law is

concerned with identifying and punishing "those forced combined sales that can credibly injure competition" (Hovenkamp, 1999).

Tying jurisprudence has experienced significant changes over time, evolving gradually from a strict *per se* hostility (*Northern Pacific Railways,* 1958) to a recent and timid (*i.e.*, framed as an exception) rule of reason (*Microsoft Corp.*, 2001), passing through the application of an idiosyncratic *per se* approach (*Jefferson Parish,*, 1984). Moreover, this process of evolution towards growing role for market analysis and efficiency justifications appears not yet over.

To be sure, in the current dominant doctrine, the modified *per se* approach endorsed by the Supreme Court in the remarkable *Jefferson Parish* case remains the basic legal standard, although subject to a technological tying exception under the *Microsoft III* jurisprudence.

In particular, beginning with the landmark *Fortner II* decision in 1977[97], the Court has begun to require substantial proof of market power in the tying market and developed a complex test of "modified *per se* illegality". In the *Jefferson Parish* decision, the majority opinion (four over nine Justices sought a rule of reason) of the Court, while confirming the *per se* standard applied since the old-days of US antitrust[98], also required that tying arrangements had to pass several screens before being considered illegal on their appearance. In that, the Supreme Court moved significantly towards recognizing efficiencies and economic arguments for the widespread diffusion of bundling in modern economies. In particular, the endorsed four-part test, as confirmed in successive judgments, imposed on the plaintiff the burden to prove that: a) two separate products were involved; b) the defendant had sufficient economic power in the tying-product market; c) there was coercion by the seller to force or influence the buyer's choice, and d) the tying arrangement foreclosed a substantial amount of interstate commerce in the tied-product market. No proof of anticompetitive effects was required.

Contrarily, some lower courts have asked for anti-competitive evidence, although actual assessment appears admittedly far from unambiguous. For example, the proof of competitive harms is sometimes integrated within the coercion-test (point sub c.) or, in

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[97] *United States Steel Corp. v. Fortner Enterprises*, 429 US,610 (1977)

[98] In the earliest decisions, tying agreements were treated as inherently anti-competitive, without factual or market analysis, since it was believed that they "serve hardly any purpose beyond the suppression of competition" (*Standard Oil. v. United States,* 337 US 293,305-6, (1949)). See also, *International Salt Co. v. United States*, 332 US 392,396 (1947), *Northern Pacific Railways Co. v. United States,* 356 US,1 (1958) and *United States Steel Corp. v. Fortner Enterprise*, 394 US 495,503 (1969).

other cases, included into the broad-based antitrust inquiry, instead of being treated as a separate requirement. In effect, although neither universally asked nor uniformly assessed, the analysis of anticompetitive effects by itself confirms the ambiguity of resorting to a *per se* standard. To borrow some words from a prominent US scholar:

> "The whole point of *per se* illegality is to avoid expensive individualized inquiries concerning competitive effects […] the use of an anticompetitive effects requirement probably reflects considerable doubts about the wisdom of the *per se* rule" (Hovenkamp, 1999)

We voluntary skip, because outside of the scope of this work, a complete description of courts' actual treatment of the aforementioned elements in the *Jefferson Parish* test. It's just worthwhile noting that the Supreme Court basically considers such criteria as proxies for competitive harms; a sort of safe-harbor for screening out most *false positives* (Ahlborn *et al.*, 2004).

In effect, one could hardly draw a clear line between such a modified *per se* standard and a rule of reason approach (Abbott and Wright, 2008). Also the Supreme Court seems to acknowledge this point when, in *National Collegiate*, limpidly argues:

> "While the Court has spoken of a per se rule against tying arrangements, it has also recognized that tying may have pro-competitive justifications that make inappropriate to condemn without considerable market analysis[99]"

In effect the multi-part test for *per se* illegality under the *Jefferson Parish* doctrine, as progressively articulated by US courts, increasingly resembles a rule of reason inquiry, in that requires a market analysis and, at least before certain lower courts, even the evidence of anticompetitive effects[100]. Sometimes, also some efficiency defenses are allowed by courts, either assessed in isolation (*e.g.,* new product defense) or within the frame of the separate-product test (point sub a.). Because of such idiosyncrasies, the US legal treatment of tying arrangements largely departs from the ordinary way of challenging *per se* violations, such as price fixing.

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[99] *National Collegiate v. Board of regents of University of Oklahoma*, 486 US 85,104 n.26 (1984).
[100] See *Wells Real Estate, Inc. v. Greater Lowell,* 850 F.2d 803,815 (1stCircuit, 1988) and *Fox Motors, Inc. v. Mazda Distribs. Inc.*, 806 F.2d 953,958 (10thCircuit, 1986).

Yet, it remains a *per se* rule, in that neither involves complete assessment of facts nor leaves sufficient room for all possible efficiency defenses.

However, causing a Copernican change that is likely to progressively enhance further evolutions, the Court of Appeal challenged the modified *per se* rule under *Jefferson Parish* in the landmark *Microsoft* decision of 2001 (hereinafter *Microsoft III*)[101]. The Court reasoned that the alleged physical or technological integration raised novel issues, that could not be properly addressed under a *per se* standard. It also held that the efficiencies involved in the case at bar could have hardly been incorporated into a separate-product test (point sub a. of the *Jefferson Parish* test). Indeed, a direct demand analysis and consumer preferences inquiries, which rely on past information, were deemed "poor proxies for overall efficiencies in the presence of new or innovative integration". By endorsing a rule of reason, *Microsoft* has introduced a technological exception to the *Jefferson Parish* doctrine. However, the latter still remains the dominant position, given the circumscribed scope of the *Microsoft* jurisprudence (the judgment is limited to technological integration in "platform-software markets" and, as a matter of law, to the D.C. Circuit).

Microsoft III is unlikely to mark the end of the evolution path towards more economically rooted standards in US tying law. As suggested by several antitrust commentators, the rationale for moving to a rule of reason approach in *Microsoft III* does not rest strictly upon the distinction between factual circumstances at bar and the general run of tying arrangements (Hovenkamp, 2002). Moreover, the tone of the Supreme Court's decision in *Independent Ink* and the Copernican revolution endorsed in *Leegin* with respect to another practice -the resale price maintenance- historically challenged as a *per se* violation, authorize legitimate beliefs on the Court's intention to reject *per se* prohibition, "when presented with the opportunity to do so" (Abbott and Wright, 2008). *Independent Ink* has been judged as a "missed opportunity" in this respect (Kobayashi, 2008).

III.2.II. The Market Power Requirement

Introduction

Anticompetitive tie-ins are implausible in perfectly competitive as well as in oligopolistic settings with homogeneous products: sellers cannot impose the purchasing of unwanted

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[101] *United States v. Microsoft Corp.*, 253 F.3d 34 (D.C.Circuit 2001).

products unless, buyers are adequately compensated; competition would drive prices down to marginal costs; consumers would buy only what they want.

However, we have observed that coerced purchasing of undesired goods is possible when sellers hold some degree of market power. Yet, they do not need dominance or (near) monopoly, as uncritically claimed by courts. Indeed, as argued in Section II, a generalist firm facing specialist (imperfect) competition in each component-market can profitably engage in pure bundling to progressively foreclose markets, even when its original market shares are largely below (quasi)monopoly or dominance thresholds. Needless to say, in the competitive environments considered in previous models, differentiation confers some degree of market power over more devoted clients; yet this would be hardly sufficient to pass a dominance-test strictly defined[102].

In this section we address the issue of whether the current judicial treatment of tying before US courts reflects -implicitly or explicitly- our findings. To this end, one should distinguish between underlying doctrines and *de facto* judicial approaches. Notwithstanding their contestations to the contrary, US courts' actual assessment of market power *de facto* departs in some instances from "mainstream" economic predictions, in that the observed power is judged "sufficient" even in absence of large market shares or fudged just by forcing the notion of market power itself or the relevant market definition. In effect, while arguing the need for dominance, courts' concrete measurement has been sometimes strained in such a way to include all circumstances in which a firm was able to coerce consumers. However, in some judicial proceedings, bundling could have hardly been challenged through a defendable assessment of the bundler's "power over prices".

Such a relaxed dominance-test may be interpreted as implicitly confirming our predictions from the preferential viewpoint of the concrete assessment of factual circumstances and anticompetitive effects, that is outside from theoretical abstractions, by definition unsuited with the complexity of real market practices, given the restrictiveness of their underlying assumptions.

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[102] In effect, original market shares could be even lower than in our formal frame when removing the simplifying assumption of only one specialist rival in each component-market.

The establishing of an illegal tying under the Section 1 of the Sherman Act and the Section 3 of the Clayton Act requires the proof of dominance in the tying-market, on the premise that bundling would be unprofitable or ineffective as anticompetitive devise when practiced by firms lacking sufficient degree of market power. In particular, the mainstream economic theory suggests that, for bundling to be profitable and not replicable by coordinated rivals, sufficient economic power should amount to (quasi)monopoly in the tying-product market (Whinston, 1990). Indeed, absent (near) control of the latter, the bundler may not benefit so much from the exclusion or it would simply be subjected to the risk of coordination among specialist competitors to match its bundle and nullify any exclusionary purpose (Ahlborn *et al.*, 2004). Therefore, one has to infer, following economic theories of general reference, that the degree of power "sufficient" for legal proceedings should be -at least in theory- particularly high.

To be sure, with respect to the question of *how much* market power the seller should possess to find illegality, the Supreme Court's position has rapidly changed over time. While in *Times-Picayune* the Court appeared to require dominance, the "sufficient threshold" has been progressively lowered far below dominance levels since the *Northern Pacific* decision. In *Fortner I*, the Court limpidly argued that "the standard of sufficient economic power does not require […] that the defendant have a monopoly or even a dominant position throughout the market for the tying product". Conversely, in the very influential *Jefferson Parish* judgement, the Court appeared to defiantly return to the dominance-test of *Times-Picayune*. To this end, it explicitly required a rigorous definition of the relevant market and the computation of sellers' market shares. This position is undisputed, at least in appearance, in the successive jurisprudence.

However, when moving from theory to practice, courts have departed from well-settled and apparently shared economic arguments, and lowered the standard of proof in its actual implementation. In particular, under the influence of legal doctrines stressing the potential for "coercion" or the "uniqueness" of bundlers' product attributes, courts have progressively emptied the very notion of market power, *de facto* depriving the concept of its undisputed economic meaning. The use of several presumptions, ambiguous criteria of uniqueness or misleading inference from ubiquity or growing sales in the tied market have forced a tying-specific notion of market power, not consistent with that credited in the economic literature.

To critically assess such a judicial inclination -including its misplaced trust in disputable presumptions and poor signals of dominance-, some theoretical clarifications are useful, starting from the consolidated definition of market power in industrial economics and antitrust practice.

Market power relates to the ability to raise prices above competitive levels without losing so many sales to make ultimately unprofitable the price increase. The *Lerner index* formalizes such a concept, by measuring the relative deviation of prices from marginal costs, *i.e.,* through the formula $L = \dfrac{(p - c')}{p} = \dfrac{1}{\varepsilon^d}$, where ε^d represents the residual demand elasticity.

However, in most cases, given the unavailability of reliable figures for prices, marginal costs and residual demand, an indirect way of assessment tends to be preferred in courtrooms. In particular, after a preliminary definition of the (product and geographical) boundaries of relevant markets, calculation of market share statistics is typically used to make inference on defendants' market power -in effect there exist a formal relation between market shares and power over prices[103]-.

Therefore, but for the qualification that mere share-assessment may induce misleading or partial inference on firms' ability to profitably raise prices, the soundness of final decisions depends crucially on the accuracy of the market definition exercise and on qualitative judgments (or quantitative adjustments) for disciplining forces not necessarily included (supply-side substitutes, buyers' power) or surely excluded (credible entry threats) from the market-share-analysis.

In practice, the definition exercise may be simply biased towards finding the alleged infringement. A certain inclination of antitrust authorities and courts to invert the assessment order –*i.e.*, to firstly determine the occurrence of an abuse and then accordingly define the market- has been denounced by some commentators (Van den Bergh and Camesasca, 2004). To make an example, in *Heatransfer v. Wolkswagenwerk* the 5th Circuit Court could find dominance after having narrowly defined the relevant market as "air

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[103] Landes and Posner, 1981.

conditioning for Wolkswagens"[104]. Another instance of questionable decision is *Kodak*. While observing that the analysis of competition issues in "aftermarkets" would maybe bring us too far, here we will confine ourselves to the observation that a single-brand relevant market, based on the so called "lock-in" doctrine, appears at least debatable.

In this respect, questionable market definitions are not the only expedient used by courts to fudge dominance. Sometimes courts have even missed any preliminary step to scientifically define the market. Indeed, a striking finding in the analysis of US jurisprudence is the application of a halfway (neither indirect nor direct) inference, consisting in the use of presumptions or *prima facie* signals of dominance and in forcedly consistent or simply implicit (*i.e.*, not analytically drawn) market definitions. For instance, tying markets have been defined accordingly with the boundaries of patents' claims or simply identified with "unique and unusual" seller's products, without any inquiry on real substitution opportunities, neither on the demand-side nor on the supply-side.

In the remainder of this section we describe some of these expedients and their reconcilability with defendable and consolidate paradigms, with the aim to prove a certain courts' "intolerance" towards dominance as meaningful screening for anticompetitive tie-ins, in spite of economic theories of apparent acceptance.

COERCION PRESUMPTION. In the tying context, US courts often assess market power *functionally*, as the power to coerce bundled buying and force undesired purchase. In *Yentsh v. Texaco* the 2nd Circuit Court counts "a sufficient economic power in the tying product market to coerce purchaser acceptance of the tied product[105]" among the elements for tying illegality. Likewise, in *Bob Maxfield v. American Motors*, the court confirms "a sufficient market power in the tying market to coerce purchase of the tied product" to be one of the characteristics of an illegal tying arrangement[106]. This *functional* approach is also endorsed by the Supreme Court in the landmark *Jefferson Parish* decision, where the Court defines market power as the "power to force a purchaser to do something he would not do in a competitive market"[107]. A position constantly confirmed in the successive jurisprudence of the Court.

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[104] Hovenkamp, 1999.
[105] *Yentsch v. Texaco, Inc.*, 630 F.2d 46 (2nd Circuit, 1980).
[106] *Bob Maxfield, Inc. v. American Motors Corp*, 637 F.2d 1033,1037 (5thCircuit, 1981).
[107] *Jefferson Parish*, at 14.

For what is relevant here, such an approach has often translated in mere presumption of dominance, on the premise that coercion would be otherwise unfeasible. Arguably, this approach may be subjected to criticism of circularity[108]. Emblematic in this vein is the Supreme Court's reasoning in *Northern Pacific*, where the "existence of [a] host of tying agreements in itself" was regarded as "compelling evidence of a [firm's] great power", absent any additional sound confirmation. Not surprisingly, it appears sometimes hard to distinguish the proof of dominance from that of coercion, notwithstanding courts' separate acknowledgement in formal statements of legal doctrines.

UNIQUENESS. In some cases, dominance has been inferred from unique attributes of the seller's tying product, without any separate showing of absence of substitutes. In *Fortner I*, the Court reasoned that "the crucial economic power could be inferred from a mere showing that the unusual attributes of US Steel's credit offering were reflective of its unique economic advantage over competitors". Although rejected as a presumption in *Fortner II* absent confirming market share evidence, some lower courts continue to rely on uniqueness for inferring "sufficient power", with poor inquiry on facts and/or on the seller's actual price control. In this respect, the Seventh Circuit has held that uniqueness can be used to find market power when there is sufficient evidence that the attributes of the defendant's tying product -uniquely appreciate by consumers- are not duplicable and create an effective entry barrier.

Moreover, monopoly has been easily presumed in case of patents or copyrighted products - at least before *Independent Ink*[109]-, on the premise that uniqueness is by definition guaranteed by protection of exclusive rights[110]. However, this attitude is at odds with the broad consensus among economists that patents do not necessarily confer monopoly in the final markets where they are exploited (Kobayashi, 2008).

Then, if the Supreme Court's unanimous position in *Independent Ink* of 2006 is destined to change the consolidate approach to monopoly inference even outside the realm of IPRs is difficult to predict. More substantially, the judgement appears implicitly confirming our claims about courts' *functional approach* and its hard reconcilability with generally agreed views on market power assessment.

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[108] Dominance is inferred from coercion and then used to prove abusive coercion.

[109] *Illinois Tool Works v. Independent Ink*, 547 US 28 (2006). For extensive analysis of this decision, see Kobayashi, 2008.

[110] *International Salt Co. v. United States*, 332 US 392 (1947); *United States v. Loew's, Inc.*, 371 US 38 (1962).

UBIQUITY. As suggested by Hovenkamp (1999), another economically unjustifiable route followed by US courts to assess market power consists in inferring dominance from tie-in ubiquity or from broad customers' acceptance to put up with it[111]. Instead of guessing efficiency justifications from widespread diffusion, some courts have judged ubiquity as lack of equally valuable market alternatives, hence as implicit proof of undisputed power.

GROWING SALES OF TIED PRODUCTS. Equally unjustifiable is the use of an *end-back* perspective, consisting in inferring dominance from growing sales in tied markets[112]. The underlying rationale rests upon the misleading belief that higher sales of the tied product would have been unfeasible and unrealistic absent any control of the tying market. Once again, this line of reasoning misses appropriate recognition of potential efficiencies, in terms of lower cost of production/distribution or added value for consumers. Yet, it misses some of the arguments advanced in section II about the *internalization effect* (in case of complementary components) or the *forcing-purchasing effect* (independent goods).

To sum up, the reliance on a *functional* approach -whereby sufficient economic power is interpreted as "special ability to coerce purchasers"- and the use of other expedients to circumvent restrictive standards of proof may be interpreted as a signal of courts' dissatisfaction for strict dominance-tests (and eventually for their underlying law-and-economics arguments), notwithstanding courts' *petitio principi* to the contrary. In extending competitive concerns outside from the realm of dominant firms, US jurisprudence, maybe unconsciously, confirms our claims.

More explicitly, in the *per curiam* opinion of *Microsoft III,* the court refers to a certain "special ability to force purchasers" as a condition for illegality and then clearly argues that "a seller's market power to coerce can be based on circumstances other than the seller's market share in the tying product market". Monopoly and even dominance are neither sufficient nor necessary conditions for the power to coerce, hence for welfare-detrimental bundling to occur, in spite of misplaced critiques of unrealism and irrationality. A strict dominance-screening may leave uncovered some harmful tie-ins and raise the risk of *false positives*.

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[111] See, for instance, *Parts & Elec. Motors, Inc. v. Sterling Elec., Inc.*, 826 F2d 712,720 (7thCirc., 1987), where it's argued that "the existence of several tying arrangements provides significant evidence of the defendant's power to restrain free competition".

[112] *Barber & Ross Co. v. Lifetime Doors, Inc*, 812 F2d 1276,1280 (4thCircuit).

Finally, one could also observe that this reasoning is implicit in the choice of challenging tying under Section 1, instead of Section 2 of the Sherman Act. As suggested by Grimes (2002):

> "if the only source of a tying seller's power to abuse lay in the seller's dominant position in the tying product market, there would be little basis for tying law to be enforced through Section I of Sherman Act and Section 3 of Clayton Act. The Sherman Act's monopoly provisions (Section 2) might provide an adequate platform for addressing abusive tying practices"

In effect, in the most recent law-and-economic literature and in some law-cases, the exploitation of informational asymmetries and lock-in effects, insofar translates in a certain control over misinformed or tied-up clients, has been considered as effective source of bundling abuse by non-dominant or non-monopolist sellers (Hylton and Salinger, 2002). In the remarkable Supreme Court's *Eastman Kodak* decision, information issues have justified the condemnation of otherwise safe bundling practices. Supporting arguments are general. Consider a producer of a durable good with 20 percent of market shares, which tie the sale of such a good and its replacement parts (tying product) to that of repair services (tied product). In case of information deficiencies (customers cannot ex-ante calculate the lifecycle price of the bundle) and consumers *lock-in*, bundling may result in secondary market foreclosure and exploitation of derivative power over locked-in clients, even when the primary market is sufficiently competitive. Therefore, notwithstanding the lack of dominance in the tying (or primary) market, such a bundle may be held unlawful.

However, absent dominance, there is a more powerful source of bundling abuse, apparently not yet acknowledged by courts or branded as irrational by prominent commentators, namely firms' "unique" multi-market presence. As formally proved in the above, likewise dominance, information deficiencies and lock-in, also the asymmetric market position of (non-dominant) multi-product firms in differentiated industries confers the "power to coerce" a consistent volume of purchasing, which would be undesired or otherwise oriented (*i.e.*, oriented to other sellers) in perfectly competitive markets. While also taking into account potential efficiencies, such a bundle could harm social welfare and potentially foreclose markets in the long-run, in spite of the lack of dominance. If, as observed, the sufficient economic power requirement under the dominant US approach amounts to mere assessment of firms' "potential to coerce", one draws the striking

conclusion that also those tying cases discussed in Section II would presumably pass the *functional* approach to market power endorsed by US courts.

III.2.III. CONCLUDING REMARKS

In the US jurisprudence, a progressive *de facto* dissociation of the notion of "sufficient economic power" from that of dominance has reduced the critical relevance of market shares and "power over prices" assessment, while making crucial for final decisions formal factors, not necessarily related to actual substitution opportunities. Consequently, the flexible dominance-test endorsed by US courts may unexpectedly turn out to be effective in challenging cases of harmful bundling by non-dominant firms discussed in this paper, notwithstanding different *petiones principi.*

As a matter of law, this leaves unsolved a crucial issue, namely how the current legal frame may allow to more explicitly distinguish tie-in cases on the basis of bundlers' market power, in coherence with the whole system of the US antitrust law. As we will argue more extensively in the last Section, the distinct application of the Sherman Act and the Clayton Act offers an unexpected way out.

III.3. EC COMPETITION LAW ON BUNDLING

III.3.I. TYING AS ABUSE OF DOMINANCE: A CRITICAL ASSESSMENT OF ARTICLE 82 CASE-LAW

A striking finding in the analysis of the European tying law is the influential pressure of old-fashion ideas and outdated principles, which do not properly match the recent evolution in the economic thinking. This explains a more hostile attitude on this side of the Atlantic (up to now, tying has been held lawful in none of initiated legal proceedings), also in spite of recent stances of different sign. The "leverage theory" remains the undisputed rationale for most decisions, notwithstanding Chicagoans' critiques and post-Chicago "qualified" revival (*i.e.*, leverage is rational only under limited circumstances). Accordingly, in the view of the Commission and the European Court of Justice (hereinafter ECJ), the

dominance-assessment in the tying-product market appears crucial to determine concrete chances of leveraging.

As regards substantive rules, tie-in sales have mostly been challenged as unilateral practices. Pursuant to the article 82(2)(d) TCE "making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations" may be condemned as abuse of dominant position. Therefore, as a matter of law, the dominance-assessment is apparently innate to the very application of article 82, as a difference from US reliance on Section 1 of the Sherman Act. A *per se* hostility towards bundling results directly from the "special responsibility" imposed upon dominant undertakings.

With respect to legal practice, along the line of US antitrust, also EC law is gradually moving towards less rigid criteria for prohibition[113]. Indeed, in the earliest cases, the ECJ adopted a very formalistic approach: based on findings from the leverage theory, several tying agreements were banned *per se*, with poor inquiry on both market conditions and real effects of foreclosure[114]. However, in more recent judgements[115], the Court has adopted a modified, fact-based *per se* framework, that, as suggested by some prominent scholars, is "almost a carbon copy of the US *per se* approach[116]", at least before *Microsoft III*. In particular, without any distinction between *contractual* and *technological* tying, the following four-part test applies under article 82 TCE: a) the defendant must be dominant in the tying-product market; b) through bundling consumers are forced to buy separate products; c) tying forecloses competition, and d) there is no objective justification for tie-in.

The policy debate, in particular the need for further moves towards more economics-based assessment (*e.g.*, fact-based reasonability evaluation, efficiency-defence), is basically a common ground on both sides of the Atlantic. Therefore, we send the reader back to the previous analysis of US law for discussions on legal principles and their economic justifications, while focussing here on the central question of this paper, namely actual assessment of dominance in EC case-law.

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[113] For an overview, Lenger, 2007.
[114] Case IV/30.178 *Napier Brown v. British Sugar* (1988) OJ L284/41; case 311/84 *Centre Belge d'Etudes v. CLT* (1985), ECR 3261.
[115] Case IV/30.787, *Eurofix-Bauco v. Hilti* (1988) OJ L65/19; case IV/31.043 *Elopak v. TetraPak* (1992) OJ L72/1; case COMP/37.792 *Microsoft*.
[116] Ahlborn *et al.* (2004).

In this respect, it's worthwhile recalling the definition of dominance under the constant jurisprudence of the ECJ. Since *United Brands,* dominance has been defined as:

> "a position of economic strength […] giving the power to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers[117]".

In actual implementation, market share figures provide with a first, yet incomplete, proxy for the undertakings' ability to "behave independently". Their reliability depends crucially on the robustness of the market definition exercise.

Other dominance indicators, such as favourable legal provisions, deep pocket, superior technology, vertical integration or well-developed distribution channels may also play a role (Whish, 2003). Yet, although not conclusive, market shares analysis is crucial to dominance assessment, if anything because of the relative presumption above 50 percent, ruled in *Akzo[118]*.

When scrutinizing the history of competition practice under article 82, a certain inclination to generously find dominance -through strained market definitions or questionable dominance inference- can be denounced in a number of cases[119]. For instance, although in a context only partially related to the specific aims of this paper, the narrow definition of the market (single-brand cash registers) in *Hugin* gives the impression of a certain Commission's insensitivity to rigorous substitution-analysis, when alleged dominance is difficult to prove.

With more specific reference to tie-in cases, dominance has sometimes been found with a certain degree of uncertainty and approximation. As observed by prominent scholars, "in certain cases, the Commission has defined the market so narrowly that a finding of dominance was inevitable[120]". In other cases, clearly different situations have been unreasonably assessed with similar criteria and harshness.

Take the landmark *Hilti* decision and compare its main conclusions with those of another pivotal case, *Tetra Pak II*: the similar legal treatment contrasts with large dissimilarities in

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[117] Case 27/76, *United Brands v. Commission* (1978).
[118] Case C-62/86 (1991) ECR I-3359
[119] Faull and Nikpay, 1999.
[120] Ahlborn *et al.*, 2004.

factual circumstances and with the different defendants' market shares. *TetraPak* held an incontestable (quasi)monopoly in the market for aseptic cartons (market shares between 90 and 95 percent) and tried to tie the supply of its filling-machines to that of its cartons. The case resembles the ideal frame of economic models, in which (quasi)monopoly -and not just dominance- is found necessary for market power extension.

Instead, in *Hilti,* the defendant's position was definitely weaker, even too weak to find dominance. In particular, the Commission claimed that nail-guns, Hilti-compatible nails and Hilti-compatible cartridges were three different relevant markets and that the defendant had tried, through tying, to lever its dominance for patented cartridge strips on the more competitive market for nails. The defendant alleged that guns, nails and cartridges were parts of a larger, competitive "fastening-system market.". In effect, even sharing the Commission's arguments against a "system solution" ("the very fact that there exist independent nail and cartridge strip makers who do not produce nail-guns show that these articles have different supply conditions"), a brand-defined market for consumables remains strongly questionable. Indeed, by definition, a relevant antitrust market -as one is worth monopolizing- describes the set of products (and geographical areas) exercising some reciprocal competitive pressure. One could easily guess that a price increase by Hilti for its own consumables (cartridges or nails) might have resulted in a shift of demand to independent producers of compatible components or even to rival suppliers of primary products (nail-guns), hence to different brand-compatible consumables. Information asymmetries (*i.e.*, the ability to estimate the lifetime cost of the system), often quoted as a constrain to such line of reasoning in aftermarket cases, appears a minor concern in the context at bar, while also considering the degree of buyers' sophistication. Therefore, market share figures in consumables for nail-guns in general (instead of those for Hilti-compatible nails and cartridges) would have been a more reliable proxy for the defendant's ability to profitably raise prices of its consumables. Shares below 50 percent would have presumably led to different conclusions on Hilti's dominance (and abuse).

In effect, the list of debatable dominance assessments is longer, in spite of the limited number of European bundling proceedings. Two interesting cases are discussed in depth.

In *London European-Sabena*[121], the Belgian airline company Sabena was held liable for having *inter alia* conditioned the access to its computerized reservation-system (tying product) upon London European's using of its ground-handling services. The establishment of an

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[121] *London European-Sabena*, OJ (1988) L284/41.

abuse rested upon a generous finding of dominance, based on the identification of two separate parts of the tying market, depending on the identity (travel agencies or airlines) of those requiring access. The distinction does not make economic sense, provided that Sabena's "independent behaviour" and airlines' decisions were both constrained by travel agencies' access. Indeed, for airlines, the attractiveness of computerized reservation-systems increases with the number of travel operators who are affiliated with and actually use the system. Therefore, the relevant market should have been defined simply as "computerized reservation services for travel agencies in Belgium". In this market, Sabena, holding market shares between 40 and 50 percent and facing competition of five other appreciated systems, held a non-dominant position.

In *Napier Brown-British Sugar*, the defendant (BS) was condemned for having abused its dominant position in the UK market for granulated sugar by refusing to sell beet-origin sugar at *ex-factory* prices, as it resulted in tying the delivery to the supply of sugar. However, the Commission's dominance-assessment is very uncertain and debatable. With market shares of almost 58 percent, the defendant was found dominant in a market narrowly defined in geographic terms (industrial users were willing to import sugar from other Member States), characterized by another strong competitor (Tate and Lyle, 37 percent of market shares, but with sales similar in quantity to those of BS), consistent import figures (between 5 and 10 percent) and limited entry barriers in the affine segment of cane-origin sugar. Moreover, the Court explicitly reasoned that: "imported sugar acts as a limit to the price BS may charge for its domestically produced sugar [...] BS has set prices just under that at which it would be consistently profitable to undertake imports". Although one should formally support such a statement with quantitative evidence (in line with the SSNIP logic), the Court's wording appears *prima facie* at odds with claims on the defendant's "independence" of commercial behaviours (recall dominance definition under the *United Brands* jurisprudence) and seems confirming other converging evidence presented in the above.

To conclude, the analysis of the European case-law under article 82 TCE suggests a certain attitude to easily assess dominance. This may admit two alternative, yet conflicting, explanations: on one hand, competition authorities may be biased from their hostility towards bundling as such or from a very formalistic inclination; on the other hand, this attitude may suggest a certain intolerance towards the very idea of dominance as a precondition for any bundling abuse. The former explanation has experienced much more

success among commentators; the latter is our modest contribution to the analysis of EC competition policy on bundling.

III.3.II BUNDLING ISSUES IN CONGLOMERATE MERGERS

The analysis of merger case-law offers additional evidence for the main claims of this work. To be sure, in cases of conglomerate mergers, the theory of "portfolio effects" has justified very controversial decisions, where the Commission has tried to guess incentives and ability of merged entities to engage in exclusionary practices, including tie-ins. Such a proactive attitude may be criticized as involving too arbitrary syndicate on future intentions and as potentially distorting genuine commercial behaviour. Recent stances of the CFI and the ECJ, both asking for more convincing evidence of likely exclusionary effects, confirm such claims.

This paper is not the best place to address complex issues about the soundness of EC authorities' policies, when compared, for instance, to the more market-friendly US approach. In effect, we share the caution of certain judicial and scholars' positions asking for more convincing evidence of likely success of anticompetitive practices in the light of facts at bar. And we also share the opinion of those proposing more consideration for less distorting alternatives (behavioural remedies, ex-post investigation under article 82, etc.). However, our position is not extreme. Indeed, we think that conglomerate mergers, under specific circumstances, may actually result in competitive harms.

As a matter of law, EC merger regulation does not require any assessment of (actual or expected) dominance, at least after the recent shift from the previous "dominance-test" to the new test of "significant impediment to competition", more in line with the US Clayton Act and the most followed economic insights. However, in a sort of internal, systemic coherence, the Commission's approach in conglomerate mergers raising bundling issues seems not departing so much from that for abusive tying under article 82 (Burnley, 2007). Thus, *inter alia* the proof of dominance in at least one of merging markets has been always required, as a precondition for future tying profitability and reasonability.

Nevertheless, the reliance on poor or (maybe) biased evidence of dominance has strongly contributed to criticism towards EC approach, while accordingly increasing suspicions on

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the use of merger discipline as a tool of political influence for the Commission. More substantially for our aims, strained market power assessments confirm that intolerance towards generally accepted economic arguments, already documented by some article 82 cases.

A prominent example is the *GE/Honeywell* case, a $42 billion merger between two US companies prohibited by the Commission after being authorized by the DOJ. The decision has been heavily criticized as an expression of "an outdated and inappropriate tendency to emphasize the protection of competitors rather than competition[122]". The decision is very complex. Here, we will stress just those issues that are of a certain interest to our ends. Indeed, although the case also involved horizontal and vertical profiles, the main focus of the merger review consisted in the assessment of potential "portfolio effects", *i.e.* the risk that the merger may have resulted in non replicable bundle of complementary products (engines with avionic and non-avionic aircraft components), hence in an unbeatable market advantage over specialist rivals. We think that the Commission's concerns rest upon questionable conclusions on GE's dominance, based on a calculation of 52,5 percent of market shares over the installed base of engines under production. As observed by prominent commentators, this figure is, at most, too optimistic, principally for two reasons[123]. Firstly, excluding from calculation planes still in service (but no longer produced) amounts to miss a large part of firms' overall profitability, basically gained in aftermarkets (spare parts and repair services). Secondly, the Commission treats all sales of the joint-venture CFMI as integrally belonging to GE, which just held 50 percent of its stocks. If one takes into account both remarks, GE's market shares would fall to 28 percent; they would be respectively 44 and 36 percent when correcting figures only for the first or the second criticism[124]. Each of these statistics would have precluded from finding GE's dominant position in engine for large commercial aircrafts. Moreover, "contributing factors" used to confirm dominance, such as financial strength (deep pocket theory) and vertical integration in financing and leasing activities (through a GE's subsidiary, GECAS), are not convincing at all. Finally, the analysis of other competition-enhancing factors (buyers' countervailing power, strong rivals, bidding competition) is totally missed or poorly argued.

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[122] Burnley, 2006.
[123] See Nalebuff and Majerus, 2003 and Motta, 2004.
[124] *Id.*

To be sure, the CFI has recently upheld the previous prohibition, confirming the Commission's concern on horizontal effects. However, the Court has rejected the allegation of "portfolio effects" of foreclosure, on the ground (shareable) that the Commission's conclusions were not supported by sufficient or convincing evidence of likely anti-competitive impact. However, in the CFI's judgment, GE's dominance-assessment was not questioned at all, in spite of manifest flaws.

Without taking any position on EC policy against conglomerate mergers, apart from those already put forth, our position is relatively simple. We think that incentives and ability of merged entities to engage in future bundling would not require any assessment of dominance, provided that certain reasonability conditions (about bundle size, elasticity of demand, product differentiation, brand fidelity) are satisfied. This proposed route is in line with our findings (see *supra*, Section II). It would be both legally (dominance is not required under the current merger-test) and economically justifiable, while avoiding the Commission's artificial attempts -too stuck with conventional views- to find evidence of market power when it does not exist.

III.3.2. ON THE SYSTEMIC INCONSISTENCIES OF EC LAW: TYING CLAUSES IN VERTICAL AGREEMENTS

So far we have observed some inconsistencies between legal framework and its concrete application in EC competition practice, not dissimilar -except for their forms- from those found by analysing the US jurisprudence. In this sub-section, we consider a more manifest, systemic instance of contradictoriness, emerging from an holistic assessment of EC rules.

In particular, we observe that dominance is not required when tying is imposed in vertical agreements, as if there should be more compelling reasons to fear non-dominant bundling in vertical business relationships. However, the distinction would lack any defendable justification, on the ground that economic theories of general acceptance by no way distinguish on the basis of consumers' identity and/or on their positioning in the value chain. These inconsistencies should justify legitimate doubts on EC authorities' strict convictions in principles ruled under the rubric of article 82.

In effect, the wording of the Regulation 2790/1999 makes explicit our point. Bundling and similar obligations (*e.g.*, single-branding obligations) are not blacklisted, so that tying clauses in vertical agreements are automatically exempted when the supplier's market shares do not exceed 30 percent. Above the market share threshold, the Commission's Guidelines call for an effect-based analysis. It's specified that the establishment of potential anticompetitive effects should be based *inter alia* on the assessment of competitors' market position, buyers' countervailing power and entry barriers[125]. Apart from a generic reference to the supplier's market position, in particular to its "importance […] on the market of the tying product[126]", no proof of dominance is required. Instead, "when appreciable anti-competitive effects are established, […] a possible exemption under article 81(3) arises as long as the company is not dominant[127]". By implication, this wording makes clear that the Commission judges tying clauses potentially anticompetitive even when adopted by firms lacking dominance[128], safe the possibility of individual exemptions.

The same approach is also adopted in the Regulation 772/2004 on technology transfer agreements. In this context, tying could consist in forcing the licensee to also subscribe other licences and/or purchase other goods. When tying does not represent the primary objective of the licensing agreement and contracting parties fall short the market share threshold (20 percent if they are competing counterparties; otherwise, 30 percent), the Commission's Guidelines invoke a balance between anticompetitive and pro-competitive effects, with the qualification that for the former to realistically occur a "significant degree of market power" in the tying market and an appreciable coverage of the tied market has to be shown[129]. The wording is vague enough to include also cases of bundling by non-dominant firms. What is "sufficient" market power is not clarified, so that it has to be assessed in a fact-based fashion. In this respect, it's our contention that a level of market power falling short dominance may be "sufficient" to cause competitive harms, including long-run foreclosure, hence may pass a fact-based test.

The inconsistency of tying law under articles 81 and 82 TCE with respect to the dominance-requirement, and the lack of sound justifications for differences, appears -to

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[125] European Commission, 2000, at par. 215-224.
[126] *Id.* at 219.
[127] *Id.* at 222.
[128] Langer (2006).
[129] European Commission, 2004, at par.193.

our eyes- the best proof of EC authorities' doubts on the reasonability of such a requirement.

One could also predict that the disparity of treatment may feed distortions and strained findings of "anticompetitive agreements", for instance through generous interpretation of *tacit acquiescence* or other supposed manifestations of *concurrence of wills* in bundling cases[130]. This, in order to challenge genuine unilateral practices that, in spite of observed competitive harms, could be hardly filed as abuses of dominance[131] [132]. Recently, growing criticism to this questionable approach has been voiced in the law-and-economics literature (Pardolesi, 2006).

III.3.IV. CONCLUDING REMARKS

From the analysis of bundling and tying cases under EC competition law a number of ambiguities emerge both in the application of the same legal framework to different market circumstances (sometimes dominance has been poorly fudged) and in the use of inconsistent approaches in different fields of competition law (dominance is not required when tying clauses are included in vertical agreements). In spite of universal declarations of faith in the "dominance-must", in practice the requirement has been flawed and largely undermined or inconsistently applied. Although someone may suggest alternative and, maybe, more reassuring explanations (formalistic approach, biased decisions, etc.), we think that such an evidence represents an implicit, fact-based confirmation of our arguments about the inappropriateness of the dominance-test under specific circumstances.

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[130] The very idea of *concurrence of wills* appears at odds with required evidence of a coercive imposition of packaged purchasing.

[131] Soubrier, 2007.

[132] It has been observed that, under the Clayton Act, no proof of the concerted nature of the practice is required (Leslie, 2007).

IV. Conclusions And Policy Suggestions

This paper discusses the economic rationale and the legal treatment of bundling in non-monopolistic settings. In Section II, we show that tying can be a rational strategy for non-dominant firms under a specified set of market conditions, which differ between cases of complementary (low differentiation, large bundle size, elastic demand) and independent components (high brand fidelity). The social welfare impact, both in a short-run and in a long-run perspective, is discussed in depth, where efficiency explanations (added value, quality improvements, cost-savings) are also taken into account for ultimate inference. We find that non-dominant bundling may harm social welfare and potentially activate a self-reinforcing process of market power achieving and rivals' foreclosure, even absent original dominance in any involved market.

In Section III, these economic findings are compared with the legal practice, apparently influenced and stuck with the traditional view about non profitability and ultimate irrationality of non-dominant bundling. Various documented attempts to generously find dominance both in US jurisprudence and in EC competition practice and other systemic inconsistencies authorize a common interpretation of international tying law: in legal proceedings, dominance is considered as a purely formal requirement, more than an economic precondition for exclusionary purposes.

Supported by the analysis of underlying economics and by contradictoriness in legal practice, we conclude with modest proposals to integrate our main findings into a consistent policy frame. In particular, we invoke for more explicit acknowledgement that the dominance-screening may be unreasonable under certain conditions.

In this respect, the US more flexible system appears better fitting with such policy recommendations. Following Justice Clark's opinion in *Times-Picayune*, the distinction between the Sherman Act and the Clayton Act offers an unexpected way out. A mere duplication of rules would be meaningless, as redundant and inexplicable. Instead, when focussing on differences, one could observe that the broader scope of the latter provisions may allow US courts to potentially challenge, under its rubric, non-dominant tie-ins which "may substantially lessen competition".

Conversely, EC law appears less prone to uphold radical changes. Dominance is connate to the application of article 82, while article 81 is limited in scope (business-to-business vertical relationships) and hard to conciliate with the inherent "unilateral" nature of tying arrangements. In effect, harmful non-dominant tie-ins just represent the "tip of an iceberg", namely the difficulty, under EC law, to challenge unilateral practices when adopted by non-dominant undertakings. Instead of resorting to strained, yet debatable, interpretations of statutes, an appreciable economics-based review of competition policy should move in the direction of avoiding formal dominance-screening, when facts document undisputable harms to competition.

At this point, it's also worthwhile recalling that in some Member States tying arrangements have been already challenged regardless of the bundler's (dominant) position, on the basis of the rules governing "fairness competition". Such an evidence becomes more interesting in the light of the opportunity to root fairness concerns on more formal economic reasoning, and requires focussed future research.

As regards the specific legal treatment, we think that a modified *per se* legality -whereby non-dominant tying should be considered lawful unless there is strong evidence of anticompetitive effects overweighting efficiencies- could guarantee against the risk of under-deterrence, while also respecting business freedom. Needless to say, a *feasibility-test* reflecting all the conditions we have proved necessary for non-dominant bundling rationality should be preliminary performed, in order to optimize inquiry efforts.

We are aware of potential criticisms phrased in terms of transforming antitrust in a gun shooting in indiscriminate fashion, thus undermining legal certainty and distorting competition on the merits. However, these or similar critiques would be improperly addressed. We are just suggesting "well-defined" non-monopolistic settings under which it's wise to move from an "absolute" to a "relative presumption" of legality. Even more, legal certainty and genuine competition would be preserved and, if any, enhanced, against strained applications of existing rules, used to bypass too rigid formal standards.

We hope this paper could represent an useful starting point for further developments. In the closer European perspective, challenging existing legal standards and their uncritically accepted rationale would be in line with proclaimed commitment to a more economics-based approach. It would contribute to make the whole system more effective as a tool of

protection of European consumers and social welfare. It would make decisions more defendable and the legal environment much more certain.

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A. COURNOT'S PROBLEM OF COMPLEMENTARY MONOPOLY

Consider a two-component system. A single monopolist of both components would face the following maximization problem (recall that we have assumed a linear demand and zero costs):

$$Max_P[(a/b)P - (1/b)P^2] \qquad\qquad \text{(A.1)}$$

whose FOC yield:

$$\frac{a}{b} - 2\frac{P}{b} = 0 \qquad\qquad \text{(A.2)}$$

hence:

$$P^M = a/2 \qquad\qquad \text{(A.3)}$$

$$Q^M = a/2b \qquad\qquad \text{(A.4)}$$

In case of double monopoly -*i.e.* both components are sold by separate, uncoordinated firms-, monopolist *i* faces the following problem of maximization:

$$Max_{pi}[p_i(a - p_i - p_{J\neq i})/b] \qquad\qquad \text{(A.5)}$$

whose FOC yield:

$$\frac{a}{b} - 2\frac{p_i}{b} - \frac{p_{J\neq i}}{b} = 0 \qquad\qquad \text{(A.6)}$$

hence, firm *i*'s reaction curve:

$$p_i = \frac{a - p_j}{2} \qquad\qquad \text{(A.7)}$$

and symmetrically for firm *j*:

$$p_j = \frac{a - p_i}{2} \qquad\qquad \text{(A.8)}$$

By intersection of the two curves in (A.7) and (A.8), and given firm symmetry, each monopolist sets the price:

$$p_i = p_j = \frac{a}{3} \qquad\qquad \text{(A.9)}$$

and thus:

$$P^{DM} = p_i + p_j = \frac{2a}{3} > P^M \qquad (A.10)$$

and:

$$Q^{DM} = q_i(P^{DM}) = q_J(P^{DM}) = \frac{a}{3b} < Q^M \qquad (A.11) \qquad \bullet$$

B. Monopoly in The Market For Only One Complementary Component

Consider a multi-product firm subjected to price competition only in one component-market. It will apply marginal-cost pricing in that market where facing *Bertrand* competition, while extracting all rents from monopolistic sales in the complementary market. In particular, under the assumption of zero marginal costs, it will price such a second item at the price of a single two-component bundler, $P^M = \frac{a}{2}$ (see Proof A). $\qquad \bullet$

C. Proof of Proposition 1

Under independent pricing, consumers choose in a component-by-component fashion: this allows us to find separately equilibria in each market. Recall from the above that, in both markets, consumers are uniformly distributed over an interval [0,1], at whose extremes are located two competing sellers/brands of the same product/service.

Given market symmetry, we only focus on the market for *y*. Rational consumers choose the brand of *y* with the lowest perceived cost, including transportation costs. Therefore, a rational consumer will buy variety *A* of component *y* only if:

$$x_1 + p_{Ay} < (1 - x_1) + p_B \qquad (C.1)$$

hence, if:

$$x_1 < \frac{1}{2} + \frac{p_B - p_{Ay}}{2} = \overline{x_1} \qquad (C.2)$$

(all consumers located between 0 and $\overline{x_1}$ will prefer variety *A*; the remaining demand will choose variety *B*)

Therefore, the demand function for A_y will be:

$$D_{Ay} = \frac{1}{2} + \frac{p_B - p_{Ay}}{2} = \overline{x} \qquad (C.3)$$

and that for the variety B of y:

$$D_B = 1 - \bar{x} = \frac{1}{2} - \frac{p_B - p_{Ay}}{2} \qquad \text{(C.4)}$$

Given the zero-costs assumption, from (C.3) and (C.4) respective profit functions will be:

$$\pi_{Ay} = p_{Ay} D_{Ay} = \frac{1}{2} p_{Ay} + \frac{p_{Ay}(p_B - p_{Ay})}{2}$$
$$\pi_B = p_B D_B = \frac{1}{2} p_B - \frac{p_B(p_B - p_{Ay})}{2} \qquad \text{(C.5)}$$

By finding F.O.C. $(\frac{\partial \pi_{Ay}}{\partial p_{Ay}} = \frac{\partial \pi_B}{\partial p_B} = 0)$ and after simple algebra, one obtains firms' reactions

functions, *i.e.*:

$$p_{Ay} = \frac{p_B + 1}{2} \qquad \text{(C.6)}$$

$$p_B = \frac{p_{Ay} + 1}{2} \qquad \text{(C.7)}$$

From the intersection of the two reaction curves in (C.6) and (C.7), equilibrium prices and profits will be:

$p_{Ay} = p_B = 1$ (hence, firms split equally the unit demand, *i.e.* $D_{Ay} = D_B = 0,5$)

$\pi_{Ay} = \pi_B = 0,5$

Given market symmetry, one also gets:

$p_{Az} = p_C = 1$ (hence, firms split equally unit-demand, $D_{Az} = D_C = 0,5$)

$\pi_{Az} = \pi_C = 0,5$ •

D. PROOF OF PROPOSITION 2

From *(3)*, the demand for the bundle is a function of the price difference d:

$$D_{AA}(d) = 1 - [\frac{1}{2}(1 - \frac{d}{2})^2] = \frac{1}{2}(1 + d - \frac{d^2}{4}) \qquad \text{(1.D)}$$

FOC for A, B and C are respectively:

$$\frac{\partial \pi_A}{\partial P_{AA}} = \frac{\partial [D_{AA}(d)P_{AA}]}{\partial P_{AA}} = 0 \qquad \Longrightarrow \qquad D(d) = -D_{Paa}{}'(d)P_{AA}$$

$$\frac{\partial \pi_B}{\partial p_B} = \frac{\partial [(1-D_{AA}(d))p_B]}{\partial p_B} = 0 \qquad \Longrightarrow \qquad [1-D(d)] = -D_{Paa}{}'(d)p_B$$

$$\frac{\partial \pi_C}{\partial p_C} = \frac{\partial [(1-D_{AA}(d))p_C]}{\partial p_C} = 0 \qquad \Longrightarrow \qquad [1-D(d)] = -D_{Paa}{}'(d)p_C$$

and:

$$P_{AA} = -\frac{D(d)}{D_{Paa}{}'(d)}$$

$$p_B = -\frac{[1-D(d)]}{D_{Paa}{}'(d)} \qquad\qquad (2.D)$$

$$p_C = -\frac{[1-D(d)]}{D_{Paa}{}'(d)}$$

hence:

$$d = p_B + p_C - P_{AA} = \frac{-2[1-D(d)]+D(d)}{D_{Paa}{}'(d)} = \frac{3D(d)-2}{D_{Paa}{}'(d)} \qquad (3.D)$$

From (1.D), we get the first derivative of demand function:

$$D_{Paa}{}'(d) = -\frac{1}{2} + \frac{d}{4} \qquad (4.D)$$

(to understand signs, note that we are deriving with respect to P_{AA} and that $d = p_B + p_C - P_{AA}$)

By substitution of (1.D) and (4.D) in the (3.D):

$$d = -\frac{\frac{3}{2}(1+d-\frac{d^2}{4})-2}{\frac{1}{2}(1-\frac{d}{2})} = -\frac{\frac{3}{2}-2+\frac{3}{2}d-\frac{3}{8}d^2}{\frac{1}{2}(1-\frac{d}{2})} =$$

$$= -\frac{\frac{1}{2}(-1+3d-3\frac{d^2}{4})}{\frac{1}{2}(1-\frac{d}{2})} = \frac{1-3d+\frac{3}{4}d^2}{1-\frac{d}{2}}$$

$$1-4d+\frac{5}{4}d^2 = 0$$

$$d = \frac{4 \pm \sqrt{16-5}}{5/2}$$

$$d = 0,273$$

hence:

$$D_{AA}(d) = \frac{1}{2}(1 + d - \frac{d^2}{4}) = 0,6271$$

and :

$$D'(d) = -\frac{1}{2} + \frac{d}{4} = -0,43175$$

By substitution in *(2.D)*, we get equilibrium prices and profits:

$$P_A = 1,45$$
$$P_B = P_C = 0,86$$

$$\pi_A = 0,91$$
$$\pi_B = \pi_C = 0,32$$

•

E. PROOF OF PROPOSITION 3

Math is very similar to that of maximum differentiation (see Proof C). The only significant difference is that markets for y and z are no longer symmetric. Therefore, we have to separately find firms' reaction curves, equilibrium prices and profits in each component-market. To be sure, reaction curves in the market for component y will be:

$$p_{Ay} = \frac{1 - 2e + p_B}{2}$$
$$p_B = \frac{1 - 2e + p_B}{2}$$

(E.1)

And, in the market for component z:

$$p_{Az} = \frac{p_C + 1}{2}$$
$$p_C = \frac{p_{Az} + 1}{2}$$

(E.2)

where the reader can easily notice that, due to maximum differentiation, reactions curves in (E.2) basically coincide with those in (C.6) and (C.7).

By separate intersection of reactions curves in both markets, one gets equilibrium prices and profits (notice that, due to symmetric pricing, both markets are equally split among rival brands, *i.e.* the demand is equal to 0,5 for all single components):

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$$p_{Ay} = p_B = 1 - 2e$$

$$p_{Az} = p_C = 1$$

$$\pi_A = \pi_{Ay} + \pi_{Az} = 0.5(1 - 2e) + 0.5 = 1 - e \qquad \text{(E.3)}$$

$$\pi_B = 0.5(1 - 2e)$$

$$\pi_C = 0.5$$

•

F. PROOF OF PROPOSITION 4

Case 1: $d < 2e$

When the demand function is given by *(7)*, that is when $d < 2e$, FOC for our three firms will be given by:

$$\frac{\partial \pi_{AA}}{\partial P_{AA}} = 0 \qquad \frac{\partial \pi_B}{\partial p_B} = 0 \qquad \frac{\partial \pi_C}{\partial p_C} = 0 \qquad \text{(F.1)}$$

or:

$$\frac{\partial [P_{AA}(1 + p_B + p_C - P_{AA})/2]}{\partial P_{AA}} = 0 \qquad \text{(F.2)}$$

$$\frac{\partial [p_B(1 - p_B - p_C + P_{AA})/2]}{\partial p_B} = 0 \qquad \text{(F.3)}$$

$$\frac{\partial [p_C(1 - p_B - p_C + P_{AA})/2]}{\partial p_C} = 0 \qquad \text{(F.4)}$$

hence, their reactions curves will be:

$$P_{AA} = \frac{1 + p_B + p_C}{2}$$

$$p_B = \frac{1 - p_C + P_{AA}}{2} \qquad \text{(F.5)}$$

$$p_C = \frac{1 - p_B + P_{AA}}{2}$$

From the intersection of such curves, we get equilibrium prices $P_{AA} = \frac{5}{4}$ and $p_B = p_C = \frac{3}{4}$. Then, by simple algebra, one can easily verify that such equilibrium is consistent with $d < 2e$ only for $e \geq \frac{1}{8}$.

Case 2: d > 2e

When the demand function is given by *(6)*, that is when $d > 2e$, reaction curves (we skip maths, because is much longer, yet based on the same logic of previous proofs) intersect when:

$$P_{AA} = \frac{-6 + 6e + 4\sqrt{e^2 - 22e + 11}}{5} \quad , \tag{F.6}$$

and

$$p_B = p_C = \frac{1 - e + \sqrt{e^2 - 22e + 11}}{5} \tag{F.7}$$

This equilibrium is consistent with $d > 2e$ only if $e > \frac{1}{8}$.   •

G. PROOF OF PROPOSITION 5

Bertrand competition in the market for z is conductive to marginal-cost price. At this price, only a λ percent of consumers (those having higher valuation $v_h = 1$ for it) is willing to buy the item. Both firms A and C get zero profits in the market for z.

Instead, because of the assumption of Hotelling competition, the market for y is equally split between A and B, each serving a half of the unit line.

Therefore, equilibrium prices and profits in both markets will be:

$$p_{Ay} = p_B = c \qquad \pi_{Ay} = \pi_B = 0 \tag{G.1}$$

$$p_{Az} = p_C = t + c \qquad \pi_{Az} = \pi_C = 0,5t \tag{G.2}$$

If one preserves the assumption of zero costs and *t=1*, equilibrium prices and profits in both markets will be:

$$p_{Ay} = p_B = 0 \qquad \pi_{Ay} = \pi_B = 0 \tag{G.1}$$

$$p_{Az} = p_C = 1 \qquad \pi_{Az} = \pi_C = 0,5 \tag{G.2} \qquad •$$

Specialist rivals of differentiated components have no incentives to coordinate their marketing strategy to assemble a rival bundle, since they would get less profits than under autonomous selling.

Proposition. *In case of two-components systems, if firm A bundles and competitors react by assembling a (coordinated) rival bundle, equilibrium prices and profits will be:*

$$D_{AA} = D_{BC} = 0,5$$
$$P_{AA} = P_{BC} = 0,5$$
$$\pi_{AA} = 0,5$$
$$\pi_B = \pi_C = \frac{\pi_{BC}}{2} = 0,25$$

Proof. After firm *A*'s decision to bundle, *C* and *B* could choose to assemble their own (coordinated) pure bundle. Under maximum differentiation, consumers' demand is equally split between the pure bundle *AA* and the coordinated version *BC*. The problem resembles the usual Hotelling outcome with maximum differentiation. With zero marginal costs and $t = 1$, one easily gets equilibrium prices:

$$P_{AA} = P_{BC} = 1 \qquad \text{(H.1)}$$

and equilibrium profits for the three firms are:

$$\pi_{AA} = 0,5$$
$$\pi_B = \pi_C = \frac{\pi_{BC}}{2} = 0,25 \qquad \text{(H.2)}$$

Now compare such results with those of a "bundle-against-components" equilibrium (see *Proposition 2*). Specialists firms would end up with harming themselves by coordinating their selling strategy, as to offer a rival, yet coordinated bundle. This also suggests a further contention: in case of several generalist firms, the first engaging in bundling can exploit a consistent *first-mover advantage*, not replicable in the future by rivals. •

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Proof 1. Optimal menu contract in a two-type case - _Lemma 1_-

Consider the tendering authority's maximisation problem defined in expressions through (7) to (10). Based on underlying assumptions, if both types were allowed to charge equal tariffs, profits for low-cost bidders would be higher than for high-cost ones, *i.e.*:

$$\Pi_l(p) > \Pi_h(p); \quad \forall p \qquad (1.1)$$

This implies that only the participation constraint for a high-cost firm is relevant, since - under equal economic terms of provision – this constraint automatically implies that for low-cost firms:

$$U_h \geq 0 \qquad \rightarrow \qquad U_l > 0 \qquad (2.1)$$

Provided that rents are socially costly, this participation constraint is binding at equilibrium, *i.e.* a high-cost firm will be optimally provided with no rents:

$$U_h^* = 0 \qquad (3.1)$$

By substitution of (3.1) in the incentive-compatible constraint (8), and observing that rents are costly also when afforded to efficient types (*i.e.* the incentive-compatibility constraint in (8) is solved as equality), one gets:

$$U_l^* = \lambda[(c_h - c_l)Q(p_h)] \qquad (4.1) \qquad \bullet$$

Proof 2. Optimal menu contract in two-type cases - _Proposition 1_-

Given *Lemma 1* and expressions (3.1) and (4.1), the objective function in (7) can be re-written as:

$$W = [1 - (1-\pi)^n]\left[CS(p_l) + \Pi(p_l) - (1-\alpha)\lambda[(c_h - c_l)Q(p_h)]\right] +$$
$$+ (1-\pi)^n[CS(p_h) + \Pi(p_h)] \qquad (1.2)$$

After some simple algebra, (1.2) can be re-expressed in a more convenient form:

$$W = \frac{1-(1-\pi)^n}{(1-\pi)^n}\left[CS(p_l) + \Pi(p_l) - (1-\alpha)\frac{\pi(1-\pi)^{n-1}}{1-(1-\pi)^n}[(c_h - c_l)Q(p_h)]\right] +$$
$$+ [CS(p_h) + \Pi(p_h)] =$$

$$= \frac{1-(1-\pi)^n}{(1-\pi)^n}[CS(p_l) + \Pi(p_l)] - (1-\alpha)\frac{\pi}{1-\pi}[(c_h - c_l)Q(p_h)] +$$
$$+ [CS(p_h) + \Pi(p_h)] \qquad (2.2)$$

By maximising (2.2) with respect to both prices, one obtains:

$$\frac{\partial W}{\partial p_l} = 0 \qquad \rightarrow \qquad p_l^* = c_l \tag{3.2}$$

$$\frac{\partial W}{\partial p_h} = -(1-\alpha)\frac{\pi}{1-\pi}[(c_h - c_l)Q'(p_h)]] + c_h - p_h = 0 \tag{4.2}$$

$$\rightarrow \quad p_h^* = c_h - (1-\alpha)\frac{\pi}{1-\pi}[(c_h - c_l)Q'(p_h)]] \tag{5.2}$$

For sake of simplicity, one can assume a linear demand function, having the following functional representation:

$$Q(p) = a - p \tag{6.2}$$

which implies:

$$Q'(p) = -1 \tag{7.2}$$

By substitution of (7.2) in (5.2), one gets a more explicit price solution also for high types:

$$p_h^* = c_h + (1-\alpha)\frac{\pi}{1-\pi}(c_h - c_l) \qquad\qquad \bullet$$

Proof 3. **Optimal menu in two-types cases with favouritism – *Proposition 3* -**

Consider the tendering authority's maximisation problem defined in expressions through (14) to (17). In subsection IV.1, we assumed an exogenous probability η of favouritism and very generous economic conditions $\{p_F; S_F\}$ for "favoured operators".

In the remaining $(1-\eta)$ percent of cases, there is genuine competition, on equal foot, as in Section III. The optimal menu contract for "non-favoured firms" maximises the objective function (14) under constraints (15)-(17). By *Lemma 1*, the participation constraint (16) for the high-type implies that for low-types (17), *i.e.*

$$U_h \geq 0 \qquad \rightarrow \qquad U_l > 0 \tag{1.3}$$

Again, since rents are costly, both the relevant participation constraint and the compatibility constrain hold as equalities:

$$U_{h(N.F.)}^* = 0 \tag{2.3}$$

$$U_{l(N.F.)}^* = \lambda[(c_h - c_l)Q(p_h)] \tag{3.3}$$

where, as before, the ratio λ is given by:

$$\lambda = \frac{\frac{(1-\pi)^{n-1}}{n}(1-\eta)}{\frac{1-(1-\pi)^n}{n\pi}(1-\eta)} = \frac{\pi(1-\pi)^{n-1}}{1-(1-\pi)^n} \tag{4.3}$$

Based on these findings, the constrained objective function to be maximised can be written as:

$$W = \eta * [CS(p_F) + \Pi(p_F) - (1-\alpha)U_F + B] +$$
$$+ (1-\eta)\{ (1-(1-\pi)^n)[CS(p_l) + \Pi(p_l) - (1-\alpha)\frac{\pi(1-\pi)^{n-1}}{1-(1-\pi)^n}[(c_h - c_l)Q(p_h)]]$$
$$+ (1-\pi)^n[CS(p_h) + \Pi(p_h)] \} \tag{5.3}$$

Expression in (5.3) can be rewritten in a more convenient form. To do this, lets preliminary define the following quantity:

$$F = [CS(p_F) + \Pi(p_F) - (1-\alpha)U_F + B] \tag{6.3}$$

Then, by substituting (6.3) in (5.3) and applying some algebra:

$$W =$$
$$\eta F + (1-\eta)\{ (1-(1-\pi)^n)[CS(p_l) + \Pi(p_l) - (1-\alpha)\frac{\pi(1-\pi)^{n-1}}{1-(1-\pi)^n}[(c_h - c_l)Q(p_h)]] +$$
$$+ (1-\pi)^n[CS(p_h) + \Pi(p_h)] \} =$$

$$= \frac{\eta}{1-\eta}F + (1-(1-\pi)^n)\left\{CS(p_l) + \Pi(p_l) - (1-\alpha)\frac{\pi(1-\pi)^{n-1}}{1-(1-\pi)^n}[(c_h - c_l)Q(p_h)]\right\} +$$
$$+ (1-\pi)^n[CS(p_h) + \Pi(p_h)] =$$

$$= \frac{1}{(1-\pi)^n}\frac{\eta}{1-\eta} F + \frac{(1-(1-\pi)^n)}{(1-\pi)^n}\left\{CS(p_l) + \Pi(p_l) - (1-\alpha)\frac{\pi(1-\pi)^{n-1}}{1-(1-\pi)^n}[(c_h - c_l)Q(p_h)]\right\} +$$
$$+ [CS(p_h) + \Pi(p_h)] =$$

$$= \frac{1}{(1-\pi)^n}\frac{\eta}{1-\eta} F + \frac{(1-(1-\pi)^n)}{(1-\pi)^n} [CS(p_l) + \Pi(p_l)] - (1-\alpha)\frac{\pi}{(1-\pi)}[(c_h - c_l)Q(p_h)] +$$
$$+ [CS(p_h) + \Pi(p_h)] \tag{6.4}$$

By maximising (6.4) with respect to prices, one gets:

$$\frac{\partial W}{\partial p_l} = 0 \quad \rightarrow \quad p^*_{l(N.F.)} = c_l \tag{7.4}$$

$$\frac{\partial W}{\partial p_h} = -(1-\alpha)\frac{\pi}{1-\pi}[(c_h - c_l)Q'(p_h)]] + c_h - p_h = 0 \tag{8.4}$$

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$$\rightarrow \quad p^*_{h(N.F.)} = c_h - (1 - \alpha)\frac{\pi}{1-\pi}[(c_h - c_l)Q'(p_h)]] \tag{9.4}$$

As before, if one assumeS, for simplicity, a linear demand function of the type:

$$Q(p) = a - p \qquad\qquad Q'(p) = -1 \tag{10.4}$$

By substitution of (10.4) in (9.4), one obtains a more explicit price solution:

$$p^*_{h(N.F.)} = c_h + (1 - \alpha)\frac{\pi}{1-\pi}(c_h - c_l) \tag{11.4}$$

Observe that the optimal menu contract under favouritism does not differ from the optimal reimbursement rule without favouritism (see previous proof). The reason is intuitive: with probability η, the authority agrees to award the contract $\{p_F; S_F\}$, in exchange for bribes or electoral support of value B. With probability $(1 - \eta)$, she faces the same maximisation programme of Section III, with analogous solutions.

The only relevant difference is that the chance to select the most efficient providers is decreasing in the probability of favouritism η and the first-best asymptotic outcome is never achieved. Indeed, at the limit, the probability to award services to a low-cost type is still $(1 - \eta) < 1$, and decreasing in the degree of favouritism or corruption. •

Proof 4. **Optimal bonus component with unverifiable Y**

With quadratic, additive cost function, as in (39), the marginal condition for optimum under (35) and (36) implies that:

$$\breve{a}_i = \frac{b \cdot h_i}{2k_i} \quad \forall i = 1,2 \tag{1.4}$$

$$\breve{a}_3 = 0 \tag{2.4}$$

The bonus component in the incentive scheme is chosen as to maximise total social welfare. In particular, by recalling risk-neutrality assumption, the agent's expected welfare is given by:

$$E[w] - C(\breve{a}_1, \breve{a}_2) = t + b(\breve{a}_1 h_1 + \breve{a}_2 h_2) - k_1(\breve{a}_1)^2 - k_2(\breve{a}_2)^2 \tag{3.4}$$

The principal's expected wealth is:

$$E[y - w] = q_1\breve{a}_1 + q_2\breve{a}_2 + q_3 0 - t - b(\breve{a}_1 h_1 + \breve{a}_2 h_2) \tag{4.4}$$

Therefore, by summing up (3.4) and (4.4)) and substituting for (1.4), expected social welfare is:

$$E[y] - C(\breve{a}_1, \breve{a}_2) = b\frac{q_1 h_1}{2k_1} + b\frac{q_2 h_2}{2k_2} - b^2 k_1(\frac{h_1}{2k_1})^2 - b^2 k_2(\frac{h_2}{2k_2})^2 =$$

$$= b\frac{q_1 h_1}{2k_1} + b\frac{q_2 h_2}{2k_2} - b^2\frac{h_1^2}{4k_1} - b^2\frac{h_2^2}{4k_2} = \qquad (5.2)$$

$$= b\frac{q_1 h_1}{k_1} + b\frac{q_2 h_2}{k_2} - b^2\frac{h_1^2}{2k_1} - b^2\frac{h_2^2}{2k_2}$$

And maximising (5.4) with respect to b one gets the optimal incentive component:

$$\frac{q_1 h_1}{k_1} + \frac{q_2 h_2}{k_2} - b\frac{h_1^2}{k_1} - b\frac{h_2^2}{k_2} = 0$$

hence:

$$b^* = \frac{\dfrac{q_1 h_1}{k_1} + \dfrac{q_2 h_2}{k_2}}{\dfrac{h_1^2}{k_1} + \dfrac{h_2^2}{k_2}} = \frac{\dfrac{k_2 h_1 q_1 + k_1 q_2 h_2}{k_1 k_2}}{\dfrac{k_2 h_1^2 + k_1 h_2^2}{k_1 k_2}} =$$

$$= \frac{q_1 h_1 k_2 + q_2 h_2 k_1}{h_1^2 k_2 + h_2^2 k_1} \qquad\qquad \bullet$$