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## **ABSTRACT**

### **Advertising and the Distribution of Content\***

This paper examines incentives for exclusive distribution of content in the presence of advertising. A monopoly seller of content - such as television rights to popular sports - may contract with one or both of two competing distributors, charging lump-sum fees. When distributors are subscription-funded, exclusive sale to a single buyer is the seller's profit-maximising choice, even when distributors also sell advertising airtime. When distributors are purely advertising-funded, however, non-exclusive contracting may instead be preferred. Advertising revenues accruing directly to the content provider may also generate a preference for non-exclusivity even when selling to subscription-funded distributors. The analysis has implications for the distribution of content to pay TV and free-to-air broadcasters, and for internet distribution of content.

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# 1 Introduction

A notable feature of the distribution of content, whether on television, radio or over the internet, is the prevalence of advertising as a revenue source. Historically, analog broadcast TV lacked a mechanism to exclude non-payers from viewing, hence broadcasters relied on the sale of advertising airtime to finance commercial services. With the growth of cable systems—for which exclusion is relatively straightforward—and the development of encryption technology for satellite and terrestrial broadcasting, viewer charges (subscription, pay-per-view) have become easier to implement. In many countries pay TV services now exist alongside free-to-air television (FTA), though even then, pay TV channels also carry significant amounts of advertising. By contrast, most commercial radio stations remain purely advertising-funded to this day. Meanwhile, the internet has developed into a wide-reaching platform for the distribution of downloadable content including music, video, and other entertainment content. Although the internet is often credited with creating new business models, internet-based services have tended to rely on the same funding source as the early commercial broadcasters: the sale of advertising space that is viewed alongside the content that consumers wish to obtain.

The value of content to its provider depends not only on its intrinsic attractiveness but also on the mechanism by which revenues are generated. In pay TV, attractive content allows a broadcaster to set higher viewer charges, directly extracting viewers' willingness to pay. If programmes are broadcast free-to-air, due to either technological constraints or regulation, revenue can then be derived from advertising alone. Desirable content then benefits the broadcaster by increasing its viewer numbers, to which advertising revenues are positively related, but the value of content to viewers cannot be extracted directly.

This paper considers how alternative funding sources affect the contracting choices of content providers. Specifically, when a content provider sells

its rights to subscription-funded services (such as pay TV operators) or to advertising-funded distributors (such as FTA broadcasters), how does the distributors' business model affect the content seller's choice between exclusive and non-exclusive distribution? The analysis builds on that of Armstrong (1999), which considers incentives for signing exclusive contracts for premium content in pay TV, first extending it to advertising-funded distributors, and then allowing for upstream advertising revenues. The findings cast light on changing contracting patterns following the growth of pay TV, on international comparisons where different revenue sources are used, and for the development of internet distribution.

When content is sold to subscription services in return for lump-sum fees this paper shows, like Armstrong (1999), that exclusive distribution is the content provider's profit-maximising choice. However, we find that advertising funding may reverse this result. With pure advertising funding and no subscription fees, or when advertising revenues accrue directly to the content provider, non-exclusive distribution may instead be preferred. Intuitively, the presence of advertising revenues creates a desire for greater reach, tending to favor non-exclusivity. These findings can account for the increased tendency of sports leagues to contract exclusively with one broadcaster when selling to pay TV, compared with the wider distribution of rights observed under FTA. Implications can also be drawn for internet distribution of content, as advertising-funded services are replaced with paywalls.

Exclusivity in pay TV is the subject of a number of related papers. Armstrong (1999) analyses incentives for exclusive supply of premium content in pay TV under lump-sum and per-subscriber fees. Harbord and Ottaviani (2001) discuss contractual arrangements and competition in pay TV with particular reference to the UK industry. Weeds (2012) assesses incentives for exclusive distribution of premium content in pay TV under both static and dynamic frameworks. Hagi and Lee (2011) examine links between exclusivity and control over retail pricing, in a setting where content providers and

platforms are vertically separated. Stennek (2007) assesses the implications of exclusive distribution for investment in programme quality. These contributions, however, focus entirely on a downstream pay TV industry, and do not assess the implications of advertising funding.

The economics of advertising is comprehensively surveyed in Bagwell (2007). Advertising is a classic example of a two-sided market. Two-sided markets have been studied in depth by, *inter alia*, Rochet and Tirole (2003, 2006) and Armstrong (2006). The model of distributor competition adopted in this paper follows the Hotelling-based approach used to study the economics of broadcasting by, *inter alia*, Gabszewicz et al. (2001, 2002, 2004), Gal-Or and Dukes (2003), Dukes and Gal-Or (2003), Anderson and Coate (2005) and Peitz and Valletti (2008). These contributions examine a number of issues including content differentiation, advertising intensity, and welfare comparisons under pay TV and FTA. None of these papers considers content exclusivity, however.

The focus of this paper is on incentives for exclusive distribution of content in the presence of advertising. Section 2 sets out the model, solving this first for subscription services downstream (section 2.1) and then for advertising-funded distributors (section 2.2). Section 3 considers outcomes when advertising revenues accrue to the content provider rather than the distributor, such as when advertisements are integrated into the content itself. Section 4 discusses implications of the results.

## 2 The model

A premium content is supplied by a monopoly seller; this is the case when, for example, a sports league sells the television rights of its constituent teams. The content may be sold either to one or to both of two competing distributors; it is assumed that the seller can commit to grant the content exclusively (perhaps by means of an auction) should it wish to do so. When

a distributor's offering includes the content its attractiveness to consumers is raised by an amount  $v$  (its social benefit). The content has no direct substitute and is difficult to replicate, hence an excluded distributor cannot replace the value  $v$  by acquiring alternative content.

Contracting between the content provider and the distributor(s) takes place with the following restrictions: (i) lump-sum fees are paid for the content, and (ii) distributors do not resell content to one another. The first condition typically holds for sports broadcasting contracts, and may also be the case for other types of content.<sup>1</sup> The second condition is innocuous: as Armstrong (1999) shows, on the basis of lump-sum fees the purchaser of the content would not wish to resell to its rival.

Downstream competition is modeled as follows. Two distributors,  $i = A, B$ , supply content (and perhaps also other services) to a population of consumers. Consumers regard the products supplied by the two distributors as horizontally differentiated. Following Hotelling (1929), consumers are uniformly distributed on the unit interval, while distributor locations are fixed with one located at each end of the line. A consumer's utility (net of any charges) from the product supplied by firm  $i$  is  $u_i$ . A consumer located at  $x \in [0, 1]$  obtains net utility of  $u_A - tx$  if she buys from A and  $u_B - t(1 - x)$  if she buys from B, with transport cost  $t > 0$ . The marginal cost of supplying a consumer is taken to be zero.<sup>2</sup>

The market share of distributor  $i$  is given by the Hotelling formula,

$$s_i = \frac{1}{2} + \frac{u_i - u_j}{2t}. \quad (1)$$

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<sup>1</sup>The restriction to lump-sum payments rules out per-subscriber or per-viewer fees. Such fees might be infeasible due to technological constraints that limit the verifiability of subscriber or viewer numbers. Or they may be undesirable: having less information about consumers' willingness to pay than the distributor, the seller may prefer not to influence retailing decisions by setting usage-based fees. This is likely to be the case when the content seller operates in a different industry, as for a sports league.

<sup>2</sup>Little in the analysis is altered if there is a distribution cost per viewer. It is assumed that any fixed costs are sufficiently small that the distributors continue to operate.

It can be shown that total consumer surplus is given by

$$CS = \frac{1}{2}(u_A + u_B) - \frac{1}{4}t + \frac{1}{4t}(u_A - u_B)^2. \quad (2)$$

Utility  $u_i$  is given by

$$u_i = v_i - \delta n_i - p_i \quad (3)$$

where  $v_i$  reflects the quality of the distributor's content,  $n_i$  is the number (or intensity) of advertisements shown, and  $p_i$  is the subscription charge (if any) that is levied. The parameter  $\delta$  represents the perceived nuisance of an advertisement to viewers.

Quality  $v_i$  has two components: initial quality  $v_0$  and (if the distributor obtains this) the premium content  $v$ . We assume that the distributors are symmetric *ex ante* and normalise  $v_0 = 0$  for both firms. Thus a distributor's (relative) quality is determined by whether or not it, and/or its rival, obtains the premium content.

Suppose that if a firm supplies quantity of advertising  $n$  it receives advertising revenue  $R(n)$  per viewer. We assume that there are decreasing returns to supplying advertising:  $R$  is an increasing but concave function, i.e.  $R'(n) \geq 0 > R''(n)$ .

Timing of the game is as follows. In the first stage, distributors compete in contracting for premium content. In the second stage, distributors compete for consumers, simultaneously choosing prices and/or advertising intensities. Solving backwards, the analysis proceeds as follows. First, equilibrium outcomes in the downstream industry are derived for non-exclusive and exclusive contracts. Then, conditional on these outcomes, the seller's incentive to sign an exclusive deal at the contracting stage is assessed.

## 2.1 Subscription-funded distributors

When downstream distributors offer subscription services, both the prices and advertising intensities of the firms must be determined. In the second



stage, the profit of distributor  $i$  is

$$\pi_i = \left( \frac{1}{2} + \frac{v_i - \delta n_i - p_i - [v_j - \delta n_j - p_j]}{2t} \right) (p_i + R(n_i)). \quad (4)$$

Since  $p_i = v_i - u_i - \delta n_i$ , this can be rewritten in the form

$$\pi_i = \left( \frac{1}{2} + \frac{u_i - u_j}{2t} \right) (v_i - u_i + R(n_i) - \delta n_i).$$

Therefore it is a dominant strategy (i.e. regardless of market shares) for each distributor to choose advertising intensity  $n_1$  which maximizes  $R(n) - \delta n$ . The corresponding advertising revenue is denoted  $R_1$ .

*Non-exclusivity.* When both distributors supply the content,  $v_A = v_B = v$ . The profit of distributor  $i = A, B$  is given by

$$\pi_i = \left( \frac{1}{2} + \frac{p_j - p_i}{2t} \right) (p_i + R_1).$$

One can calculate that the symmetric equilibrium subscription price is given by

$$p_1 = t - R_1.$$

In order that the subscription regime does not collapse to the purely advertising-funded regime, we impose the restriction  $R_1 < t$ . Each distributor makes profit

$$\pi_1 = \frac{1}{2}t. \quad (5)$$

Consumer surplus is given by

$$CS_1^{NE} = v - \frac{5}{4}t + R_1 - \delta n_1. \quad (6)$$

Note that (i) consumers gain the entire value of the content,  $v$ , and (ii) since advertising revenue is passed on to consumers in the form of lower

subscription prices, the firms' optimal advertising intensity  $n_1$  is also the viewer optimum.

*Exclusivity.* Now suppose (w.l.o.g.) that A retails the content exclusively. Without available substitutes, B cannot match A's quality.<sup>3</sup> Market shares are given respectively by

$$s_A = \frac{1}{2} + \frac{(v - p_A + p_B)}{2t} ; s_B = \frac{1}{2} - \frac{(v - p_A + p_B)}{2t}.$$

One can show that the equilibrium prices are then

$$p_A = t - R_1 + \frac{1}{3}v ; p_B = t - R_1 - \frac{1}{3}v.$$

A's market share is given by

$$s_A = \frac{1}{2} \left( 1 + \frac{v}{3t} \right).$$

For the market to be competitive we require  $3t \geq v$ ; this condition is assumed henceforth. Profits of the two distributors are

$$\pi_A = \frac{1}{18t} (3t + v)^2 ; \pi_B = \frac{1}{18t} (3t - v)^2. \quad (7)$$

With exclusivity consumer surplus is lower than under non-exclusive distribution, with

$$CS_1^E = \frac{1}{2}v + \frac{1}{36t}v^2 - \frac{5}{4}t + R_1 - \delta n_1. \quad (8)$$

*Contracting.* We make certain simplifying assumptions about the contracting process. The seller can commit to exclusivity: thus, a potential buyer knows that, were it to reject the seller's offer, its rival would acquire the content exclusively. In addition it is assumed that the seller can extract

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<sup>3</sup>If B has an inferior substitute, then  $v$  can be reinterpreted as the *relative* value of the premium content. The analysis carries through unchanged.

the buyer's entire surplus by making a take-it-or-leave it offer.<sup>4</sup>

Suppose that the seller offers an exclusive contract to one of the distributors. Given that if agreement is not reached its rival will be granted the content exclusively, the distributor is willing to pay up to  $\pi_A - \pi_B$  for this contract. Therefore, the most revenue that the seller can obtain by contracting exclusively is

$$V_1^E = \frac{2}{3}v.$$

Alternatively, the seller might offer contracts to both distributors. In this case, each potential buyer faces a choice between supplying the content *as well as* its rival, or not purchasing and facing a rival with exclusive content. Each distributor is willing to pay up to  $\pi_1 - \pi_B$  for this contract; thus the seller's maximum revenue is twice this amount, yielding

$$V_1^{NE} = \frac{2}{3}v - \frac{1}{9t}v^2.$$

Clearly,  $V_1^E > V_1^{NE}$ ; thus the seller chooses exclusive contracting.<sup>5</sup> Compared with non-exclusivity, the seller gains  $\Delta V_1 = \frac{1}{9t}v^2$ , while consumers experience a loss, the difference in consumer surplus being given by

$$\Delta CS_1 = -\frac{1}{2}v + \frac{1}{36t}v^2 < 0.$$

(Distributor profits are the same in either case: both firms are left with net

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<sup>4</sup>As Armstrong (1999) discusses, in the case of symmetric bidders this outcome could also be achieved by means of an auction. Stennek (2007) analyses a more complex contracting process.

<sup>5</sup>If distributors are asymmetric *ex ante*, Armstrong (1999) shows that the seller will contract exclusively with the firm having the initial advantage. If the asymmetry is large, the seller's revenue may exceed  $v$ . Moreover, for highly asymmetric initial shares, total welfare and even consumer surplus may be greater under exclusivity.

profit  $\pi_B$ .) The effect of exclusivity on total welfare is therefore<sup>6</sup>

$$\Delta W_1 = -\frac{1}{2}v + \frac{5}{36t}v^2 < 0. \quad (9)$$

Note that with subscription-funded distributors, advertising at the downstream level has no effect on the equilibrium contracting choice. Advertising revenues merely lower consumer charges, raising consumer welfare.

## 2.2 Advertising-funded distributors

We now consider purely advertising-funded distributors, imposing the constraint  $p_i = 0$ . It is no longer necessarily the case that  $n_i = n_1$ ; instead expressions for the distributors' advertising intensities must be derived by solving for competitive equilibrium in each contracting situation.

*Non-exclusivity.* With identical qualities, the symmetric equilibrium advertising intensity,  $n_2$ , is defined implicitly by

$$\frac{R'(n_2)}{R(n_2)} = \frac{\delta}{t}. \quad (10)$$

Concavity of  $R$  implies that the function  $R'/R$  in the above expression is decreasing in  $n$ . With equal market shares, each distributor makes profit  $\pi_2 = \frac{1}{2}R_2$ , where  $R_2 = R(n_2)$ . Consumer surplus is given by

$$CS_2^{NE} = v - \delta n_2 - \frac{1}{4}t. \quad (11)$$

*Exclusivity.* Suppose that distributor  $A$  has secured the premium rights. Advertising intensities will now differ between the two firms. With  $i$  choosing advertising intensity  $n_i$ , the two distributors' profits are given respectively

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<sup>6</sup>Measurement of welfare on the advertiser market is sensitive to assumptions about the social benefit of advertising and is omitted.

by

$$\pi_A = \left( \frac{1}{2} + \frac{v - \delta n_A + \delta n_B}{2t} \right) R(n_A);$$

$$\pi_B = \left( \frac{1}{2} - \frac{v - \delta n_A + \delta n_B}{2t} \right) R(n_B).$$

First-order conditions yield the following implicit expressions for  $n_A$  and  $n_B$ :<sup>7</sup>

$$\frac{R'(n_A)}{R(n_A)} = \frac{\delta}{(t + v - \delta n_A + \delta n_B)} \equiv \frac{\delta}{2ts_A}; \quad (12)$$

$$\frac{R'(n_B)}{R(n_B)} = \frac{\delta}{(t - v + \delta n_A - \delta n_B)} \equiv \frac{\delta}{2ts_B}. \quad (13)$$

With  $v > 0$ , concavity of  $R(n)$  implies that  $n_A > n_2 > n_B$ . We can also infer that  $s_A > \frac{1}{2} > s_B$ . Firm  $i$ 's profit is  $s_i R_i$ , where  $R(n_i) \equiv R_i$ . With exclusive content A achieves higher profit for two reasons: it shows more adverts, thus gaining a higher revenue per viewer, and it wins a larger market share.

Without specifying  $R(n)$  it is difficult to draw firm conclusions concerning consumer surplus (and total welfare). Compared with non-exclusive distribution, A's consumers must now tolerate greater advertising and are unambiguously worse off. Those of A's consumers who would have watched B's programming under non-exclusivity suffer the additional disutility of higher transport costs. B's remaining consumers forgo  $v$ , but benefit from watching fewer advertisements. The overall impact for this group, i.e. the sign of  $-v + \delta(n_1 - n_B)$ , is ambiguous.<sup>8</sup> However, it is most likely that overall consumer surplus is lower with exclusive distribution.

*Contracting.* Following the approach in section 2.1, if the content supplier

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<sup>7</sup>These expressions imply that  $R'(n_i) > 0$  for  $i = A, B$ . Intuitively, even if  $R(n)$  were decreasing beyond some point, it cannot be an equilibrium for a firm to choose  $n$  such that  $R' \leq 0$ : reducing  $n$  would (weakly) increase both the number of viewers and revenue per viewer, unambiguously raising profit.

<sup>8</sup>For highly concave  $R$  this might perhaps be positive, as A's increased attractiveness induces a large reduction in advertising by B.

contracts exclusively its revenue is

$$V_2^E = s_A R_A - s_B R_B;$$

while if it contracts with both distributors its revenue is

$$V_2^{NE} = R_2 - 2s_B R_B.$$

The seller's gain from exclusivity is therefore

$$\Delta V_2 = s_A R_A + s_B R_B - R_2. \quad (14)$$

$\Delta V_2$  may be positive or negative depending on the concavity of  $R(n)$ . To illustrate this, we consider two specific cases. From (12), (13) and the expressions for market shares, (14) can be rewritten as

$$\Delta V_2 = \frac{1}{2t\delta} [(t+y)^2 R'_A + (t-y)^2 R'_B - 2t^2 R'_2]. \quad (15)$$

where  $y \equiv v - \delta(n_A - n_B) > 0$  and  $R'(n_i) \equiv R'_i$ . If  $R$  is approximately linear then  $R'_A \cong R'_2 \cong R'_B > 0$ . The sign of  $\Delta V_2$  is then determined by  $2y^2 > 0$ : thus the content supplier prefers exclusive selling, as in the subscription regime.

If  $R$  is highly concave, on the other hand, non-exclusive distribution may be the more profitable approach. Suppose, for example, that  $R$  is piecewise linear such that

$$R(n) = \begin{cases} r_0 n & \text{for } n \leq \hat{n} \\ r_0 \hat{n} + r_1 (n - \hat{n}) & \text{for } n > \hat{n} \end{cases}$$

where  $r_0 > r_1$ . Suppose further that  $n_B < n_2 < \hat{n} < n_A$ . Expression (15) can be rewritten as

$$\Delta V_2 = \frac{1}{2t\delta} [y^2 (r_1 + r_0) - t(t+2y)(r_0 - r_1)]. \quad (16)$$

With  $r_0 - r_1$  sufficiently large,  $\Delta V_2 < 0$  and the seller prefers non-exclusive distribution.<sup>9</sup>

Intuitively, a highly concave advertising revenue function  $R$  implies that a distributor with exclusive content gains little additional advertising revenue per viewer, although it does benefit from increased market share, while its rival's loss of revenue per viewer is larger. It is then more likely that the seller's gain in revenue from the contracting firm,  $\pi_A - \pi_2$ , is insufficient to offset the forgone payment of  $\pi_2 - \pi_B$  from the other firm.

An advertising cap, such as that imposed on TV broadcasters in EU member states, might have this effect. By limiting the airtime given over to advertising in a given period, an advertising cap prevents per-viewer revenue from being raised further by increasing advertising intensity beyond this point, creating a kink in the revenue function. If the cap is binding for a distributor with exclusive content but lies above the desired advertising intensity of its competitor, the former is unable to increase its per-viewer revenue further while its rival reduces its advertising and earns lower per-viewer revenue. The overall result will be lower revenues from exclusive than from non-exclusive distribution.

### 3 Integration of advertising with content

In some instances advertising is integrated into the content itself, such as when stadium advertisements displayed during sports matches are viewed by television audiences. In this case, advertising revenues accrue directly to the content seller rather than to the distributor(s). A similar situation arises when television viewing promotes sales of related products by the content provider, such as merchandising revenues. The impact of upstream advertising revenues on the contracting choice is the subject of this section.

To simplify the analysis we make the following assumptions: (i) upstream

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<sup>9</sup>Numerical simulations show that such an outcome is possible.

advertising intensity is fixed and advertising revenue per viewer is  $r$ , (ii) content value  $v$  incorporates the disutility of these advertisements, and (iii) there is no additional advertising at the distributor level (as shown above, when distributors charge subscription fees this makes no difference to the contracting choice). The downstream industry is subscription-funded, with distributor  $i$  setting a price  $p_i$  to its consumers.

Equilibrium outcomes in the downstream industry are analogous to those of section 2.1 but with  $n = R = 0$ . However, in contracting with distributors the content seller now takes account of both distributor payments (again assumed to be lump-sum) and advertising revenues. Following the approach above, with exclusive contracting the seller's total revenue is

$$V_3^E = \frac{2}{3}v + r \left( \frac{1}{2} + \frac{1}{6t}v \right);$$

while non-exclusive contracting yields total revenue

$$V_3^{NE} = \frac{2}{3}v - \frac{1}{9t}v^2 + r.$$

Comparing the two, the seller's gain from exclusivity is

$$\Delta V_3 = \frac{1}{9t}v^2 - \frac{r}{6t}(3t - v).$$

Thus the seller prefers exclusive contracting if and only if the following condition is satisfied

$$\frac{2}{3} \frac{v^2}{(3t - v)} > r. \tag{17}$$

With higher  $r$ , upstream advertising revenues become more important relative to distributor fees. This raises the value of reaching the whole market, favoring non-exclusivity. Higher  $v$  and lower  $t$  have similar effects: in both cases contracting is more likely to be exclusive. There are two reasons for this. First, the exclusive distributor's market share is greater, mitigating the



sacrifice in advertising revenues. In addition, the increment in distributor fees from exclusive contracting is increasing (resp. decreasing) in  $v$  (resp.  $t$ ).

Compared with non-exclusivity, the seller's gain from exclusive contracting is lower than that in section 2.1 by an amount  $\frac{x}{6t}(3t - v)$ . The difference in consumer surplus is identical. The impact on total welfare is thus correspondingly lower; i.e., with upstream advertising revenues exclusivity is even more socially undesirable.

Note that, due to vertical separation and the restriction to lump-sum fees, there is an uninternalised externality which reduces the seller's benefit under exclusive contracting. The seller would like A to reduce its retail price  $p_A$  in order to boost its market share and raise the advertising revenue accruing to the seller, given by  $r_{SA}(p_A)$ . But in the absence of per-subscriber fees, which could be reduced to internalise the externality, this cannot be achieved. (With non-exclusive selling the inefficiency does not arise as reach is universal.)

## 4 Discussion and conclusion

This paper examines incentives for exclusive distribution of content in the presence of advertising. We find incentives for exclusivity to be sensitive to the method of revenue generation, qualifying the conclusion of previous literature that when content rights are sold on a lump-sum fee basis the supplier should sell exclusively to a single distributor. With pure advertising funding and no subscription fees, or when advertising revenues accrue directly to the content provider, non-exclusive distribution—the socially efficient outcome—may instead be preferred. In essence, the presence of advertising revenues creates a desire for greater reach, tending to favor non-exclusivity.

The analysis has implications for the supply of content rights that are sold for lump-sum fees, such as television rights sold by sports leagues. In many (especially European) countries, the pay TV sector has grown substan-

tially over the past two decades and now tends to acquire the most attractive sports rights. The migration of premium content from free-to-air to subscription services may explain the increased prevalence of exclusive contracts for such rights.<sup>10</sup> By contrast, in the USA, where many important sports fixtures remain on FTA television,<sup>11</sup> packages of rights are typically sold to several networks. The findings in this paper provide an explanation for this international difference in contracting approaches.

Broadcasting regulations may also impact upon the contracting choices of content sellers by affecting the ability to raise revenue from different sources. In EU member states key sporting events may be “listed”, requiring these to be shown free-to-air.<sup>12</sup> As we have shown, FTA distribution can be expected to affect the seller’s contracting decision: non-exclusivity may well be preferred, even in the absence of additional population coverage requirements (typically also specified by the listing). A cap on the amount of advertising that broadcasters may show, as exists in the EU, generates a highly concave revenue function at this point. If this occurs over the relevant interval, the bias towards non-exclusive distribution under free-to-air broadcasting is strengthened.

Beyond the television sector, the findings have implications for internet distribution of content. Initially, many internet content distribution services were financed through advertising (e.g. video streaming service Joost). However, as internet distribution has developed and content providers have clamped down on illegal file-sharing, subscription and pay-per-download services (e.g. music services iTunes and Rhapsody, and video streaming services Netflix and LOVEFiLM) have largely replaced the early free download sites.

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<sup>10</sup>For example, after the launch of pay TV in the UK the FA Premier League chose to sell all of its television rights to a single bidder, the satellite broadcaster BSkyB, until forced by regulatory intervention to split its rights into several packages and award these to more than one bidder (see European Commission Decision IP/06/356, 22 March 2006).

<sup>11</sup>See Szymanski (2006) for a discussion of the reasons for this.

<sup>12</sup>Hansen and Kyhl (2001) considers the impact of the ban on pay-per-view broadcasting for listed events.

Depending upon the form of payments to content providers—i.e. whether lump-sum or usage-based fees are paid—the creation of paywalls might be expected to affect the distribution pattern, with greater prevalence of exclusivity.

One caveat should be noted: the analysis in this paper is predicated on lump-sum payments for content. This assumption fits the sale of content such as sports rights, for which such payments are the norm. Relaxing this restriction alters the seller’s incentives: with per-subscriber fees, selling to both distributors becomes more attractive.<sup>13</sup> This alternative assumption is appropriate for the wholesale distribution of TV channels: where this occurs, per-subscriber fees or revenue-sharing arrangements are typically used. Thus our analysis is relevant to the sale of content rights, rather than the wholesale distribution of channels.

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<sup>13</sup>As Armstrong (1999) shows for a pure pay TV industry, a per-subscriber fee may be used to extract the content value  $v$  from all consumers via non-exclusive distribution; in general (except for highly asymmetric distributors) this yields higher revenue for the seller. Weeds (2012) explores in greater depth the incentives for exclusivity when per-subscriber fees are used.

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