ENTRY DETERRENCE AND MULTIDIMENSIONAL COMPETITION IN THE SATELLITE PAY-TV MARKET

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Abstract

This work analyses competition in the satellite pay-TV market, focusing on the antitrust case Telepiù-Stream in Italy. Duopolistic firms commit to offer TV programmes to attract subscribers to their broadcasting platforms. However, under certain cost conditions, a first mover advantage acquired in programmes can result in the monopolisation of the pay-TV market, due to network effects. Welfare analysis shows that consumers are better off with duopoly, particularly with symmetric duopoly. Total welfare can be higher under monopoly, but only in the region where the unit fixed cost of the TV programmes is low. Moreover, the model suggests that a more balanced (ideally, symmetric) duopoly, promoted with the antitrust intervention, would improve total welfare, with respect to the asymmetric duopoly that would affirm spontaneously.
The model offers an analytical benchmark for some recent antitrust cases; in some of them, antitrust authorities have chosen to limit the accumulation of broadcasting rights as a mean to prevent the monopolization of the pay-TV market. The rationale of their argument is supported and even reinforced by our results.

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«Competition in the media industry
should really be something more than two guys
from High Noon facing off in the street
to see who is left standing after the gunsmoke clears»

Commissioner M. J. Copps,
on the merger project between Echostar e Direct TV,
FCC, Washington (D.C.), October 2002.

1. Introduction

The commercial exploitation of new communication platforms like coaxial cable systems and (later) geo-stationary satellites have been increasing the transmission capacity available for broadcasting programmes, thereby relaxing the endemic scarcity of electromagnetic spectrum[1] which was affecting the radio-television (radio-TV, henceforth) industry.

This trend was recently strengthened by the digital revolution. Basically, information and communication technologies (ICTs) provide new and better techniques to compress and manipulate the signal broadcasted. Consequently, pay-TV has been promoted as a new business model alternative to the traditional "free to air" broadcasting. In fact, while traditional broadcasts are both non rival and non excludable services, digital encryption techniques transform the radio-TV signal into a private service, which can be offered to households in exchange of a direct payment.

The satellite pay-TV industry is a case in point and provides the best example of the recent pro-competitive trends in the industry.[2] In fact, in Europe the satellite is currently the main platform of delivery for digital services: in 2001, it holds a share of 76% of the digital market, while cable TV reaches 19% and the terrestrial system only 5% (see Crespi, 2002). With the "direct to home" (DTH) satellite transmission, the domestic reception of broadcasts is based on a relatively cheap equipment, usually composed of a small dish antenna and a "set top box".

The commercial launch of the satellite digital pay-TV services, first in the US (1994) and later in Europe (1996), was accompanied by an increase in the number of competitors: soon the incumbent of each national market faced the entry of another competitor, and in some cases a market with three operators affirmed (like in Spain and France) (see IDATE, 2000c).[3]

Indeed, although the average concentration of the European pay-TV markets remain high, the introduction of the satellite pay-TV has increased the degree of pluralism of each national radio-TV industry and has brought a sensible increase of the quantity and variety of the programmes available for consumers.

[1] Up to the Nineties, this bottleneck was among the main justifications of the tight regulatory regime of terrestrial broadcasting, both in the US and Europe.
[2] Instead, cable TV offers a partially different situation and its market structure remains more affected by "natural monopoly" characteristics, mainly due to the high sunk costs related to the deployment of cable rings and terminal equipment.
[3] Particularly, in Europe the diffusion of the digital satellite technology was greatly helped by the standardisation process carried out under the DVB consortium, strongly promoted by the European Union. For technical details, see Stienstra (1996) and Rysdale et al. (1996).

Currently, the pay-TV market's dynamics witnesses a reversal of the initial trend: while the pay-TV market continues to grow in value added, the number of competitors tends to shrink, both in Europe and the US. Moreover, the operators which plan to exit are not always marginal in size: there are cases in which the smaller operators have planned to merge or to acquire the bigger rivals. In any case, the most likely outcome is that in the near future the pay-TV market would end up monopolised or severely concentrated.

These facts have been giving rise to very complex antitrust cases. Sticking to the satellite market, in the US a recently planned merger would have consolidated Echostar and Direct TV in a new monopolistic entity, but it has not been authorised by the FCC (see FCC, 2002). Similar stories have been characterising some European countries.

In Italy, during 2001-2002, three projects of merger between the duopolists Telepiù and Stream were proposed. The first two plans were abandoned, face to the severe conditions for clearance imposed by the Italian antitrust authority and to other external factors. In summer 2002, the third project of consolidation was announced, with Stream (the smaller operator) willing to buy the entire stake of Telepiù and form a new monopolistic operator (Sky Italia). In April 2003 this merger has been cleared by the European Commission, and since July 2003 in Italy Sky is monopolist in the satellite pay-TV, and near-monopolist in the overall pay-TV market.

In order to highlight the 'mechanics' of competition in the satellite pay-TV market and to assess the decisions adopted by antitrust authorities, we propose a model of entry deterrence and oligopolistic competition specifically focused on the satellite pay-TV filière (section 3); we do this after having surveyed the existing literature (section 2). In section 4 welfare analysis is carried out, together with its policy implications. In section 5 the policy implications stemming from our model are compared with the actual policy adopted by national authorities. Conclusions and issues for future research are presented in section 6.

2. The specificities of the pay-TV market

Models addressing oligopolistic rivalry in the digital radio-TV industry are almost absent. Classic literature on analogue TV is abundant (both for terrestrial and cable TV), but not useful for digital TV, and especially for its pay-TV segment. For example, Steiner (1952) and Beebe (1977) analyse the effects of market structure on the endogenous variety of programming, but focus on "free to air" radio and TV broadcasting, financed by advertising and subject to spectrum constraints.

More recently, other authors have focused on the relation between advertising, investment in programmes and market concentration, always in free to air TV. In Motta and Polo (2001), for example, broadcasters need to invest in the perceived quality of their programmes schedules, in order to attract a larger audience and raise advertising revenues. The free entry equilibrium (mirroring the relaxation of the spectrum constraints) and the growth in the market size do not lead necessarily to a lower concentration; with endogenous fixed costs for programmes, concentration is determined by the degree of horizontal differentiation among TV-channels. As a result, market concentration can be high if firms choose similar programmes schedules.

Indeed, the relaxation of the spectrum constraints is the main advantage brought about by the digital broadcasting technology, both in its "pay" and "free to air" model. The increase of transmission capacity and the fall in its cost is significant particularly in satellite broadcasting, where new entry does not require the high sunk costs typically necessary to build cable networks: the satellite transponder capacity is increasingly available for lease. Moreover, in most OECD countries, political and regulatory control on commercial TV has been substantially reduced, with a further relaxation of the previous institutional barriers (see OECD 2001, chp. 6)[4].

However, the logic of operation of pay-TV remains substantially different from that of free to air broadcasting, given that in the former consumers pay directly to broadcasters in return for entertainment, while in the free to air model consumers pay nothing and broadcasters get their revenues selling advertising slots to firms: because of this difference, they are also treated as two different relevant market in the European antitrust law and practise[5].

Moreover, new kinds of bottlenecks have been materialising along the pay-TV filière. Some of these bottlenecks include an intellectual property right and possess the characteristics of an “essential facility”. As a whole, the regulatory intervention, aimed at achieving (at least) interconnection among different platforms, has been partially successful: in fact, while the signal transmission technology has been successfully standardised (DVB-S standard), the receiving and decoding technology was not and it lacks full interoperability. This is the case of the technologies embedded into the set top box: the Directive on TV standards[6] mandated interoperability among the existing proprietary conditional access systems (CAS)[7] (see European Commission, 1999), but, for a series of reasons (mainly strategic), in some countries full interoperability among the different populations of set top boxes was never reached. Consequently, subscribers willing to switch to a competing pay-TV bouquet should also have bought another set top box (see below footnote 13 for the Italian case).

Further, the most complex antitrust and regulatory issue remains that affecting the segment of the production, packaging and distribution of TV programmes. Here, the main antitrust concern is represented by the large diffusion of exclusive dealing clauses to sell broadcasting rights for programmes: these clauses, facilitating accumulation of content, enable strategies of “vertical foreclosure” of the downstream market[8]. In fact pay-TV operators, in order to persuade subscribers to join their services, need to differentiate themselves from free to air TV; so, the attractiveness of the (downstream) digital platform is mainly a function of the richness and variety of the content available over it, and depends particularly on the availability of some “premium” programmes, like certain sport events (like Prime League football matches and Formula 1 races) and

[4] In Italy, for example, while terrestrial broadcasting is subject to a ministerial licence granting the rights to spectrum usage, satellite broadcasting is only subject to an authorisation granted by the Authority for telecommunications.

[5] For a wider perspective on market definition in the TV sector, see Carter (2001). Surveys of antitrust decisions concerning the relevant product market in pay-TV are provided in AGCM (2002a; sections 13-17) and European Commission (2003b, 18-47).

[6] See Directive 95/47/EC, 24 October 1995, available at: http://europa.eu.int.

[7] The CAS is a technology embedded into the set top box which allows subscribers to descramble the encrypted signal and view the programmes: the CAS is typically protected by intellectual property rights. By definition, it cannot be duplicated but can be made available via a compulsory licence, since access to it is required to any operator willing to reach the consumers looked into the rival’s technology. Because of the importance of the CAS for the protection from piracy, most operators developed their own proprietary solutions, often incompatible with the others.

[8] Indeed, this main tendency is not specific to pay-TV, being common to the other communication industries, where entry into transmission infrastructure has caused content to become the scarce input - especially premium content (see OECD, 1999).

"first release" movies, called informally "killer applications". This interdependence can be interpreted as a "virtual network" effect.

In order to build an irreversible advantage, pay-TV operators may over-invest in content to deter entry. As a result, strategies of accumulation of premium content at the wholesale level can easily lead to the monopolisation of the retail market, with a deterrence mechanism more powerful than that of 'traditional' vertical foreclosure, where the monopolised key-input does not display network effects. Similarly, there is another analogy with the "raising rival's cost" literature (see Salop and Scheffman, 1983, 1987): although here no cost is directly raised, the market share (and the profits) of the rival in the retail market are automatically reduced by the accumulation of the scarce input (content), via the network effect[9].

It follows that, to understand the logic of competition in pay-TV, it is essential to formalise the strategic interdependence existing between content accumulation and downstream competition for subscribers. A few papers have been written on pay-TV, but they have not addressed specifically the mechanics of competition and its relation with market structure. Doyle (1998) presents a two stage duopoly where a firm chooses first the kind of programme and second the model of financing (advertising, pay or mixed): then, an analysis of which form of financing ensures the wider variety of programming and the highest social welfare is carried out. However, Doyle (1998) stylises the filière with one unique segment and its model does not treat strategies of vertical foreclosure and entry deterrence. The models proposed by Armstrong (1999) - which stylises separately the two main segments of the filière - are focused on network interconnection and compatibility between rival systems[10], but they do not address vertical strategies based on content accumulation[11]. In a similar framework, Harbord and Ottaviani (2001) assume exogenously network effects, posing a parameter of preference for the platforms, and their model focuses on the optimal licensing scheme for trading broadcasting rights.

Our model, instead, draws on the literature originally developed for the consumer electronics industry (computers, videogames and videorecorders), which first formalised the concept of indirect network externalities (Chou and Shy, 1990; Church and Gandal, 1992; 1993). In fact, despite the differences, there is a strong similarity between these manufacturing industries and a tertiary sector like pay-TV: the original concept of indirect network externality developed there describes well also the interdependence existing between the attractiveness of a pay-TV platform and the variety and quality of its content.

Our model, in particular, builds on the framework presented in Church and Gandal (1996), which stylises a manufacturing filière composed of two basic segments (software and hardware) vertically integrated (or somehow connected[12]). Similarly, in

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[9] Further, we can also argue that the exclusivity clauses used in pay-TV represent a particularly strong and self-reinforcing example of those exclusionary rights analysed by Krattenmaker and Salop (1986): in fact, in pay-TV demand and supply for the key input (content) are inelastic and the indirect network effects reinforce the exclusionary potential of the input accumulation.

[10] These features are traditionally key issues in telecommunication competition, where "open access" provisions have been fully implemented. However, in pay-TV compatibility among rival platforms has not been achieved, despite the efforts made by the policy maker.

[11] Although Armstrong (1999) is aware of the importance of premium programming for platform competition, he does not address endogenously programme's variety and strategic exclusion and leaves the point to further analysis. The second model presented in his paper focuses on a related interesting point, that of the optimal trade regime for broadcasting rights.

[12] As remembered by Church and Gandal (1996), a well designed set of vertical restraints can replicate the market outcome typical of vertical (equity) integration.

our framework, the assumption of exogenous vertical integration (or vertical restraints) between content and hardware reflects the typical European pay-TV filière, where content is either internally produced or externally acquired under exclusivity clauses (or both). Here, indirect network effects materialise between the availability of content and the attractiveness of the broadcasting platform.

Either in the case of "in-house" production or external acquisition, content is proprietary and cannot be offered by the rival platform: this character represents an institutional kind of incompatibility among rival systems, different from the technological incompatibility considered in the network externality literature but similar in its strategic rationale. Moreover, since existing pay-TV platforms are often not compatible in hardware[13], coherently we will assume that interconnection between rival systems is not feasible[14] and that the only way to get a particular kind of content is to subscribe to the platform owning its broadcasting rights.

From above, it follows that each platform operator will act as a monopolist with respect to its potential subscribers. This fact might represent a serious concern in the case of those premium programmes scarce by nature ("first release" films and the most popular sport events), for which supply and demand are rather inelastic and long term exclusive contracts are the typical trading scheme.

Moreover, content is usually chosen for its peculiar qualitative features and there could be a low degree of substitutability among the rival schedules of TV programmes– sport events and cinema are a case in point[15]; our model will control for this character, including an horizontal preference parameter (k) in the comparative statics analysis[16].

Finally, our model radically departs from the "indirect network externality" literature for some substantive points of its welfare and policy analysis:

1) Contrary to the "network externality" and the "race for standard" literature, our analysis does not aim at finding the socially optimal standard and its related "market failure" aspects, nor it focuses on the trade off between technical efficiency of hardware and (vertical) variety of complementary goods. Indeed, in satellite pay-TV, hardware technology accounts for a small portion of total costs and platform operators, belonging to big international conglomerates, have access to similar technologies. This also legitimise our assumptions on the hardware costs and efficiency of the duopolists.

2) Our model, instead, focuses on the deterrence potential of the vertical differentiation strategies based on content accumulation, and their welfare and market structure

[13] This is the case of Italy, where, to mandate hardware interoperability, the Decree (Decreto legislativo) n. 191 of 17 May 1999 on "Attuazione della direttiva 95/47/CE in materia di emissione di segnali televisivi" was issued. Because of the delays, the operators were also fined by the antitrust authority; at the end, an agreement was reached. However, the degree of compatibility resulted to be partial and strategically irrelevant, since the "killer applications", offered by pay per view services, remained excluded from interoperability.

[14] Again, this is a main departure from the existing literature on pay-TV, like Armstrong (1999) and Harbord and Ottaviani (2001).

[15] Typically, the person fancying for his preferred sport (football) will not subscribe to the pay-TV operator which lacks the rights for that sport (and even club), even if the same operator can offer in compensation a wider variety of options (horse riding, windsurf, cricket). Similarly, the lover of the French School cinema will not consider most Hollywood productions a good substitute, even though the latter have frequently higher budgets and better paid casts.

[16] These qualitative (horizontal) preferences are typically neglected in the original literature, developed for consumer electronics, since software is more likely to present vertical characteristics, like the extent of diffusion and the degree of compatibility with hardware platforms.

outcomes; in particular, our welfare analysis highlights the mechanics of the distribution of total surplus between producers and consumers across alternative market structures. We believe that this welfare analysis is crucial for a mass-media sector, where the promotion of the operative efficiency should be coupled with a special safeguard of the consumer's surplus and that of a minimum degree of pluralism of the market[17].

3) Moreover, to better account for the specificities of this mass-media sector, we propose a positive (mirroring the existing market structure) and a normative (the ideal) version of the same model. This will allow us to draw some reflections on the welfare properties of the real markets and to assess the policy effectively undertaken by antitrust authorities.

3. The model

3.1. Assumptions and structure of the game

Two rival platforms (*A* and *B*) composed each of a "content" and a "hardware" segment are located at the two extremes (respectively 0 and 1) of the segment representing the pay-TV market. Due to vertical integration and lateral incompatibility, the hardware of type i ($i = A, B$) identifies also the overall platform. Consumers are uniformly distributed along the unit interval and their population is normalised to 1. Each consumer has income y.

The platforms are equally efficient and face identical fixed costs C_i (rental of satellite transponders, transmission facilities and encryption techniques): we normalise them to 0. From the business practise we know that marginal costs of hardware are almost negligible and we assume them equal to 0[18]. As in most information good industries[19], the fixed up-front cost (f) for content is the major relevant cost component, since the marginal cost is negligible (again, equal to 0); the exogenous cost f is assumed identical for both platforms[20].

Given the price, consumers value each platform i according to two main characteristics, respectively horizontal and vertical:

1) according to the distance between their location (the ideal platform) and the location of the platform i (t_i), times a parameter k representing the intensity of this preference;

[17] As already suggested in the Green paper on the Convergence (see European Commission, 1997), we can even assume that in these sectors pluralism and consumer's surplus have a particular 'public' status.
[18] In fact, household connection costs are zero, due to the wireless transmission of the signal. Set top box costs are the only non negligible direct cost for hardware, but they can be excluded from the analysis (hence, both from the cost and the hardware price), since they are substantially symmetric and paid to external manufacturers of consumer electronics.
[19] See Shapiro and Varian (1999). For an economic analysis of media industries and their typical cost structure, see Vogel (2001).
[20] The cost structure for the acquisition of external content could include also a "per subscriber" fee: in the Italian case, the pay-TV operators must pay this fee once they reach a certain threshold of subscribers; however, for the football rights, this threshold of subscribers was never reached in the past (see AGCM, 2002a, section 43).

2) according to the number of the programmes available with each platform, N_i. N_i is a variable which also correlates positively with the level of the quality and the internal variety of the programmes.[21]

In particular, the preferences of the potential subscribers with respect to the vertical variety (N_i) of each platform i are such that:

a) The gross utility of each subscriber increases with the number N_i, although at a decreasing rate (see equation [1], where $0<b<1$).
b) The gross utility provided by hardware alone is α, constant and equal for both platforms. Being hardware only instrumental to the fruition of content, if $N_i = 0$, $a=0$. In this case, irrespective of k, the consumer gets only the outside good.
c) The demand for the hardware and a variety of content is perfectly inelastic.

In fact, hardware and programmes need to be bought together, and each consumer needs only one unit of hardware and one unit of each TV event (programme), without duplications; moreover, provided that the conditions for the optimal choice are verified, in general each consumer will buy more than one unit of content.

Equation [1] describes the (gross) utility function of a potential subscriber located distance t_i[22] for platform i when he enjoys N_i different programmes; o represents the consumption of an outside good:

$$U_i = a + N_i^{\ b} + o - k \cdot t_i \qquad [1]$$

Equation [2] describes the budget constraint for the same subscriber: r_{ni} is the price of a programme of type n, (where $n= 1 \ldots N_i$) broadcasted over platform i and p_i is the price of the hardware component of platform i. o is the price of the outside good and y is the consumer's income.

$$\sum_{n=1}^{N_i} r_{ni} + o = y - p_i \qquad [2]$$

The timing of the basic (positive) version of the model develops over four stages. In stage 1 one firm (let it be firm A) enters the pay-TV market and commits to content, producing (or externally acquiring) N_A programmes. To do this it sustains a fixed cost f for each programme.

In stage 2, the other firm (B) makes an entry decision; if entry is feasible, it commits to N_B programmes, sustaining a fixed cost f for each of them. Both for A and B the investment decision is credible, since the total fixed costs $f \cdot N_i$ ($i = A, B$) cannot be later recovered.

In stage 3, given the programmes N_i and N_j ($i = A, B, i \neq j$) committed to and provided that B has entered, the two platform operators invest in hardware and compete simultaneously à la Bertrand in the market of subscriptions; otherwise A acts as a monopolist. In the same stage, the market shares of the platforms (t_i and t_j) are

[21] For example, concerning the quality, a valuable (premium) programme can correspond to a multiple of a basic programme. Concerning the variety, this stems from the fact that programme schedules avoid internal duplications.

[22] By definition of Euclidean distance, if t_i is the market share of the platform i, that of platform j (with $j \neq i$) will be t_j=1-t_i.

determined.

In stage 4, the programmes' prices r_{ni} are set and subscribers buy them in order to maximise their utility. Technically, the maximisation of equation [1] subject to [2] for the subscriber implies a two-stage optimisation process, which is simultaneous to the firm' decision of the prices r_{ni}. Solving backwards this two-stage process, first the consumer maximises equation [1] subject to [2] for each hardware, so that the subscriber selects the types and the number of the programmes to be bought in each of the two offers[23]. These choices, once substituted back into [1], give the indirect utility functions connected to the two platforms. Finally, in the second stage, the potential subscriber compares the two indirect utility functions and chooses the most valuable platform.

The model assumes perfect rationality and complete information. The game is solved finding the (Selten) subgame perfect equilibrium, going through backward induction.

3.2. The equilibrium choice of content

Given the list of the prices of the programmes (ρ_{ni}) available for the chosen platform i, subscriber will buy them according to the optimal choice rule. Since demand for hardware and a programme type n is perfectly inelastic, subscribers will buy one unit of hardware and one unit each of N_i varieties of content, where the N_i^{th} equates price and marginal utility.

By assumption, the operators know the consumer's decision rule and realise that at stage 4 their platform subscribers are captive. So, the optimal price behaviour for content will be that expressed by Lemma 1:

Lemma 1.
When N_i programmes have been committed to for platform i, the profit maximizing price for each variety of content is:

$$r_{N_i} = b \cdot N_i^{\,b-1} \qquad [3]$$

Proof of Lemma 1 is presented in the Appendix.

So, in equilibrium each subscriber will find convenient to buy one unit of each programme available for the chosen platform. Moreover, the equilibrium price of content depends (negatively) only on the number of programmes developed (N_i, which also stands for variety). It follows that the operators, when they commit to content (stages 1-2), they also credibly and implicitly commit to its price.

Now, we turn to the consumer's choice of the platform i. Solving the second of the two-stage optimization process, we substitute content equilibrium prices in [2] and we solve for o. Then, we substitute the resulting expression for o into [1], getting the indirect utility function of a subscriber localised at distance t_i from platform i:

[23] As suggested by Church and Gandal (1996; p.339), one can imagine the following cognitive process happening for each platform. First, the different programmes available are ranked in ascending order by price. The consumer will buy programmes if the marginal benefit of a programme (equal to $\beta \cdot N_{ni}^{\beta-1}$) is less or at least equal to its price ρ_{ni}. So, at the end, the N_i lowest priced programmes are bought, and the price of the last is r_{Ni}.

$$V_i = \alpha + (1-\beta)\cdot N_i^{\,b} + y - p_i - k\cdot t_i \qquad [4]$$

From [4] one can see that the utility of the subscriber is increasing in the variety of content, decreasing in the adoption price of the platform and in its Euclidean distance from the ideal platform.

The subscriber compares the two platforms' indirect utilities and chooses the highest. The subscriber indifferent between the two will have V_A=V_B. Solving for t_i, we get the market share of platform *i*.

$$t_i = \frac{(1-\beta)\cdot\left(N_i^{\,b} - N_j^{\,b}\right) - (p_i - p_j) + k}{2k} \qquad [5]$$

3.3. The equilibrium choice of hardware

In stage 3 we could have a duopoly or a monopoly, depending on entry at stage 2. We need to distinguish between the two subgames.

3.3.1. Both commit to content

If the operator *j* has committed to content and entered at stage 2, in stage 3 we have duopolistic competition à la Bertrand. Recalling Lemma 1, the generic profit function of the duopolist *i* is:

$$\pi_i = (p_i + \beta\, N_i^{\,b})t_i - N_i f \qquad [6]$$

To solve the optimum problem, we proceed to calculate the Nash equilibrium in the prices, conditionally on the varieties of content committed to at stages 1-2. We arrive at the following results:

Lemma 2.

Case a) If $\left|N_i^{\,b} - N_j^{b}\right| \leq 3k$ *:*

(i) The equilibrium hardware prices are:

$$p_i = \frac{(1-3\beta)}{3} N_i^{\,b} - \frac{1}{3} N_j^{\,b} + k\,, \qquad i = A, B, i \neq j \qquad [7]$$

(ii) The market shares are:

$$t_i = \frac{1}{6}\frac{(N_i^b - N_j^b + 3k)}{k}\,, \qquad i = A, B, i \neq j \qquad [8]$$

(iii) The duopoly profits are:

$$\pi_i = \frac{1}{18}\frac{\left(N_i^{\,b} - N_j^b + 3k\right)^2}{k} - N_i f\,, \qquad i = A, B, i \neq j \qquad [9]$$

Case b) If $\left|N_i^{\,b} - N_j^{\,b}\right| > 3k$ *; without loss of generality, let us discuss the case* $N_i > N_j$ *:*

(i) The equilibrium hardware prices are:

$$p_i = \frac{(2-3b)N_i^b - 2N_j^b}{3} \qquad [10]$$

$$p_j = \left(\frac{1}{6}\left(N_j^{\,b} - N_i^{\,b}\right) - b\,N_j + \frac{1}{2}k\right) \qquad [11]$$

(ii) The market share for firm i is $t_i=1$.

(iii) The profits for firm i are:

$$p_i = \frac{2}{3}\left(N_i^b - N_j^{\,b}\right) - N_i f \qquad [12]$$

The main result of Lemma 2 is that, to have a viable duopolistic competition (case a), the difference between the rival content bases should not be 'too big', taking into account the intensity of the preference for the ideal platform (k)[24].

Also, the price equation [7] highlights the fact that in equilibrium the hardware price is decreasing in the rival's variety and increasing in k, which allows the duopolists to leverage on horizontal differentiation. With respect to an increase of its own variety, the price increases if subscribers get low utility from content ($b \leq 1/3$) while, if b is higher, there is a negative relation (i.e., is better to price competitively to acquire an higher market share and to consequently focus on content profits). Finally, the price equation [7] shows that some hardware prices can be negative for a certain range of the parameters b and k: in this case firms would give a hardware subsidy to subscribers. This feature of the model reflects the current business practice, where in special occasions the operators offer promotional packages to subscribers, like some equipment given for free (parable antenna, subsidisation or cheap rental of the set top box) or a waiver in the administrative costs of connection[25]. Again, its underlying rationale is that hardware profits can be sacrificed to get a higher market share, promising to bring more content profits[26].

Finally, w.r.t. the parameter b, the profit functions of firm i are monotonically increasing in N_i and decreasing in N_j. This legitimises us to fix the parameter b without loss of generality.

Before proceeding further, we verify under what conditions in duopoly the market is fully covered: a sufficient condition is to assume $a \geq 3/2\,k$ (see Proof III).

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[24] In other words, ceteris paribus, a more intensive interest for the preferred platform (higher k) relaxes the asymmetry constraint, allowing in equilibrium more difference between the players' schedules of programmes.

[25] Further, an underlying assumption is that firms must be able to impose a quantity restriction on the infinite demand faced with negative prices

[26] This feature, in a truly dynamic model where content is bought several times, could even appear stronger.

3.3.2. Only one operator commits to content

If the operator *B* has not committed to content and not entered at stage 2, in stage 3 we have a monopoly with firm *A*, unchallenged by nothing but the participation constraint of the subscriber. So, we now derive A's monopoly price and profits, under the hypothesis of full market coverage (later we will show how in this sub-game for the monopolist is convenient to serve the entire market). From [4], posing the indifference condition ($V_A - y = 0$) for the subscriber located at t=1, we solve for p_A:

$$p_A = a + (1-b)N_A^b - k \qquad [13]$$

Substituting [13] into [6], we get the monopoly profits for A:

$$p_A = a + N_A^b - k - N_A f \qquad [14]$$

3.4. The content commitment of the entrant

In stage 2, *B* decides the entry and which variety of content to commit to. In an interior equilibrium, the optimal (Nash) variety of programmes for *B* is found maximising [9] w.r.t. N_B. From the study of the FOC we see that, to have an explicit solution, we need to fix the value of **b** . Without loss of generality (see above), we set **b** = 1/2.

Provided that $f \neq 1/(18k)$ (so, we will assume as relevant range $f \geq 1/(18k)$), an interior solution exists (we will see later that this restriction is compatible with the solutions of the overall game):

$$N_B = \left(\frac{3k - N_A^{1/2}}{18fk - 1} \right)^2, \quad N_A < 9k^2 \qquad [15]$$

The restriction on N_A comes from the second order condition, verified in Proof IV. Substituting back [15] into [9], yields the duopoly profits for B, conditionally on N_A:

$$p_B = \frac{1}{9}\left(3k - N_A^{1/2}\right)^2 \frac{9fk - 2}{k(18fk - 1)} \qquad [16]$$

From [15] appears clearly that the varieties N_A and N_B act as strategic substitutes (cfr. Bulow et al., 1985). Consequently, (see [16]), in equilibrium the profits of *B* decline with the increase of N_A, since the latter reduces the market share of *B*.

3.5. The content commitment of the incumbent

In stage 1 the incumbent *A* commits to content. Since this commitment is binding, at the same time *A* decides to deter or to accommodate the entry of *B*. Given the assumptions of perfect rationality and complete information, *A* will choose the strategy which maximises its profits.

3.5.1. Entry deterrence

The deterrence subgame, with the incumbent becoming a monopolist, is qualified in Proposition 1:

Proposition 1.
Starting from f³1/(18k), for an initial range of values of f, entry does not happen. In particular:
Case a) When f is relatively small (f£1/(6k)), entry is blockaded. The monopoly equilibrium yields:

$$N_A^b = \frac{1}{4f^2}; \quad p_A^b = a + \frac{1}{4f} - k; \quad p_A^b = a + \frac{1}{4f} - k \qquad [17]$$

Case b) For f>1/(6k) entry (and, consequently, duopoly), is feasible, but for A the profit-maximising strategy is to deter entry. The deterrence equilibrium yields:

$$N_A^{de} = 9k^2; \quad p_A^{de} = a + \frac{1}{2}k; \quad p_A^{de} = a + 2k - 9k^2 f \qquad [18]$$

Proof (V) of Proposition 1 is given in the Appendix.

We notice first that, in equilibrium, (pure) monopoly and deterrence profits are decreasing in f and k, two parameters which account for, respectively, supply and demand shocks. Moreover, in equilibrium, the higher is k, the more A has to invest in content to deter entry. In fact, when a subscriber exhibits a stronger preference for the ideal platform (high k), ceteris paribus it needs a wider (vertical) variety and/or higher quality of content, to be compensated for the loss of the (horizontal) variety of the platform excluded. Further, an higher k affects in turn the (sustainable) deterrence price and profits, respectively positively and negatively.

Finally, being deterrence profits decreasing both in f and k, we should expect that, after a certain level of the two, for A is preferable to accommodate. In fact, being the deterrence strategy based on the over-investment in content, an higher f and/or k makes this conduct very costly.

3.5.2. Accommodation

If A abandons deterrence, a spontaneous duopolistic equilibrium affirms. However, A still enjoys a first mover advantage and, anticipating the best response function of B, commits to the variety N_A which maximises its profits. We substitute [15] in [9] and maximise it; from the FOC we derive the optimal[27] variety of accommodation for A:

$$N_A^a = \left(\frac{(6k(9fk - 1)}{(18fk - 1)^2 - 18fk} \right)^2 \qquad [19]$$

Substituting back [19] in the profit function, yields the accommodation profits for A:

[27] The second order condition is satisfied for $f > 1/(9k)$, which contains the interval of existence of the deterrence equilibrium ($f > 1/(6k)$) and, therefore, also that of the accommodation equilibrium.

$$p_A^a = \frac{2k(9fk-1)^2}{(18fk-1)^2 - 18fk} \qquad [20]$$

We now proceed to the joint discussion of the equilibria of the overall game.

3.6. Solutions of the game

Combining Proposition 1 and the subgame equilibrium under § 3.5.2, we can state the following:

Proposition 2.

a) *For 1/(6k)<f£ f(a,k), the incumbent deters entry. For f(a,k)<f, the incumbent accommodates entry and an asymmetric duopoly affirms.*
b) *The duopoly market shares converge asymptotically in symmetry (t_i=1/2) with the increase of the parameters f and/or k.*

Proof (VI) of Proposition 2 is given in the Appendix.

Therefore, after the critical point *f(a,k)*, accommodation profits surpass deterrence profits and *B* enters the market. It is interesting to notice that the exact location of the indifference point is shifted w.r.t. the horizontal axis according to a trade-off dynamics of the two parameters: the higher *a*, the more the crossing point will shift on the right-hand side, the higher *k*, the more the crossing point will shift on the left. So, ceteris paribus, stronger preferences (higher *k*) of subscribers can implicitly promote the viability of a more pluralistic (duopolistic) market structure, enlarging its interval of existence.

3.7. The simultaneous version of the model

Let us abandon the initial assumption of a first-mover advantage for A. Consequently, the initial four-stage game will now collapse in a three stage game. In this new game, in stage 1 the two potential players decide simultaneously the content commitment (N_i) (and the entry). The following stages 2 and 3 are identical to stages 3 and 4 of the basic version of the model: in stage 2 the operators, conditionally on the varieties committed to in stage 1, compete à la Bertrand for hardware subscriptions, and in the final stage (3) they sell content to their (captive) subscribers. In this timing, also network effects are generated simultaneously for the two players, between stage 1 and 2.

The equilibrium choice of content

If entry is feasible, in stage 1 the operators commit to content and in stage 3 they set its price, with the same logic examined in Lemma 1. According to this Lemma, the equilibrium unit price for each variety of content available for platform *i* will be dependent only on the effective number of varieties developed:

$$r_{N_i} = 1/2 \cdot N_i^{-1/2}$$

The equilibrium choice of hardware

In stage 2, the duopolists compete à la Bertrand for hardware subscriptions, maximising the general profit function [6]. Substituting [5] in [6] and maximising w.r.t. p_i, yields the following best response function:

$$p_i = \frac{1}{2} p_j - \frac{1}{4} N_j^{1/2} + \frac{1}{2} k \ , \quad i = A, B, i \neq j$$

Solving the unlinear system of equations hereby identified, we find the Nash equilibrium of the prices, conditionally on the varieties of content:

$$p_i = -\frac{1}{6} N_i^{1/2} - \frac{1}{3} N_j^{1/2} + k \qquad [21]$$

From [21] emerges a negative relation between the price and the varieties, both with the rival's (stronger) and with the own's. In fact, first of all, in equilibrium, a wider rival variety imposes a more competitive pricing, aimed at capturing an higher market share. Second, to increase the own variety causes the global profits to become more dependent on content profits, instead of hardware. Finally, substituting the Nash prices in [5], yields the following, equivalent to [8]:

$$t_i = \frac{1}{6} \frac{(N_i^{1/2} - N_j^{1/2} + 3k)}{k}, \qquad i = A, B, i \neq j \qquad [22]$$

The simultaneous content commitment

In stage 1 the duopolists commit simultaneously to content, to maximise their duopoly profit functions. Substituting back [21] and [22] in [6], yields the duopolistic profit function dependent only on the varieties, equivalent to [9]. We need to maximise this expression w.r.t. N_i. From the FOC we get a pair of best response functions[28]:

$$N_i = \frac{\left(3k + N_j^{1/2}\right)^2}{\left(18 fk - 1\right)^2}; \quad N_i = \frac{\left(3k - N_j^{1/2}\right)^2}{\left(18 fk - 1\right)^2}; \quad i = A, B, i \neq j; \quad N_j < 9k^2 \qquad [23]$$

The unlinear system of the best-response functions does not have an explicit solution. Therefore, imposing symmetry (N_i=N_j) in [23], we get the following:

Proposition 3.
The subgame perfect equilibrium of the simultaneous game, which features a duopoly with a simmetric market share, is characterised by:

$$N_i^s = \frac{1}{36 f^2}; \quad p_i^s = -\frac{1}{12 f} + k; \quad p_i^s = \frac{1}{2} k - \frac{1}{(36 f)}; \quad i = A, B, i \neq j \qquad [24]$$

[28] The restriction on N_j in [23] comes from the second order condition.

Proof (VII) of Proposition 3 is presented in the Appendix. In the same proof we demonstrate that none of the two duopolists has incentive to deviate from the symmetric equilibrium: when the rival commits to the symmetric duopoly variety, the monopolisation strategy would yield negative profits. Moreover, the sustainability of the symmetric duopoly does not depend on the size of f: even though the absolute loss from the monopolisation strategy is increasing in f, profits are negative in any case, also for "small" values of f.

From above follows the most important result of the overall model (basic and extended version), possessing a strong policy implication: in such a kind of (non-cooperative) game, the key-instrument for the monopolisation strategy is the first mover advantage in content acquisition in itself, being the (exogenous) amount of the fixed cost f just a "reinforcing mechanism".

Finally, it is worth to notice that, in equilibrium, the vertical variety is decreasing in f, while the price and the duopolistic profits are increasing in k: in fact, if the subscribers display a stronger preference for the horizontal identity of the platform, the symmetric operators can leverage on that, appropriating the consumer's surplus.

4. Welfare analysis and policy implications

Now we go to assess the welfare properties of the equilibria found in the basic (positive) version of the model and in the symmetric version.

Blockaded entry

From the indirect utility function ([4]), the generic consumer's surplus equation associated to the (monopolistic) platform i is:

$$CS_i = \int_0^1 \left(a + \frac{1}{2} N_i^{1/2} + y - p_i - kt \right) dt = a + \frac{1}{2} N_i^{1/2} + y - p_i - \frac{1}{2} k \qquad [25]$$

For $f \leq 1/(6k)$, entry is blockaded. The monopolist commits to the monopoly variety and charges the monopoly price (see [17]). Substituting these equilibrium values in [25], yields:

$$CS_A^b = y + \frac{1}{2} k \qquad [26]$$

From [17] we know already the producer's surplus in the blockaded entry equilibrium. So, summing up the two surpluses[29], it is immediate to calculate total welfare:

[29] Here, to present a basic analysis, we adopt a simple additive form for total welfare, giving an equal weight to the consumer's and producer's shares. However, for the considerations previously made about the special status of consumer's surplus and the pluralism of the market in media industries, one could legitimately propose a modified additive form assigning an higher weight to the consumer's surplus. Similarly, one should include a term representing the public interest to pluralism. In both cases, the social preference for duopoly would come out reinforced.

$$W_A^b = a + y + \frac{1}{4f} - \frac{1}{2}k \qquad [27]$$

Deterred entry

For $f > 1/(6k)$, entry can be deterred. Substituting in [25] the deterrence equilibrium values (see [18]), yields:

$$CS_A^{de} = y + \frac{1}{2}k \qquad [28]$$

Recalling from [18] the deterrence profits, total welfare will be:

$$W_A^{de} = a + y - 9fk^2 + \frac{5}{2}k \qquad [29]$$

It is worth to notice that, at the indifference point ($f = 1/(6k)$), the consumer's and the producer's surpluses connect themselves with continuity.

Accommodated entry

For $f > 1/(6k)$ and $f \geq f(a,k)$, an interior accommodation equilibrium exists. Since the exact location of the equilibrium depends on a, also the welfare analysis will be developed parametrically. The consumer' surplus equation will be:

$$CS_T^a = \int_0^{t_A} \left(a + \frac{1}{2}N_A^{1/2} + y - p_A - kt \right) dt + \int_{t_A}^{1} \left(a + \frac{1}{2}N_B^{1/2} + y - p_B - kt \right) dt \qquad [30]$$

We need first to have the equilibrium varieties, prices and market shares; then, after having developed the integrals of [30], we substitute these equilibrium values in (see Proof VIII). Going through some algebraic manipulations, we get:

$$CS_T^a = a + y - \frac{1}{2}k + \frac{k(18fk-1)(9fk-1)}{((18fk-1)^2 - 18fk)^2} - \frac{-9k(6fk-1)^2}{(18fk-1)^2 - 18fk} \qquad [31]$$

The accommodation producer's surplus is the sum of [20] and the corresponding profits for B, found substituting [19] in [16]. After a few passages, we get the following:

$$PS_T^a = \frac{2k((18fk-1)^2 - 18fk)(9fk-1)^2 + 9k(9fk-2)(6fk-1)^2(18fk-1)}{((18fk-1)^2 - 18fk)^2} \qquad [32]$$

Finally, summing [31] and [32], and doing some manipulations, we get the total surplus:

$$W_T^a = a + y - \frac{1}{2}k + \frac{6k(9fk-1)(15fk-2)}{((18fk-1)^2 - 18fk)^2} \qquad [33]$$

Symmetric duopoly

For our policy discussion and empirical applications it is extremely interesting to compare the two versions of the model, to shed some light on a possible “normative” (i.e., socially preferable) market structure for the pay-TV market. So, we conduct the same welfare analysis for the simultaneous version of the model.
For the consumer’s surplus, starting from a generic equation similar to [30], where now t_A=1/2, we develop the integrals and we get:

$$CS_T^s = a + \frac{1}{4}N_A^{1/2} + y - \frac{1}{2}p_A - \frac{1}{2}k + \frac{1}{4}N_B^{1/2} - \frac{1}{2}p_B \qquad [34]$$

Substituting in [34] the symmetric equilibrium values (see [24]), yields:

$$CS_T^s = a + \frac{1}{6f} + y - \frac{3}{2}k \qquad [35]$$

The producers’ surplus is the sum of the two profit functions (see again [24]):

$$PS_T^s = k - \frac{1}{18f} \qquad [36]$$

Finally, summing the surpluses, total welfare in the simultaneous model will be:

$$W_T^s = a + y + \frac{1}{9f} - \frac{1}{2}k \qquad [37]$$

We now turn to the comparative discussion.[30]

Let us start with the consumer’s surplus. While [26] and [28] depend additively only on the parameter *y*, [31] and [35] depend also on a (positively). So, we simplify *y* but we retain a: let us remember that its minimum admissible value is $a = (3/2)k$.

From the function study, complemented by numerical simulations, we can see that, for the admissible range of existence of *f* (i.e., $f>1/(18k)$), [31] and [35] are decreasing in *f*. Instead, [26] and [28] are constant w.r.t. *f* and depend only on *k*. If $(3/2)k \leq a < 2k$,[31] the duopolistic surpluses are bigger than the monopolistic ones up to a certain *f*, but inferior going towards bigger *f*: in this region, the higher is *k*, the sooner the crossing appears. However, the crossing disappears completely and *k* does not influence anymore the relation if we fix a a bit higher: just fixing $a=2k$ it’s enough to have the duopolistic surpluses always higher that the monopolistic ones. It is easy to interpret this fact. Since the monopoly power from the hardware’s intrinsic value (a) is transferred back to the subscribers by the duopolistic competition, while it’s retained by

[30] For the clarity of it, at some stage we need to fix some parameters. However, we will show that the results are not sensitive to the parameter choice or, if they are, we will study the changes. In any case, we will fix the parameters in a way that does not reinforce the results in an “ad hoc” manner.
[31] Obviously, in line with most of the literature on “horizontal differentiation”, in this model we assume $k \geq 1$.

the monopolist as a profit (see later), "a sufficiently high" a ensures that the subscribers are always better off with the duopoly w.r.t. the monopoly, does not matter the intensity of their horizontal preference (k).

Second, the producer's surplus. Here, from [17] and [18], we know that the monopolistic profits are decreasing in f; concerning [32] and [36], instead, the function study tells us that both are increasing in f (although mildly, and [32] monotonically only after $f>2/(9k)$). This is enough to say that, conditionally on the parameters a and k, at a certain point there will be a crossing between the monopolistic and the duopolistic surpluses. At the right-hand side of this point (w.r.t. the x-axis), the duopoly surpluses will be higher than the monopoly ones.

Moreover, the values of the parameters act in a trade-off: a pushes up the monopoly surpluses (and shifts the crossing on the right w.r.t. the x-axis), while k pushes them down[32] (shifts the crossing on the left). Finally, it is immediate to see that symmetric profits are increasing in k and f.

We can conclude saying that the advantage of monopoly over duopoly for the producer is rapidly eroded with the increase of f; moreover, this advantage is parametrically reinforced by a and reduced by k. However, it is interesting to remember that the same parameters act in an opposite way in the consumer's surplus: in fact, there the consumer's surplus under monopoly was increasing in k while under duopoly in a.

Third, the total surplus. Before going to discuss the welfare levels, if we compare [27], [29], [33] and [37] we notice that the complexity of the discussion is dramatically reduced simplifying the addenda a, y and $(-1/2)k$.

After that, it is immediate to notice that the deterrence welfare (c) performs very badly (see downward-sloped dotted line in figure 1): in fact, after an initial superiority over the duopolistic outcomes (y and w)[33], c is rapidly falling well under the two (y and w) when f increases. Moreover, the rate of decrease of c is increasing in k: so, when subscribers display strong horizontal preferences, the vertical foreclosure strategy becomes increasingly costly and resource-wasting. From above, we can derive a fundamental welfare property of the model:

Proposition 4.

a) The welfare levels of the four market structures decrease with the increase of f; the rate of decrease of the welfare associated to the monopolistic market structure is higher than that of the duopolistic ones.

b) After a certain f, with $f>\underline{f}(k)$[34], the symmetric duopoly's welfare is the highest.

Figure 1 about here

[32] For the deterrence profits, this happens for $k>1/(9f)$.

[33] At least, in this initial range of f, the superiority of χ is clear over the symmetric one (ω), given that the accommodation equilibrium (whose welfare is ψ) exists (and hence is comparable) only after a certain $f(a,k)$ (recall Proposition 1). The blockaded entry monopoly (whose welfare is φ) is preferable (and comparable) in its range of existence, that is $f\leq 1(6k)$ (recall Proposition 2).

[34] The value of f needed for that is quite small and near to the left bound of existence of the deterrence equilibrium. For example, for $k=1$, we have $f= 1/6+(1/18)\sqrt{5}$.

Moreover, the previous discussion has highlighted that monopoly and duopoly have very different distributional schemes. The parameter a illustrates well this point: we saw that, with the increase of a, subscribers are better off under duopoly, while operators under monopoly. So, the consumer's and producer' surpluses are differently impacted by a variation of a, even though total welfare as a whole is not affected. Since the stand alone utility provided by hardware (the parameter a) reflects closely the rate of technological progress generated outside the pay-TV sector (mainly in the space aircraft, communication and electronic equipment industries), there is another reason for which duopoly is better than monopoly, from an antitrust perspective: it transfers the "windfall gains" stemming from exogenous technological change to consumers. Further, presumably the parameter a assumes high values in countries like Italy, where alternative digital platforms are almost absent or present severe problems of implementation, while pay-TV operators can enjoy a cheap, country-wide and reliable satellite transmission network.[35]

To conclude, the welfare analysis suggest that the policy-maker choice of promoting duopoly appears as the best and socially preferable option. This choice is strengthened if we go to consider that we are dealing with a mass-media industry, where it is wiser to give a preferential protection to the consumer's surplus and to the pluralism of the market.

5. Antitrust policy in practise: the case study "Telepiù-Stream"

The asymmetric duopoly equilibrium found in the basic version of the model reflects closely the pay-TV market structure which was present in some European countries. In particular, it is a realistic representation of the recent developments of the Italian market, before the authorisation of the merger and the launch of the new monopolistic platform Sky Italia (respectively, April and July 2003).[36]

In Italy, up to the first half of 1998, only Telepiù was active on the satellite market and when Stream decided to enter, it faced a very difficult take-off phase. Basically, in the first year of activity, Stream encountered severe difficulties in raising the attractiveness of its platform and increasing its base of subscribers, since most of the premium broadcasting rights had already been bought by Telepiù. For this reasons, in February 1999 Stream presented a complain to the Italian antitrust authority (AGCM), claiming that the Italian wholesale market for both premium sports and "first release" movie rights was practically monopolised by the incumbent; moreover, these rights had been acquired for a duration which was so long to prevent competition in the phase of the renegotiations of the contracts. This situation of premium content accumulation was so unfair, argued the plaintiff, that Stream was not allowed to remain and compete on the (downstream) pay-TV market (see AGCM, 2000).

The decision n. 8386 of the AGCM (see AGCM, 2000) confirmed the complains

[35] In Italy, because of its geography and population density, it is technically difficult and expensive to implement terrestrial or wired (digital) radio-TV transmissions. Digital terrestrial transmission involves much higher operative costs than satellite transmission: according to a recent study, «the cost of a year of digital transmission through satellite amounts to approximately EUR 0,5 million whereas the cost of a nation-wide DTT transmission amounts to EUR 5 million» (see European Commission, 2003b; p.27). An analysis of the potential of the satellite facility and of the different digital options for Italy is presented in Matteucci (2002;chp. 1 and 4).

[36] For a fuller account of the Telepiù-Stream case-study and the prospects of the pay-TV market in Italy, see Matteucci (2004).

of Stream, even though a remedy was taken only for sport rights. In fact, Telepiù at that time had a dominant position in the "first release" movie rights (having the rights accounting for 85-90% of the Italian box-office revenues), but this position had been acquired before the entry of the rival. Although the excessive time length of these rights was *per se* questionable (in some contracts, up to 10 years), the AGCM at that time decided not to challenge the dominant position in movie rights and intervened only in the sport rights segment.

Concerning sport rights, the AGCM decision was taken on the basis of the abuse of a dominant position, aiming at restraining the rival's access to a necessary input. The AGCM decision was directly inspired at previous decisions, dating back to the notorious Coditel II case[37], where the European Court of Justice similarly challenged the excessive duration of some exclusive broadcasting contracts. Moreover, although not directly infringed, for premium football rights a law (n.78/99) had been previously established, setting a limit of 60% for the accumulation of premium broadcasting rights.

Although the AGCM decision n. 8386 did not impact immediately on the asymmetric position of the two duopolists, it represented a first important assessment of the principle that, to have a fair and workable (downstream) competition in pay-TV, a contestable wholesale broadcasting rights market is needed. Further, beyond the specificity of the case under decision, this principle was recognised both for movie and sport rights.

Moreover, together with other (more specific) decisions (n. 6869, see AGCM, 1999, and n. 10985, see AGCM, 2002b) and laws (n. 78 in 1999), the decision n. 8386 initiated the build-up of a normative framework aimed at ensuring that the entrant can compete effectively, via a more contestable broadcasting rights market.

Finally, the issue of the contestability of the broadcasting rights market was indirectly reaffirmed in the AGCM decision n. 10716, concerning the proposed acquisition of Stream by Telepiù (see AGCM 2002a). In this decision, authorising the acquisition under conditions, AGCM noticed that the consolidation of the market in a monopoly possessing a wide amount of exclusive broadcasting rights would have blocked any future entry, not only in the satellite pay-TV market, but also in any other pay-TV platform (cable or Internet-based media).

The logic of the argument is the same as in the previous decision. Translated into our economic jargon, being the accumulation of broadcasting rights a powerful mechanism of entry deterrence, via the indirect network effects which would materialise, a monopolist combining the exclusive contracts for sport and movie rights formerly possessed by the two duopolists would not be challenged in the future by any potential competitor. Moreover, this monopolist, having also the "negative" (holdback) pay-TV rights for the same events, would have prevented the development of alternative transmission platforms based on other electronic media. For these reasons, the AGCM authorised the acquisition but requested the monopolist to be divested of a substantial amount of premium rights, together with a reduction of the duration of the rights it could maintain.

This project of acquisition was abandoned shortly afterwards. In fact, in the meanwhile Telepiù was caught by the sudden financial crisis of its parent company, Vivendi Universal, due to external circumstances. Soon, a new project of merger was proposed: this time News Corporation Limited, controlling a 50% share of Stream, would acquire the control of Telepiù and Stream, with the aim of creating a new

[37] See Coditel SA v. Cine-Vog Films, Case 262/81, decided on 6/10/1982.

monopolistic operator, Sky Italia.

After an in-depth investigation, in April 2003 the European Commission cleared the merger, subject to a list of behavioural remedies.[38] In line with the logic of the AGCM decision n. 10716, the EU Commission took the view that «authorising the merger, subject to appropriate conditions, would be more beneficial to consumers than the disruption that would be caused by the likely closure of Stream, the smaller and weaker of the two existing operators» (see European Commission, 2003a; p.1); also in this case, the operation under scrutiny would have created a near-monopoly in the Italian pay-TV market

The Commission clearly stated that, while authorising the merger, it was not accepting the "failing firm defence" argument proposed by the parties.[39] Instead, with the words of Commissioner Mario Monti, «the Commission […] has established the right conditions for the pay-TV market in Italy to remain open and to evolve in a competitive way on a lasting basis to the advantage of consumers» (see European Commission, 2003a; p.1).

In other words, the Commission was aware of the dangers implicit in a monopolistic market structure, especially in terms of consumer' surplus. However, face to the financial difficulties encountered by the operators, there was a certain probability that a denial of authorisation of the merger would have led one of the operators to exit (probably Telepiù, and not Stream, as argued by the Commission). In this case, an unconstrained monopoly would have been established - and this would have been the 'the biggest evil'.

Indeed, the position held by the Commission represents a noticeable synthesis of sound economic reasoning and factual realism. One may have some objections in accepting the authorisation of the monopoly, which seems to be given in the market context where monopoly is clearly socially inferior w.r.t duopoly – referring to our model, in the region where the unit fixed cost of programmes is high.[40] Moreover, we could doubt that a new satellite platform could affirm in the future in the Italian market, especially if at the same time we also consider to be high the probability that one of the two operators – among the world biggest players - exits from the market in case of denial of authorisation.[41] Finally, one could also argue that this horizontal merger is particularly dangerous since, in addition to its horizontal character, it involves two operators which also present a medium and high degree of vertical integration. For these reasons, a different decision more oriented to those structural remedies adopted by the U.S. Federal Communication Commission in the Echostar-Direct TV case – the denial of authorisation of the merger, see FCC (2002) – was also possible and legitimate.

However, the severe behavioural remedies imposed by the UE Commission on News Corporation (and Telecom Italia, see the "Annex of Undertakings", European Commission, 2003b) probably represent an effective and realistic defence of the contestability of the overall pay-TV market (potentially composed by other platforms

[38] There were also structural remedies, concerning the divestiture of the terrestrial transmission assets and frequencies held by Telepiù.

[39] Some practitioners have argued that the authorisation was granted under a purported "ailing-but-not-yet failing defence" (see Caffarra and Coscelli, 2003).

[40] In fact, since the advent of pay-TV, the price of broadcasting rights, for both "prime release" movies and premium sport events, has skyrocketed (see also European Commission, 2003b, section 86).

[41] With the words used by Commissioner Copps at the FCC on the case "Echostar-Direct TV", taking into account the barriers to entry and the capital shortages in the pay-TV sector, which currently witnesses a trend to exit, to expect a future entry would imply to «[…] *dream an impossible dream*». (cfr. Copps, 2002).

such as cable, xDSL, UMTS and probably terrestrial transmission), if not of the contestability of its satellite segment.

To conclude, putting emphasis on the potential competition which might arise from a more contestable (wholesale) TV rights market, all the decisions taken by the antitrust authorities contributed to promote the socially optimal market structure. In fact, the AGCM decision n. 8386 contributed substantially to the reduction of the degree of asymmetry of the (initially) spontaneous duopoly, pushing the real market structure to converge to an (ideal) symmetric duopoly: this market structure, especially in a setting of high fixed costs, ensures the highest welfare (recall Proposition 4).[42] Similarly, the AGCM decision n.10716 and the UE Commission decision n. 2876 enlarged the perspective of the analysis towards other competing digital platforms. The behavioural remedies imposed on the new monopolist in both the decisions - including the divestiture of the TV rights held under exclusivity and a substantial reduction of the duration of the contracts - appear to be adequate to ensure market contestability and future entry.

At least, this is what we can legitimately expect from antitrust authorities. After all, in line with other scholars (for example, see Motta and Polo, 2001), we believe that in broadcasting another important role has to be played by the other policy makers (regulatory and legislative bodies).

6. Conclusions

Digital technologies are thought to mark a fundamental change in broadcasting and in communication technologies in general, promising to increase the level of competition in media markets. This paper presents some first problematic insights into this perspective. Basically, the main argument of this work is that in electronic media markets we need to distinguish between what is affecting the hardware segment and what is more specific to "content". We have argued that the increasing importance of intellectual property rights and exclusive dealing contracts challenges the simplistic view that media markets are facing a reduction of barriers to entry, both technological and strategic.

Our model illustrates the mechanics of competition in a typical European satellite pay-TV industry, where an incumbent is challenged by the entry of a new operator. Thanks to the wide availability of new and cheap transmission capacity, new entrants can easily build new hardware platforms, but they may encounter severe difficulties in finding valuable content to attract subscribers. Since content is proprietary and broadcasted under exclusivity regimes, a first mover advantage in (premium) content acquisition is likely to result in vertical market foreclosure and monopoly, even when a duopoly would be socially optimal (high fixed costs regime). Moreover, even in the (purely hypothetical) case that an accommodation duopolistic equilibrium spontaneously affirms, a normatively-induced symmetric duopoly would be welfare-superior (at least statically and in a non-collusive setting).

[42] The objection that under monopoly the unit fixed cost of content would be lower is not binding, since this outcome would be partial and temporary. In fact, only the prices of sport rights would be affected, being those of movie rights largely independent from national markets' conditions. The temporary nature of the price cut for sport events can be argued from the reorganisation of the demand structure, with the likely entry of new operators willing to buy sport rights (in Italy the relevant examples are the sport bouquet "GiocoCalcio" and the free to air broadcasters).

This policy option in favour of duopoly is even more justified when one comes to consider that media markets, for their particular status, might request to assign a particular priority to interests like consumer's surplus and a minimum degree of pluralism in market structure. In any case, the welfare and policy implications of the model support and reinforce the policy orientation expressed in some recent antitrust decisions on the Italian pay-TV market. These decisions, aimed at a reduction of the degree of asymmetry between players in (wholesale) content acquisition, can effectively promote actual or potential competition in the downstream pay-TV market.

Appendix of proofs

I. Proof of Lemma 1 (see also Church and Gandal, 1996; p.340). Consumers are captive and the operators act as local monopolists. Content commitment has been made in stages 1-2 and the marginal cost of each variety is zero, so that is optimal to offer all of them. The price of the N_i^{th} (most expensive) variety is constrained at ρ_{Ni} and the unit price of the previous cannot be higher than that. However, demand for a variety is perfectly inelastic w.r.t. the unit price and the market share for hardware has been decided in stage 3: so, in equilibrium, a unit price less than $\rho_{Ni} = \beta \cdot N_i^{\beta-1}$ would reduce profits without increasing the market share. It follows that the unit equilibrium price for all the N_i varieties is ρ_{Ni}.

II. Proof of Lemma 2. To maximize [6] w.r.t. price p_i, we first substitute [5] in [6]. Then, we impose the FOC, check for the sign of the second derivative and find the price best-response function for firm i:

$$p_i = \frac{(1-2b)N_i^b - (1-b)N_j^b + p_j + k}{2}, \qquad i = A, B, i \neq j$$

Solving the unlinear system of the best-response functions, we find the Nash equilibrium, conditional on content (equation [7]). Then, substituting [7] into [5] gives [8]. Finally, substituting [7] and [8] into [6], we get [9]. However, these results hold only for the economic existence of [8] (i.e., for $0 \le t_i \le 1$, requesting $\left|N_i^b - N_j^b\right| \le 3k$). Further, we need to discuss $\left|N_i^b - N_j^b\right| > 3k$. Imposing t_i=1 in [5] and substituting the corresponding best-response function for p_j, we get [10]. Similarly, using [10], from the best-response function we get [11]. Finally, substituting [10] into [6], we find [12].

III. Proof of full market coverage under duopoly

This requests us to prove that the marginal consumer strictly prefers buying the pay-TV service and not only the outside good (whose indirect utility is y). Substituting in [4] the equilibrium values of duopoly prices and market shares ([7] and [8]), we get:

$$V_i = a + \frac{1}{2}N_i^b + \frac{1}{2}N_j^b - \frac{3}{2}k + y$$

A sufficient condition for having $V_i - y > 0$ is to assume $\alpha \ge 3/2k$.

IV. Proof on the second-order conditions of the duopolistic equilibrium.

The second order condition requests:

$$\frac{1}{36N_B k}-\frac{1}{36}\frac{(N_B^{1/2}-N_A^{1/2}+3k)}{N_B^{3/2}k}<0$$

This implies $N_A < 9k^2$.

V. Proof of Proposition 1.

Case a) Once B has not entered, A is a monopolist. Solving backwards, A maximises [14] w.r.t. N_A. From the first order condition the equilibrium variety is:

$$N_A^b=\frac{1}{4f^2}\ \text{(see[17])}\ .$$

Substituting this variety into [13] and [14] yields the monopoly price and profits (see again [17] The equilibrium variety, for f ≤ 1/(6k), implies $N_A \geq 9k^2$, which excludes the existence of an interior duopolistic equilibrium for B.

However, in principle B could have an incentive to enter and monopolise the market while A acts as a pure monopolist. To prove that this strategy is not convenient for B, we impose $t_B=1$ in [8] and solve for N_B:

$$N_B=\left(N_A^{\ 1/2}+3k\right)^2$$

Substituting this expression and that of the equilibrium variety for A in [12], yields the profits for B associated to the counter-monopolisation strategy, which are negative:

$$p_B=-k-9fk^2-\frac{1}{4f}\ .$$

Case b) If f>1/(6k), from [17] the (simple) monopoly variety for A results to be $N_A<9k^2$. However, in this case we know from [15] that an interior duopolistic equilibrium exists. Hence, if A wants to be a monopolist, it has to deter entry. Technically, we need to equate [16] to 0 and solve for N_A. Trivially, the deterrence variety is $N_A^{de}=9k^2$. Substituting it in [13] and [14], yields the deterrence price and profits (see [18]).

Once again, we need to verify that for B it is not convenient to enter and counter-monopolise the market (proof of credible deterrence). Similarly to the proof given under case a), we impose $t_B=1$ in [8] and solve for N_B. Mutatis mutandis, we end up with the following profit function:

$$p_B=2k-36k^2f$$

The profits are negative for f >1/(18k), whatever is k. Since we are discussing the case f>1/(6k), the credibility of deterrence is verified.

Finally, we must verify that the monopolist finds convenient to cover the entire market. We prove this in the deterrence case, the blockaded entry being analogous. We are looking for an endogenous determination of t_A. Starting from the generic profit function, we substitute in the deterrence variety and find:

$$p_A = t_A\left(p_A + \frac{3}{2}k\right) - 9fk^2 \qquad [38]$$

The relation between t_A and p_A is derived from the usual condition of indifference of the consumer located at t=1, which yields:

$$t_A = \frac{1}{2}\left(\frac{2a + 3k - 2p_A}{k}\right) \qquad [39]$$

Now, after having substituted [39] in [38], we maximise [38] w.r.t. p_A and find that the FOC is verified for $p_A = 1/2\alpha$. This value, once substituted in [39], gives:

$$t_A = \frac{1}{2}\left(\frac{a + 3k}{k}\right) > 1.$$

This proves the convenience to serve the entire market for the monopolist.

VI. Proof of Proposition 2.

Section a)
We need to compare the two profit functions, which depend on three parameters: α,k and f.[43] To perform the comparative statics analysis, we first derive the profit functions w.r.t the parameters.
From [18], deterrence profits are increasing (additively) in α and monotonically decreasing in f; further, they are increasing in k for k<1/(9f) and decreasing for k≥1/(9f) (or, equivalently, f≥1/(9k)). So, for any α and k, w.r.t. f the function reaches its absolute maximum at the left bound of its interval (f=1/(6k), and decreases thereafter.
From [20], accommodation profits are increasing for f≤1/(9k), decreasing for 1/(9k)<f≤2(9k), and increasing thereafter; further, they are increasing in k for k≤1/(9f), decreasing for 1/(9f)≤ k< 0.182f and increasing in k≥ 0.182f. Therefore, for any k, after 'a certain f' (which will depend on k), the accommodation profits are increasing in f.
Therefore, at some point we can expect a crossing between the two profit functions, the exact point being jointly identified by the parameters α and k. At this point the incumbent is indifferent between deterrence and accommodation. At the right-hand side of this point, asymmetric duopoly affirms as the equilibrium strategy.

Section b)
We substitute in [8] the equilibrium varieties [15] and [19]; then, we take the limit of the resulting expression w.r.t. the parameters f and k, proving the result.

VII. Proof of Proposition 3

Having solved [23] for the symmetric equilibrium variety (see [24]), we substitute this variety in [21], [22] and [9], and we find the corresponding symmetric equilibrium values (see again [24]). Then, we need to prove that none of the symmetric duopolists finds convenient to monopolise the market, while the rival commits to the symmetric content variety. Let suppose that the

[43] While *a* and *k* are technological and preference parameters, *f* is a truly supply-side parameter, more likely to be influenced by policy intervention. So, the comparative statics analysis will be focused on *f*.

monopolising operator is A. After having substituted the symmetric variety for N_B in [22], we impose $t_A=1$ and solve for the corresponding N_A. We get the following monopolising variety:

$$N_A = \frac{(18f+1)^2}{36f^2} \qquad [40]$$

Substituting [40] and the symmetric variety for N_B in [21] yields the monopolising price p_A. Once we have substituted the latter and the monopolising variety ([40]) in the generic profit function ([6]), we find the following expression, negative for any f:

$$p_A = \frac{-1}{36}\frac{(18f-1)^2}{f}$$

VIII. Proof on the accommodation consumer's surplus.

Substituting [19] in [15] yields the accommodation variety for B:

$$N_B^a = \frac{(9k(6fk-1))^2}{((18fk-1)^2-18fk)^2}$$

Substituting N_A^a and N_B^a in [7] yields the accommodation prices. Substituting these prices in [8], yields the accommodation market share:

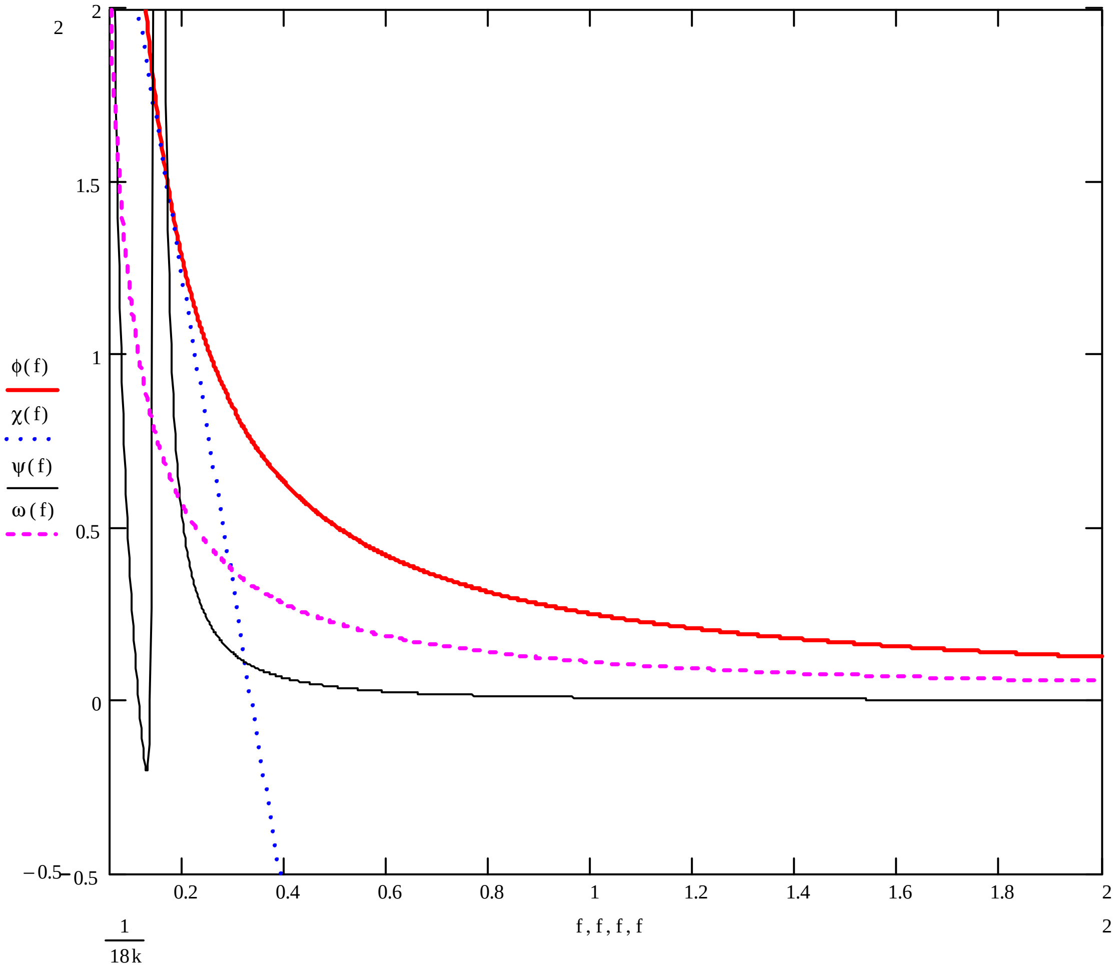
$$t_A = \frac{(18fk-1)(9fk-1)}{(18fk-1)^2-18fk} \qquad [41]$$

Then, we develop [30], getting:

$$CS_T^a = a + y - \frac{1}{2}k + t_A\left(\frac{1}{2}\left(N_A{}^{1/2} - N_B{}^{1/2}\right) - \left(p_A - p_B\right)\right) + \frac{1}{2}N_B{}^{1/2} - p_B \qquad [42]$$

Substituting in [42] the equilibrium values, we get a long expression, rather difficult to treat. Simplifying and factoring the fourth and separately the fifth and sixth addendum, yields [31].

Figure 1. The welfare levels of the four different market structures



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