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ABSTRACT

TV Wars: Exclusive Content and Platform Competition in Pay TV*

The paper examines incentives for exclusive distribution of premium television content such as live sports and Hollywood movies. Static analysis shows that a pay TV operator with premium content always chooses to supply its retail rival, using per-subscriber fees to soften competition. Incorporating platform competition, however, exclusive content gives its holder a market share advantage that is amplified by dynamic effects. Under some conditions this benefit outweighs the opportunity cost of forgone wholesale fees, making exclusivity the equilibrium choice. The analysis explains the observed incidence of content exclusivity in pay TV. Specific dynamic mechanisms are explored, and welfare and policy implications are discussed.

JEL Classification: D43, L13, L41 and L82
Keywords: exclusivity, foreclosure and pay TV

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1 Introduction

Programme content plays a key role in pay TV competition. In choosing between pay TV operators, subscribers base their choice largely on the programming available from each one. In particular, highly attractive "premium" content, especially live coverage of popular sports events and first-release Hollywood movies, drives consumer choice.[1] By retaining exclusive content an operator gains market share from its rivals, making this potentially attractive as a competitive strategy.

Control over premium content by pay TV operators, and whether and on what terms this programming is wholesaled to rivals, has in recent years been the focus of regulatory attention in many countries, especially in Europe. As well as a concern that consumers should be able to access important content regardless of their choice of transmission system (or "platform", e.g. direct-to-home (DTH) satellite, cable), regulators and antitrust authorities fear that premium content rights could be used to implement *input foreclosure*. By refusing to wholesale attractive content under its control, an operator may be able to exclude a rival or impede its growth, gaining an advantage in the pay TV retail market.

Access to premium television content is an on-going competition issue in a number of European countries. In the UK, the acquisition and exploitation of premium content rights has been the subject of repeated antitrust investigations in recent years. In 2002 the Office of Fair Trading investigated satellite-based pay TV operator BSkyB's wholesale supply of premium sports and movie channels, its findings in effect setting down the terms under which

[1] Rupert Murdoch is reported to have told the 1996 annual meeting of News Corporation (the parent company of BSkyB) that sport was the "battering ram" of pay TV.

these channels could be supplied to other retailers (notably cable), though without mandating wholesale supply.[2] In 2007 communications regulator Ofcom opened a competition investigation into pay TV, focusing on access to premium content.[3] Concluding this process, in 2010 Ofcom's *Pay TV Statement* imposed a far-reaching "wholesale must offer" remedy requiring BSkyB to supply its premium sports channels *Sky Sports 1* and *Sky Sports 2* to competing retailers on other platforms on regulated terms; the remedy has been implemented but is currently (as of 2011) under appeal by several parties. Meanwhile the supply of movies on pay TV has been referred to the Competition Commission for further investigation.

Elsewhere in Europe, wholesale must offer remedies have been imposed as part of merger clearance undertakings in Spain (*Sogecable/Via Digital*, 2002), Italy (*Newscorp/Telepiù*, 2003) and France (*CanalSat/TPS*, 2006).[4] Each of these cases involved the merger of the two leading, satellite-based pay TV operators in that country. Other undertakings restricted the duration and scope of exclusive contracts for upstream content rights and required satellite platform access to be granted to third party channels. Exclusive retailing has also been the subject of regulatory attention: in France, IPTV-based entrant Orange/France Telecom's practice of tying its premium sports and movie channels, *Orange Sport* and *Orange Cinéma Séries*, to its triple-play service of telephony, broadband and television has been subject to regulatory investigation and possible future legislation.

[2] See Office of Fair Trading, *BSkyB: The outcome of the OFT's Competition Act investigation*, December 2002.

[3] See Ofcom, *Pay TV market investigation: Consultation document*, 18 December 2007; Ofcom, *Pay TV second consultation: Access to premium content*, 30 September 2008; Ofcom, *Pay TV phase three document: Proposed remedies*, 26 June 2009; and Ofcom, *Pay TV Statement*, 31 March 2010.

[4] On 21 September 2011 the French Autorité de la Concurrence withdrew merger clearance, following its finding that Canal Plus Group had breached several of the commitments given to obtain approval. In particular, the Autorité found that Canal Plus had delayed giving third party distributors access to the seven channels it was required to unbundle, and had undermined the quality of some of these channels. The merger has been renotified and a new investigation has been opened.

Concerns over exclusive TV content have not arisen to the same extent in the USA, for several reasons. First, many of the important live sports events are carried on the major free-to-air networks: these rights have not become the key instrument of competition between pay TV operators that they are in Europe, and their control has not become as concentrated. Secondly, the Program Access Rules introduced under the 1992 Cable Act compel vertically integrated distributors (which include the major cable operators) to offer satellite-delivered programming in which they have an ownership stake to other retailers on non-discriminatory terms. These rules were brought in before competing pay TV platforms were launched, rather than *ex post* as in Europe, which may have helped prevent similar cases from arising. Nonetheless, some disputes have arisen. The "terrestrial exemption"[5] has allowed cable incumbents to deny regional sports programming to cable overbuilders,[6] satellite operators[7] and fibre-based services.[8] Concern has also been expressed over exclusive televisation contracts negotiated with sports leagues by satellite operators: in 2007 a number of senators expressed outrage at the prospect of Major League Baseball following the National Football League in signing an exclusive contract with DirecTV; agreement was subsequently reached with cable.

A puzzling feature of the pay TV sector is that, even when channel supply

[5]The Program Access Rules do not apply to content that is terrestrially delivered (e.g. by cable) to the head-end of the cable system. In 2010 the Federal Communications Commission decided to end the terrestrial exemption. As well as benefiting satellite operators and cable overbuilders, this decision assists the emerging fibre-based TV operations of Verizon and AT&T.

[6]E.g. in Kansas City, Comcast and Time Warner used the terrestrial exemption to withhold college sports programming from Everest Connections Corp., a small cable entrant. Note that in the USA, as elsewhere, cable overbuilding is rare, thus instances of cable-to-cable exclusivity are uncommon.

[7]E.g. in Philadelphia, Comcast SportsNet is not available to satellite operators DirecTV and Dish Network.

[8]In San Diego, Cox Communications has withheld access to San Diego Padres games from AT&T's U-Verse video service. In New York, Cablevision has barred U-Verse and Verizon's FiOS video service from carrying the high-definition format of its Madison Square Garden networks, which televise local sports matches.

arrangements are freely negotiated in the absence of regulation, a variety of patterns of exclusivity are observed. In many instances a vertically integrated operator chooses to supply its premium content to rival retailers, earning wholesale fees and additional advertising revenues by doing so. In other cases, however, premium channels are withheld, resulting in exclusive retail supply and possible foreclosure.

Examination of international pay TV markets reveals two broad patterns. First, exclusive content is often observed between operators that compete head-to-head on the same type of platform (intra-platform competition), especially satellite-to-satellite. Prior to merger, satellite pay TV operators in Italy (Stream and Telepiù) and France (CanalSat and TPS) competed on the basis of exclusive premium content, while in Scandinavia satellite operators Canal Digital and Viasat continue to do so. Similarly, in the USA satellite radio operators Sirius and XM each held exclusive content prior to their merger in 2008. However, non-satellite competitors have typically been supplied: in Italy Telepiù supplied its premium channels for distribution to Stream's *cable* (but not its satellite) subscribers; the Scandinavian satellite operators supply their premium programming to cable, digital terrestrial (DTT) and IPTV-based rivals, but not to one another.

Secondly, exclusivity may be employed as a market entry strategy by emerging platforms. In European countries where broadband investment has facilitated the entry of IPTV operators (typically telecoms incumbents), these entrants into pay TV often employ exclusive content to attract subscribers to their service. Orange/France Telecom's exclusive sports and movie channels and Belgacom's exclusive retailing of the Belgian Jupiler (premier) football league are instances of this phenomenon: none of this content is offered to other retailers or their subscribers.[9] In the USA, satellite operator DirecTV

[9]Belgacom has held exclusive contracts for the Jupiler League since 2005. Apart from sublicensing a few live matches to two free-to-air public channels, it retails this content to its own telephony subscribers only. The author thanks Christian Huveneers of the Belgian Competition Council for this information.

facilitated its entry into the pay TV market, in the face of entrenched cable incumbents, with its exclusive *NFL Sunday Ticket* package.

This paper addresses two questions. First, (how) can the observed patterns of exclusivity and wholesale supply in pay TV be explained? Secondly, what are the implications of content exclusivity for consumers and for competition policy? To answer these questions, we examine incentives for exclusive distribution of premium content in pay TV. Static analysis shows that a pay TV operator with premium content always chooses to supply its retail rival, using per-subscriber fees to soften competition and extract revenues. Incorporating platform competition, however, exclusive content gives its holder an initial market share advantage that is amplified by dynamic effects. Under certain conditions, this benefit outweighs the opportunity cost of forgone wholesale revenues and exclusivity becomes the equilibrium choice. This analysis can explain the observed incidence of exclusive content in pay TV markets in several countries. The dynamic mechanism is illustrated using specific cases, also lending further discussion of welfare and policy implications.

Exclusivity in pay TV is the subject of four papers related to this one. Armstrong (1999) analyses two issues. First, he discusses the possibility of vertically-integrated operators entering into collusive agreements to exchange programming. Secondly, he analyses incentives for exclusive supply of premium content in pay TV, under lump-sum and per-subscriber fees. Harbord and Ottaviani (2001) analyse contractual arrangements and competition in pay TV, with particular reference to the UK industry. Stennek (2007) assesses the implications of exclusive distribution for investment in programme quality, in a model with lump-sum wholesale fees. Hagiu and Lee (2011) examine links between exclusivity and control over retail pricing, in a setting where content providers and platforms are vertically separated.

More widely, there is an extensive literature on licensing of a cost-reducing innovation (an analogous situation to this one of supplying a quality-raising

input): *inter alia*, Kamien and Tauman (1986), Katz and Shapiro (1986), Jehiel, Moldovanu and Stacchetti (1996), Segal (1999) and Jehiel and Moldovanu (2000). Literature on the economics of vertical foreclosure is also very extensive: see, *inter alia*, Salinger (1988), Hart and Tirole (1990), Ordover, Saloner and Salop (1990), Bernheim and Whinston (1998), Riordan (1998), and the survey by Rey and Tirole (2007), while dynamic leveraging mechanisms—in this case tying—are modelled by Carlton and Waldman (2002) and Choi and Stefanadis (2001).

The modelling of pay TV competition adopted in this paper follows the approach (based on Hotelling) established 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 papers examine a number of issues, including content differentiation, advertising intensity and comparisons of welfare under pay TV and free to air (advertising-financed) television. None of these considers content exclusivity, however.

The contribution of this paper is as follows. The theory of vertical foreclosure is not new. Rather, the paper demonstrates the role of exclusive content in a foreclosure strategy and illuminates the circumstances in which exclusivity is likely to arise. The analysis derives from a modelling framework commonly used to model broadcasting competition which captures the key features of the industry, thus yielding implications for the pay TV sector. The framework has deliberately been set up such that vertical contracting inefficiencies do not arise, in order to examine other motives for exclusivity. The topic is highly policy-relevant, at a time when competition authorities and media sector regulators in Europe and elsewhere are grappling with issues of content exclusivity and the supply of pay TV services. This paper informs those policy debates.[10]

The paper is structured as follows. Section 2 examines incentives for

[10]This work has been extensively cited in the Ofcom Pay TV market investigation and the UK Competition Commission Movies on Pay TV market investigation.

a pay TV operator with premium content to supply its retail rival, using a static framework. Section 3 incorporates dynamic competition, adding a future benefit related to current market share, and examines how this affects incentives towards exclusivity. Section 4 develops a number of specific examples, illustrating how the dynamic effect may arise. This allows welfare implications to be assessed, and provides explanations for several distinct cases in which exclusivity has been observed. Section 5 concludes.

2 The supply of content in pay TV

This section investigates incentives for a pay TV operator with premium content to supply this to a retail competitor. Premium content may be thought of as a television channel (or channels) containing programming that is highly attractive to viewers, such as live coverage of popular sports or the latest Hollywood movies. This content has no substitutes: equally attractive programming cannot be created or acquired by the rival. The premium content is assumed to be produced by the operator itself, perhaps using bought-in televisation rights or externally-produced programming.[11] As the channel packager, this operator may also sell advertising airtime and receives any advertising revenue that accrues. If the content is supplied to the rival, the operator receives wholesale fees in addition to its own retail revenues, and its advertising revenues accrue in proportion to the combined audience.

2.1 The model

Following Anderson and Coate (2005) and others, competition in the pay TV industry is modelled as follows. There are two operators, $i = A, B$, which

[11] This assumption is convenient but not necessary: the content provider may be a third party as long as the retailer has exclusive rights and can choose to sublicense the channel if it wishes.

supply television channels (and perhaps also other, e.g. telecoms, services) to a population of consumers (viewers). Consumers regard the products of the two retailers as horizontally differentiated.[12] Following Hotelling (1929), consumers are uniformly distributed on the unit interval, while retailers' locations are fixed at each end of the line.[13] The utility provided by product i is denoted u_i. The 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 zero.[14]

Utility u_i is given by $u_i = v_i - p_i$, where v_i represents the quality of i's content (taking account of disutility from any advertising carried) and p_i is the subscription charge. Quality v_i is made up of two components: basic channels, which are (collectively) of quality v_0, and—if the operator has access to this—premium content v. The premium content is controlled by A, which supplies this to its own subscribers. If it chooses, A may also wholesale the premium content to B: whether or not resale takes place is the subject of this paper. Regarding v_0, it is assumed that the retailers are symmetric *ex ante* in the sense that v_0 is identical; v_0 is assumed to be sufficiently large for the market always to be covered. Thus their relative quality depends crucially upon whether or not A supplies premium content to B.

The game takes place as follows. At the start of the game, A chooses whether or not to resell its premium content to B. If it chooses to resell, A offers the premium content to B in return for a per-subscriber fee, c; B may either accept or reject.[15] Then, the operators compete in the retail

[12] Horizontal differentiation arises from differences in transmission technology (e.g. cable, satellite), basic (non-premium) programming (e.g. entertainment, news, documentaries, dramas), and/or bundled services (e.g. telecommunications).

[13] For a discussion of channel resale in alternative oligopoly models see Harbord and Ottaviani (2001) section 3.3.1.

[14] 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 both broadcasters continue to operate.

[15] Per-subscriber fees (or, equivalently, revenue-sharing arrangements) are commonplace in wholesale contracts in the pay TV sector. The analysis can alternatively be carried out using a two-part tariff; however, empirically, fixed fees are uncommon in wholesale channel

market, simultaneously choosing prices. As the channel provider, A also earns advertising revenues of r per viewer of premium content (regardless of retailer).

The analysis proceeds as follows. First, retail market outcomes are derived assuming exclusivity and non-exclusivity in turn. Then, in section 2.2, equilibrium is derived by comparing A's profits under the two scenarios.

When A supplies the premium content exclusively, equilibrium prices[16] and profits are

$$\begin{array}{ll} p_A^{excl} = t + \frac{1}{3}(v - 2r); & p_B^{excl} = t - \frac{1}{3}(v + r); \\ \pi_A^{excl} = \frac{1}{18t}(3t + v + r)^2; & \pi_B^{excl} = \frac{1}{18t}(3t - v - r)^2. \end{array} \tag{1}$$

A gains the larger market share, with $s_A^{excl} = \frac{1}{2} + \frac{1}{6t}(v + r)$. For the market to remain competitive the following condition is required, and is assumed henceforth

$$3t \geq v + r. \tag{2}$$

When A supplies its premium content to B, charging a per-subscriber fee c, equilibrium prices are symmetric at $p^{ne} = t + c$ and market shares are one-half each. Profits are then

$$\pi_A^{ne} = \tfrac{1}{2}t + c + r; \qquad \pi_B^{ne} = \tfrac{1}{2}t.$$

Note that the per-subscriber fee is passed on in full to consumers, thus B's profit is independent of c. Since π_A^{ne} is strictly increasing in the per-subscriber fee c, A would like to raise c as high as possible. It is a dominant strategy for B to accept any contract with a per-subscriber fee up to v, but to reject

contracts. The addition of a lump sum payment F allows firm A to extract additional surplus from B, but the findings of the paper are qualitatively unchanged.

[16] The non-negativity constraint on prices is ignored. One could assume that parameter values are such that prices are positive. Alternatively, negative implicit prices might be achieved by selling the TV service as a bundle with other (e.g. telecoms) products at a discounted price.

anything higher than this.[17] Thus, A offers and B accepts a contract with per-subscriber fee equal to v. Equilibrium retail prices for each are then $p^{ne} = t + v$, and A's profit is

$$\pi_A^{ne} = \frac{1}{2}t + v + r. \tag{3}$$

2.2 Equilibrium

From (1) and (3), A's gain from exclusivity as compared with non-exclusivity, $G_0 \equiv \pi_A^{excl} - \pi_A^{ne}$, is given by

$$G_0 = -\frac{1}{18t}(v + r)(12t - v - r) < 0. \tag{4}$$

Thus, A finds exclusivity less profitable than non-exclusivity. This gives us the first proposition.

Proposition 1 ***(Static equilibrium).***

In the static model with per-subscriber fees, the pay TV operator with premium content always chooses to supply its retail rival.

Compared with non-exclusivity, exclusivity imposes two opportunity costs on A: forgone wholesale fees from B and smaller advertising revenues due to reduced audience reach. The analysis shows that these costs exceed A's benefit from supplying its premium content exclusively, which gives it a larger retail market share and higher retail price. The result holds even in the absence of advertising revenues (i.e. when $r = 0$); with advertising, it is even stronger. Thus, in the static competition model it is never rational for the integrated operator to refuse to supply its premium content to its rival.

[17] If $c > v$, B would make higher profit by refusing to purchase the content and instead cutting its price by v. It is assumed that the channel provider A cannot contractually require carriage and specify retail prices (resale price maintenance is illegal in most antitrust jurisdictions). Otherwise it might be possible to use such a contract collusively to raise retail prices further, extracting part or all of v_0 from consumers. This would also require a lump sum payment to compensate B (e.g. a two-part tariff with negative F).

It can readily be shown that G_0 is decreasing in its three arguments, t, v and r. Intuitively, the comparative static results can be explained as follows.

- With greater horizontal differentiation, A finds it harder to win subscribers from its rival, reducing its ability to replace forgone wholesale business with direct retail sales.
- More valuable content raises the opportunity cost of forgone wholesale fees.
- Greater advertising revenue per viewer raises the opportunity cost of reduced reach.

Defined as the sum of consumer and producer surplus, welfare under non-exclusivity is given by $W_0^{ne} = v_0 + v + r - \frac{1}{4}t$. This is higher than welfare under exclusivity by an amount[18]

$$\Delta W_0 = \frac{1}{36t}(v + r)(18t - 5(v + r)) > 0.$$

This outcome can be explained intuitively as follows. Non-exclusivity is allocatively efficient: all consumers with positive willingness to pay receive the premium content, regardless of their choice of retail provider. The per-subscriber fee is a sufficient instrument to extract all consumer surplus: despite apparent retail competition, the supply of premium content is effectively monopolized. With equal weight on firms and consumers, welfare is higher under non-exclusivity. However, consumers would be better off under exclusivity as they would benefit from stronger price competition: compared with exclusivity, consumer surplus is lower under non-exclusivity with the

[18] Welfare results are sensitive to the assumption that firms are initially symmetric. Allowing for asymmetric firms, Harbord and Ottaviani (2001) find non-exclusivity to be welfare-improving provided that differences in initial programming v_0 are not too large.

difference given by[19]

$$\Delta CS_0 = -\frac{1}{36t}(v+r)(18t+v+r) < 0.$$

2.3 Discussion

The key to the non-exclusivity result is efficient contracting, which is achieved by the per-subscriber fee. Commonly used in wholesale channel supply in TV, a per-subscriber fee has two implications. For the rival retailer, the per-subscriber fee represents a marginal cost of supplying an additional consumer. For the vertically integrated operator, it creates an opportunity cost of winning subscribers from its rival. The result is a softening of retail price competition which allows the holder to extract the full value of premium content. This happens despite—in fact, because of—supplying its rival: if A were to refuse to supply B, some consumers located closest to B would no longer view the premium content and their potential surplus would be forfeited. With a per-subscriber fee, the efficient allocation—all consumers receive premium content—is also the profit-maximizing choice, and hence is implemented by the holder. The finding is in accordance with the wider literature on contracting in the presence of externalities (of which this is an instance): provided sufficient instruments are available, a seller always chooses the efficient allocation.[20]

This might perhaps be seen as grounds for regulation to reduce wholesale channel fees, in order to lower retail prices for premium content. With the

[19] This finding may be sensitive to the modelling approach. With homogeneous consumer valuations (v is the same for all viewers), it is easy for the firm to extract consumer surplus using a per-subscriber fee. If, instead, demand for premium content were downward-sloping, consumers would retain some surplus (except under perfect price discrimination) and this finding might be qualified. Such an approach would however raise the issue of double marginalisation which, if it could not be overcome through more complex vertical instruments, would render non-exclusive supply less efficient.

[20] See, *inter alia*, Segal (1999). In Stennek (2007) the restriction to lump-sum payments (per-subscriber fees are not permitted) biases the analysis towards exclusivity; his results are unlikely to extend to more general contractual forms.

per-subscriber fee set at or close to their willingness to pay, consumers gain little net benefit. However, wholesale regulation may undermine the holder's willingness to supply: then an obligation to supply may also be required. More fundamentally, wholesale regulation that reduces the holder's revenues can be expected to weaken incentives for content production and investment in programme quality.

Although the holder of premium content is modelled as a vertically integrated operator, the same outcome might be expected for an unintegrated content provider as long as it has similar instruments available (in particular, the ability to set appropriate per-subscriber fees to retailers).[21] Commitment power is needed, either to guarantee exclusivity or to assure a retailer that rivals will not receive preferential terms. Such commitments may be feasible in the television industry: wholesale contracts can specify exclusivity, and most favoured nation clauses or a common ratecard may be used to facilitate non-discrimination. Similarly, vertical separation alone does not ensure wide distribution of content: if a situation were found in which an integrated operator would choose exclusivity, the same might be expected of an unintegrated content provider (subject to it having commitment power).

Notice that v and r appear together in the above profit expressions. Advertising revenue r is equivalent to a reduction in the seller's (net) marginal cost. As noted in the introduction, there are strong similarities between a quality-raising input and a cost-reducing technology: it is therefore unsurprising that the two terms appear identically in this analysis. In the remainder of the paper the (somewhat redundant) term r is dropped.

The analysis so far presents us with a puzzle: the findings suggest that pay TV content will always be supplied non-exclusively; yet, in several instances, exclusivity is observed. What can explain this? It is of course possible that

[21] The main difference between an integrated and unintegrated content supplier is that, for the former, the wholesale fee charged to outside retailers automatically constitutes its own opportunity cost of winning subscribers, while in the latter case appropriate wholesale fees must be set for all retailers.

wholesale negotiations may break down occasionally, but exclusivity seems too prolonged and the pattern too consistent for this to be a plausible explanation. Rather, there would seem to be an additional factor not captured by the static analysis: the possibility of some dynamic benefit from taking market share from a competitor. Dynamic competition is examined next.

3 Dynamic competition

In this section, the model of section 2 is augmented by adding a dynamic dimension to competition. Specifically, it is assumed that a pay TV operator's future profit is increasing in its current market share. A reduced-form approach is adopted here; in section 4 a number of specific models are developed to illustrate the mechanism and its effects in more detail.

3.1 A reduced form model

Suppose that in addition to current profit, operator $i = A, B$ obtains a future benefit $b(s_i) \geq 0$, which satisfies $b' > 0$ and $0 < b'' < 4t$.[22] A convex relationship might exist if tomorrow's market share and tomorrow's price are both increasing in today's market share, for example. The benefit function is assumed to be identical for the two retailers. Advertising revenue is ignored.[23]

Under exclusivity, equilibrium prices are defined implicitly by

$$p_i^{excl} = \frac{1}{2}\left(t + v + p_j^{excl} - b'(s_i)\right) \quad \text{for} \quad i = A, B, \; j \neq i.$$

Prices are decreasing in b': adding in dynamic competition, consumers benefit from lower prices. With its larger initial market share due to exclusive content, convexity of $b(s_i)$ implies that A gains a higher marginal benefit from

[22] The upper bound on b'' ensures that profit functions are concave in p_i, and is a sufficient condition for uniqueness of equilibrium.

[23] Or, given the results above, v could be considered as the sum of the viewer's willingness to pay and advertising revenue per viewer.

a further increase in its market share than does its rival. Hence A reduces its price by more than B, and gains a larger market share than in the static case. In effect, A's initial advantage from premium content is amplified by price competition.

Under non-exclusivity, contracting takes place with a per-subscriber fee equal to v (as before). Equilibrium prices are symmetric at $p^{ne} = t + v - \overline{b}'$, where $\overline{b}' \equiv b'\left(\frac{1}{2}\right)$. Again, prices are lower than in the static model, but market shares are equal.

To make further progress we use the quadratic form $b(s_i) = \frac{1}{2}\beta s_i^2$, where $0 < \beta < 4t$.[24] Profits under exclusivity are given by

$$\begin{aligned} \pi_A^{excl} &= \frac{1}{8(3t-\beta)^2}(4t-\beta)(3t+v-\beta)^2; \\ \pi_B^{excl} &= \frac{1}{8(3t-\beta)^2}(4t-\beta)(3t-v-\beta)^2, \end{aligned}$$

while profits under non-exclusivity are

$$\pi_A^{ne} = \tfrac{1}{2}t - \tfrac{1}{8}\beta + v; \qquad \pi_B^{ne} = \tfrac{1}{2}t - \tfrac{1}{8}\beta.$$

The condition for the market to remain competitive under exclusivity is $\beta < \beta_{\max} \equiv 3t - v$; parameter values are assumed to be such that this condition holds over the relevant ranges.[25]

A's gain from exclusivity (compared with non-exclusivity) is given by

$$G = \frac{v}{4(3t-\beta)}\left(v\frac{(4t-\beta)}{2(3t-\beta)} - (8t-3\beta)\right). \tag{5}$$

The following proposition describes incentives for exclusivity, which follow from the properties of G.

[24] Adding a linear term to $b(s_i)$ makes no difference to the analysis. Importantly, a linear form alone cannot generate incentives for exclusivity.

[25] Specifically, $\widehat{\beta}_1 < \beta_{\max}$ requires $t > \frac{5}{3}v$ and $\widehat{v} < v_{\max} \equiv (3t-\beta)$ requires $\beta \in \left(\frac{12}{5}t, 3t\right)$.

Proposition 2 ***(Conditions for exclusivity).***

Preferences towards exclusivity are as follows.

(a) There exists a critical value $\widehat{\beta}_1$ *such that the operator with premium content prefers non-exclusivity for* $\beta \in \left[0, \widehat{\beta}_1\right)$ *and prefers exclusivity for* $\beta \in \left(\widehat{\beta}_1, \beta_{\max}\right]$.

(b) There exists a critical value $\widehat{v}$ *such that the operator with premium content prefers non-exclusivity for* $v \in (0, \widehat{v})$ *and prefers exclusivity for* $v > \widehat{v}$.

(c) For sufficiently large t*, the operator with premium content prefers non-exclusivity.*

Proof. See appendix. ■

Proposition 2 implies that exclusivity is preferred in the following circumstances.

- *Strong dynamic competition.* For sufficiently large β, the dynamic benefit of higher market share outweighs the opportunity cost of forgone wholesale fees and exclusivity is chosen.

- *Valuable content.* There are two, conflicting, effects in v. As section 2 shows, the opportunity cost of forgone wholesale fees is increasing in v. Larger v also widens the asymmetry in market shares, strengthening the dynamic benefit to the content holder. For less valuable content the first effect dominates and non-exclusivity is preferred, but for highly attractive content the dynamic effect dominates and exclusivity is chosen.

- *Little horizontal differentiation.* With smaller t the rival retailer's customers are easier to attract. This has two implications, both of which encourage exclusivity. First, the opportunity cost of forgone wholesale fees is reduced (as shown in section 2). Secondly, building market share is easier: for given v the content holder gains a larger market share, strengthening the dynamic benefit.

3.2 Discussion

The findings stem from a trade-off between the static revenue gain from supplying the rival retailer (wholesale channel fees plus any advertising revenues) and the dynamic benefit from building market share. For the latter effect to dominate, the benefit function $b(s_i)$ must be sufficiently convex. Convexity implies that the marginal benefit to building market share is increasing in that operator's share. Thus, any initial advantage which generates asymmetric market shares is amplified: the larger operator's incentive to build share become stronger while that of its rival weakens.

Exclusive content plays a crucial role in creating an initial asymmetry. Price competition alone cannot achieve this: with equally attractive content, equilibrium market shares are equal. Note that in the broadcasting industry, where the marginal cost of supplying an additional consumer is negligible, a competitive advantage cannot be achieved through cost-reducing innovation. Exclusivity over content is therefore the key instrument of dynamic competition. Thus, the analysis casts light on the importance of premium content: it is the particular attractiveness of this programming to viewers that makes exclusivity desirable.

Far from violating the principle in the contracting literature that, provided sufficient instruments are available, the content holder chooses the efficient allocation, the result is another instance of this. The holder implements the allocation which maximises industry profits—but now in a dynamic rather than purely static setting. With its convex form, the dynamic mechanism implies that industry profit is increasing in the asymmetry of market shares. Although exclusivity incurs some loss of allocative efficiency, since some consumers with positive willingness to pay do not receive premium content, with sufficiently strong convexity the resulting asymmetry may increase profit overall.[26]

[26] If an alternative mechanism could be found to induce asymmetry in market shares, it would be more efficient to supply premium content to all consumers. But price competition

Proposition 2 indicates that exclusivity will tend occur for more valuable content, less differentiated retailers, and when dynamic effects are strong. This fits the pattern of exclusivity described in the introduction: exclusive premium content has been employed in situations where two operators compete head-to-head on the same type of platform (e.g. satellite-to-satellite)—and hence are relatively undifferentiated—or when an entrant on a new technology tries to get established—a situation where building market share is likely to be critical.

This section has modelled dynamic effects in reduced form. To cast further light on what the dynamic mechanism might be, some specific examples are developed in the next section.

4 Examples of dynamic mechanisms

To cast further light on the settings in which exclusivity is likely to arise, and draw out implications for welfare and competition policy, this section examines possible sources of the dynamic mechanism. In section 3 the dynamic effect was modelled in reduced form as a convex relationship between market share and future profit. This implies that industry profit is higher when market shares are asymmetric; for this to hold there must be some form of scale economy. Transmission platforms tend to have this feature: on the supplier's side investment involves substantial fixed costs, while for consumers platform-specific equipment implies a switching cost of changing provider, especially to one operating on a different transmission system.[27] Accordingly we examine the following two dynamic mechanisms: switching costs and platform investment.

alone cannot generate asymmetry, and agreement over market shares would fall foul of antitrust authorities.

[27] Switching costs imply an inter-temporal economy of scope between purchases from the same supplier.

4.1 Switching costs

The first dynamic mechanism we investigate is switching costs. Television reception involves set-up costs for the customer and/or supplier, and if the customer subsequently wishes to switch to another provider a further installation cost is incurred. This is larger when the consumer switches to a different platform (e.g. from cable to satellite), but there are also costs of switching within a platform (e.g. from one satellite provider to another). Empirical estimation suggests significant switching costs exist in pay TV, equalling around one-third to one-half of the annual bill: see Shcherbakov (2009).

The extensive literature on switching costs[28] teaches that in growing markets, with many new consumers, there is a strong incentive compete fiercely to attract subscribers. Once consumers are locked in, however, switching costs can be exploited to extract additional surplus. This dynamic mechanism is typically modelled using a two-period model. At the start of the first period, consumers are unattached and suppliers compete to sign them up. Then, at the start of the second period, consumers are locked in, and subsequent competition is softened by switching costs. In the following model, this framework is augmented with the possibility of content exclusivity.

Competition takes place for two periods. In the first period, all consumers are new to the market, and each subscribes to the retailer that offers the highest utility after transport costs. Retailers are unable to make binding commitments regarding future prices. In period 2, retailers compete again but consumers now face switching costs: a consumer that wishes to switch provider incurs a cost $\sigma \in [0, t)$.[29] It is assumed that the operators are able to discriminate between their own and their rival's installed base. There may be an initial asymmetry between the operators: the underlying quality of each

[28] This literature is comprehensively surveyed by Farrell and Klemperer (2007).

[29] This may represent new receiving equipment that must be purchased and/or the time involved in switching. The incidence of the switching cost is irrelevant: the same analysis would apply if suppliers chose to subsidise this.

(distinct from premium content) is v_{i0} $(i = A, B)$. We use v_Δ to denote A's underlying advantage, $v_{A0} - v_{B0}$, and assume that $v_\Delta \geq 0$.

At the start of each period, A chooses whether or not to supply its premium content v to B; contracting assumptions are as before. Contracts last for a single period, thus an agreement for wholesale supply in period 1 does not guarantee supply in period 2 (and non-supply in period 1 does not preclude it in period 2). To keep the analysis tractable it is assumed that there is no discounting of future profits. Details of the analysis are in the appendix.

In period 2 A always chooses to supply premium content to its rival (see appendix). The intuition follows from section 2: the situation is static, thus non-exclusivity is optimal. Period 2 profits for A and B respectively are given by

$$\begin{aligned}
\pi^{ne}_{A,2} &= \frac{1}{18t}\left(t + v_\Delta + \sigma + 2ts_A\right)^2 + \frac{1}{18t}\left(3t + v_\Delta - \sigma - 4ts_A\right)^2 + v; \\
\pi^{ne}_{B,2} &= \frac{1}{18t}\left(t + v_\Delta + \sigma - 4ts_A\right)^2 + \frac{1}{18t}\left(3t - v_\Delta + \sigma - 2ts_A\right)^2,
\end{aligned}$$

where s_A is A's period 1 share. Period 2 profits constitute the benefit function $b\left(s_i\right)$ of the reduced form model; note that as assumed in section 3 these are convex in s_A. Combined industry profit is minimized at $s_A = \frac{1}{2} + \frac{1}{10t}v_\Delta$, increasing as shares become more asymmetric.

Exclusivity in period 1 allows A to sign up more subscribers, benefitting it in period 2. A's gain from exclusivity (compared with non-exclusivity) in period 1, given optimal period 2 behaviour, is

$$G_\sigma = \frac{v}{49t}\left(18v + 20v_\Delta - 21t\right). \tag{6}$$

The following proposition describes incentives for exclusivity, showing that exclusivity is more likely for more valuable content and when the operators are less differentiated (given the switching cost).[30]

[30]The model has assumed, for simplicity, that firms do not discount future profits. If

Proposition 3 ***(Exclusivity with switching costs).***

The operator with premium content chooses exclusivity in period 1 iff $7t < 6v + \frac{20}{3}v_\Delta$. *This condition implies that*

(a) Exclusivity is chosen for $v > \max\{\widehat{v}_\sigma, 0\}$ *where* $\widehat{v}_\sigma \equiv \frac{1}{6}\left(7t - \frac{20}{3}v_\Delta\right)$. *If* $7t \leq \frac{20}{3}v_\Delta$, *exclusivity is chosen for all* v.

(b) For sufficiently small t, *the operator with premium content chooses exclusivity.*

Proof. $G_\sigma(v) > 0$ requires $(18v + 20v_\Delta - 21t) > 0$. This is satisfied for $v > \frac{1}{6}\left(7t - \frac{20}{3}v_\Delta\right)$. If $7t \leq \frac{20}{3}v_\Delta$, then the condition is always satisfied. ■

The relationship between the switching cost model and the reduced form of section 3 is as follows. In the presence of switching costs, a higher current market share results in both a higher share and a higher price in the future. This generates a convex relationship between current share and future profit. This functional form is commonplace in the switching costs literature: for example, in Beggs and Klemperer (1992) a firm's future value is quadratic in its current share.

Comparing total welfare under non-exclusivity and exclusivity, the difference is given by

$$\Delta W_\sigma = \frac{v}{98t}\left(49t - 54v - 53v_\Delta\right).$$

Exclusivity is socially preferred iff $7t < \frac{1}{7}\left(54v + 53v_\Delta\right)$. Comparing this with the private optimum, it can be seen that the social planner chooses exclusivity *more* often than the private operator. The reason for this appears to be its impact on period 2 transport costs: these are lower following exclusivity in period 1, as more consumers are served by the retailer that is closest to them.[31] This can outweigh the loss of allocative efficiency and higher trans-

discounting were incorporated, the incentive for exclusivity would be increasing in the weight put on future profits as there is profit sacrifice in period 1 in return for a gain in period 2.

[31] The ability to price discriminate in period 2 implies that each firm serves a segment of demand on the distant half of the unit interval, raising total transport costs. When

port costs during period 1, making period 1 exclusivity socially desirable.

Comparing consumer surplus under non-exclusivity and exclusivity in period 1 (period 2 is always non-exclusive), taking account of switching costs incurred in period 2,[32] the difference is given by

$$\Delta CS_\sigma = -\frac{v}{98t}\left(49t - 18v - 27v_\Delta\right).$$

Thus, exclusivity is the consumer optimum iff $7t > \frac{1}{7}\left(18v + 27v_\Delta\right)$. Consumers are more likely to prefer exclusivity for small v and non-exclusivity for larger v, the opposite of both private and social preferences.[33] With exclusivity, consumers benefit from lower prices in period 1, but they then lose out from weaker competition in period 2.

Discussion. In the presence of switching costs a new pay TV operator has a strong incentive to compete for subscribers, in view of higher profits in the future after customers are locked in. During the initial "sowing" phase, there is a dynamic incentive for exclusivity in order to grow the subscriber base. This finding can explain the prevalence of exclusive content shown by new entrants, especially those on emerging platforms. In Europe a number of emerging IPTV operators offer exclusive content (e.g. Orange/France Telecom, Belgacom), while in the US, satellite entrant DirecTV uses exclusive sports coverage to win subscribers from established cable incumbents. Digital switchover may also increase the attractiveness of content exclusivity: with many analogue viewers making digital adoption decisions, this is an important time for digital operators to invest in building market share.

period 1 shares are more asymmetric, the allocation of demand in period 2 is closer to the efficient one.

[32] Total switching costs incurred in period 2 are in fact the same regardless of whether exclusivity or non-exclusivity is chosen in period 1.

[33] For parameter values that ensure interior solutions in all sub-markets (i.e. satisfying condition (8), in the appendix), exclusivity is always the consumer preference. However, it is possible that for other parameter values consumers may prefer non-exclusivity: this would require the model to be solved for corner solutions.

4.2 Platform investment

The second dynamic mechanism we investigate is platform investment. The attractiveness of a television service depends not only on the content provided but also on the quality of the transmission platform. Investment may improve this by expanding capacity or facilitating high-definition and interactive services. Investment is typically a fixed cost incurred for the platform as a whole: once made, the improved service may be provided to many consumers at no additional cost. This scale economy underlies the dynamic motive for exclusivity. Note that platform investment is specific to the investor: the product of such investment is not easily transferable to other retailers. Hence the issue of resale does not arise for platform investments as it does for programme content.[34]

Platform investment is modelled as a dynamic game as follows. At the first stage, A chooses whether to supply its premium content v to B, with contracting assumptions as before. At the second stage, each operator $i = A, B$ may invest in platform quality, q_i. In the third stage, operators compete for consumers, choosing prices p_i, and consumers make subscription decisions. Consumer utility is given by $u_i = v_i + q_i - p_i$. Fixed costs depend on the level of quality chosen according to the convex function $\frac{1}{2}\gamma q_i^2$. We impose the parameter restriction $9t\gamma - 2 > 0$.[35] Detailed analysis is provided in the appendix.

A's gain from exclusivity (compared with non-exclusivity) is given by

$$G_q = \frac{1}{2}\gamma v^2 \frac{9t\gamma - 1}{(9t\gamma - 2)^2} - \frac{1}{3} v \frac{18t\gamma - 5}{9t\gamma - 2}. \tag{7}$$

[34] For this reason the analysis of platform investment does not apply to investment in programming. Section 2 demonstrates a strong static incentive to resell content; thus, the incentive to invest in programming—including bidding for content rights—depends on the total number of viewers that can be reached on all platforms, not just those on the operator's own platform. This issue is explored further in a separate note available from the author.

[35] Concavity of the profit functions requires $9t\gamma - 1 > 0$, and the covered market condition further requires $9t\gamma - 2 \geq 3v\gamma > 0$.

The following proposition describes the seller's incentives for exclusivity, demonstrating that the content holder prefers exclusivity when content is sufficiently attractive, when retailers are less differentiated, and when platform quality is more variable (i.e. lower γ).

Proposition 4 ***(Exclusivity with endogenous platform quality).***

Exclusivity is chosen under the following circumstances.

(a) The operator with premium content chooses for $v > \max\{\widehat{v}_q, 0\}$ *where* $\widehat{v}_q = \frac{2(9t\gamma-2)(18t\gamma-5)}{3\gamma(9t\gamma-1)}$. *If* $18t\gamma - 5 < 0$, *exclusivity is chosen for all* v.

(b) For sufficiently small γ, *the operator with premium content chooses exclusivity.*

(c) For sufficiently small t, *the operator with premium content chooses exclusivity.*

Proof. See appendix. ■

The relationship between the quality investment model and the reduced form of section 3 is as follows. Investment is a fixed cost, thus quality can be provided more efficiently when more consumers are served by the same supplier. With this scale effect, industry profit is higher when market shares are asymmetric, as required for there to be a dynamic incentive for exclusivity.

Comparing total welfare (defined as the sum of consumer and producer surplus) under non-exclusivity and exclusivity, the difference is given by

$$\Delta W_q = \frac{1}{2}v - \frac{1}{4}\gamma v^2 \frac{(45t\gamma - 4)}{(9t\gamma - 2)^2}.$$

Non-exclusivity (exclusivity) is socially preferred for $v < (>) \frac{2(9t\gamma-2)^2}{\gamma(45t\gamma-4)} \equiv \overline{v}_q$. The comparison of social and private thresholds, $\overline{v}_q$ and $\widehat{v}_q$, is ambiguous: the private operator may choose exclusivity too infrequently or too often compared with the social planner. As with the private optimum, the planner is more likely to choose exclusivity when retailers are less differentiated and quality is more variable.

Comparing consumer surplus under non-exclusivity and exclusivity, the difference is given by

$$\Delta CS_q = -\frac{1}{2}v - \frac{9t\gamma^2}{4\left(9t\gamma - 2\right)^2}v^2 < 0.$$

Hence consumers as a whole are better off under exclusivity, regardless of the cost of quality. However, while A's consumers always benefit ($u_A^{excl} > u_A^{ne}$), depending on parameter values B's consumers may be better or worse off under exclusivity (i.e. it is possible that $u_B^{excl} < u_B^{ne}$). As well as having no access to premium content, B's consumers suffer from lower platform quality under exclusivity, though they pay a lower price.

Discussion. The desirability of exclusivity—for both the operator with premium content and the social planner—arises from economies of scale in platform investment. The analysis suggests that exclusivity is more likely to arise when there is scope for significant investment in platform quality, and could explain instances in which the smaller operator's investment is held back. For example, in some countries (e.g. the UK), the (larger) satellite operator was quicker to digitise its platform than its cable rival(s).[36] This might reflect differences in investment incentives due to asymmetry in subscriber numbers.

5 Conclusion

This paper has examined incentives for exclusive distribution of programme content in pay TV. Exclusivity cannot be explained in a purely static setting: there must also be a dynamic benefit from building market share. Such a

[36]In the UK, BSkyB digitised its satellite platform in three years between 1998 to 2001. Digitisation of cable started in 1999 and took much longer: in Q2 2008 digital cable accounted for around 95% of all cable television customers. Information from Ofcom, *The Communications Market: Digital Progress Report, Digital TV, 2008 Q2.*

dynamic effect originates from some form of economies of scale: industry profits must be increasing in the asymmetry of market shares. In accordance with the contracting literature, the content holder chooses the allocation that maximises industry profit, which under certain conditions implies exclusive supply.

This analysis can explain the observed incidence of exclusive content in pay TV. First, it is the most attractive, "premium" programming that tends to be shown exclusively, while general entertainment channels are widely distributed. Secondly, exclusivity is more desirable between relatively undifferentiated competitors: exclusivity is commonly found between competing satellite operators, even while competitors on other platforms (e.g. cable)—regarded by consumers as more differentiated—are supplied. Third, exclusivity is attractive when dynamic effects are strong. For example, the use of exclusivity by entrants on emerging platforms—such as IPTV in Europe and satellite in the US—can be understood as a "sowing" strategy in a market with switching costs. More generally, with scale economies in platform investment, exclusivity may be used to inhibit a rival's subscriber growth and hold back its investment.

The importance of exclusive content can be understood from the particular cost function of the pay TV industry. Operators incur substantial up-front costs, at several levels: programming incurs a large first copy cost while transmission platforms involve significant set-up costs—but afterwards programmes may be broadcast to subscribers at minimal incremental cost. Whereas in other industries firms may compete by reducing marginal cost, this is not possible in pay TV: marginal cost is already negligible. Since neither cost reductions nor price competition (which cannot generate asymmetry) can play this role, content exclusivity is the sole means by which pay TV operators can compete for market share. With economies of scale at the platform level, content exclusivity may become an attractive strategy.

This analysis has a number of messages for policymakers. First, exclusiv-

ity is not necessarily undesirable for consumers, despite the loss of allocative efficiency. When the alternative is non-exclusive supply on the basis of per-subscriber fees (as is typically the case in practice), retailing of premium content is effectively monopolised—despite the appearance of competition—and consumers may be better off under exclusivity as this generates stiffer price competition. Secondly, although dynamic effects may provide a motive for exclusivity, precise conditions are required for this: specifically, a convex relationship between today's market share and tomorrow's profit. This occurs when industry profit increases with greater asymmetry in market shares, i.e. when there are strong economies of scale, which tends to be a characteristic of transmission platforms. In essence, then, the dynamics of platform competition may provide a motive for exclusivity over content. Finally, the welfare effects in such cases are not straightforward, being sensitive to the source of the dynamic effect. If investment displays strong scale economies and greater investment benefits consumers, for example by raising quality, consumers may (on average) be better off under exclusivity. But in other instances consumers may lose out overall, despite the initial benefit of lower prices, for example if exclusivity results in a softening of future competition.[37]

This paper has modelled input foreclosure by a vertically integrated operator. As noted in section 2.3, vertical integration is not essential: if industry profit is higher under exclusivity, a non-integrated content supplier (given appropriate instruments) might also be expected to choose this allocation. However, there is a difference between the integrated and non-integrated cases. With vertical integration, the wholesale fee charged to the rival retailer determines the opportunity cost of winning subscribers at the retail level.[38] This makes wholesale supply an all-or-nothing affair: for mild dy-

[37] This paper has taken market structure to be unaffected by exclusivity. If a firm can credibly commit to exclusivity and rivals are susceptible to predatory threats, denial of premium content might raise future profit through exclusion. If the benefit to exclusivity derives from increased market power, this will harm consumers in the long run and regulators might be expected to adopt a negative view of content exclusivity.

[38] The precise relationship between the wholesale fee and opportunity cost of winning

namic effects the integrated operator continues to supply its rival, and on the same terms, but when the dynamic benefit is sufficiently large the content is withheld altogether. By contrast, a non-integrated content holder could, in principle, set different wholesale fees to different retailers, varying each one's incentive to compete for subscribers. This would allow it to create an asymmetric market structure via partial rather than full foreclosure, and to induce precisely the desired degree of asymmetry. With vertical integration this degree of control is not possible: interestingly, content supply is a blunter instrument than under vertical separation.[39]

Appendix

Proof of Proposition 2. (a) The proposition follows from the properties of $G(\beta)$. $G(0) < 0$. $\frac{dG}{d\beta} > 0$ for $\beta \leq \beta_{\max}$. $G(\beta)$ has two roots, $\widehat{\beta}_1 = \frac{1}{12}\left(34t - v - \sqrt{4t^2 + v^2 + 28tv}\right) \in (0, \beta_{\max})$ and $\widehat{\beta}_2 > \beta_{\max}$. Thus, G is negative for $\beta \in \left[0, \widehat{\beta}_1\right)$ and positive for $\beta \in \left(\widehat{\beta}_1, \beta_{\max}\right]$.

(b) The proposition follows from the properties of $G(v)$. $G(v)$ has two roots, 0 and $\widehat{v} = \frac{(6t-2\beta)(8t-3\beta)}{(4t-\beta)} > 0$. $\frac{dG}{dv} < 0$ At $v = 0$. $\frac{d^2G}{dv^2} = \frac{(4t-\beta)}{4(3t-\beta)^2} > 0$. Thus, G is negative for $v \in (0, \widehat{v})$ and positive for $v > \widehat{v}$.

(c) For $\beta \leq \beta_{\max}$, $\frac{dG}{dt} = -\frac{v}{4(3t-\beta)^3}\left(v\left(6t-\beta\right) + \beta\left(3t-\beta\right)\right) < 0$. Thus, for sufficiently small t, $G > 0$. ■

Section 4.1: Switching costs.

The model is solved backwards. To ensure that markets remain competitive in all scenarios (so that interior solutions can be used throughout), the

subscribers follows from the mode of retail competition. In the Hotelling model the two are equal, as diversion is one-for-one.

[39] It might then be asked why rights holders (such as sports leagues) often delegate distribution decisions to TV operators. This arrangement might be expected to have informational advantages: although a sports league could set varying wholesale charges, it is less well placed to ascertain the willingness to pay of viewers and diversion between platforms.

following parameter restriction is imposed

$$7t \geq \max\left\{5v_\Delta + 9v, 3v_\Delta + 18v + 7\sigma, 6v_\Delta + 8v - \frac{7}{2}\sigma\right\}. \tag{8}$$

Period 2: competition with installed subscriber bases.
A's period 1 share is denoted s_A; with a covered market, $s_B = 1 - s_A$. Retailers can discriminate between their own and the rival's installed base, giving rise to two sub-markets in period 2. Denoting by $p_{j,i}$ the price offered by i to j's installed base, the indifferent consumer in each sub-market is located at $x \in [0, s_A]$ and $y \in [s_A, 1]$ respectively:

$$\begin{aligned} x &= \frac{1}{2t}\left(t + v_A - v_B + \sigma - p_{A,A} + p_{A,B}\right); \\ y &= \frac{1}{2t}\left(t + v_A - v_B - \sigma - p_{B,A} + p_{B,B}\right). \end{aligned}$$

Under exclusivity, period 2 profits (as functions of s_A) are given by

$$\begin{aligned} \pi_{A,2}^{excl} &= \frac{1}{18t}\left(t + v + v_\Delta + \sigma + 2ts_A\right)^2 + \frac{1}{18t}\left(3t + v + v_\Delta - \sigma - 4ts_A\right)^2; \\ \pi_{B,2}^{excl} &= \frac{1}{18t}\left(t + v + v_\Delta + \sigma - 4ts_A\right)^2 + \frac{1}{18t}\left(3t - v - v_\Delta + \sigma - 2ts_A\right)^2, \end{aligned}$$

while under non-exclusivity period 2 profits are

$$\pi_{A,2}^{ne} = \frac{1}{18t}\left(t + v_\Delta + \sigma + 2ts_A\right)^2 + \frac{1}{18t}\left(3t + v_\Delta - \sigma - 4ts_A\right)^2 + v; \tag{9}$$

$$\pi_{B,2}^{ne} = \frac{1}{18t}\left(t + v_\Delta + \sigma - 4ts_A\right)^2 + \frac{1}{18t}\left(3t - v_\Delta + \sigma - 2ts_A\right)^2. \tag{10}$$

A's gain from exclusivity in period 2 is therefore[40]

$$G_\sigma^{(2)} = -\frac{v}{9t}\left(5t - v - 2v_\Delta + 2ts_A\right) < 0.$$

The sign of $G_\sigma^{(2)}$ follows from the first lower bound of (8). Thus, A always wishes to supply premium content to B in period 2. This is unsurprising: the situation in period 2 is equivalent to the static case of section 2. From (9) and (10), note that period 2 profits are convex in period 1 share s_A, as in the reduced form model. Combined industry profit is at a minimum at $s_A = \frac{1}{2} + \frac{1}{10t}v_\Delta$, and increases as shares become more asymmetric.

Period 1: competition for new subscribers

At the start of period 1, no consumer is locked in and each retailer sets a single price (p_i, $i = A, B$). Under exclusivity, total profits over the two periods are given by

$$\begin{aligned}
\pi_A^{excl} &= \frac{7}{9}t + \frac{16}{21}v_\Delta - \frac{2}{9}\sigma + \frac{1}{9t}\sigma^2 + \frac{1}{49t}\left(20vv_\Delta + 18v^2 + 11v_\Delta^2\right) + \frac{11}{7}v; \\
\pi_B^{excl} &= \frac{7}{9}t - \frac{16}{21}v_\Delta - \frac{2}{9}\sigma + \frac{1}{9t}\sigma^2 + \frac{1}{49t}\left(20vv_\Delta + 18v^2 + 11v_\Delta^2\right) - \frac{4}{7}v,
\end{aligned}$$

while total profits under non-exclusivity are

$$\begin{aligned}
\pi_A^{ne} &= \frac{7}{9}t + \frac{16}{21}v_\Delta - \frac{2}{9}\sigma + \frac{1}{9t}\sigma^2 + \frac{11}{49t}v_\Delta^2 + 2v; \\
\pi_B^{ne} &= \frac{7}{9}t - \frac{16}{21}v_\Delta - \frac{2}{9}\sigma + \frac{1}{9t}\sigma^2 + \frac{11}{49t}v_\Delta^2.
\end{aligned}$$

Thus A's gain in total profits from choosing exclusivity in period 1, $\pi_A^{excl} - \pi_A^{ne}$, is

$$G_\sigma = \frac{v}{49t}\left(18v + 20v_\Delta - 21t\right).$$

[40] Existence of exclusivity equilibria while conforming to the covered market condition (8) requires $v_\Delta \geq \max\left\{\frac{9}{5}v, \frac{36}{11}v + \frac{21}{11}\sigma, 3v - \frac{21}{4}\sigma\right\}$. Exclusivity might also arise for parameter values that do not satisfy (8) but corner solutions would then arise in some instances, requiring separate analysis.

Section 4.2: Platform investment.

Strategic choices include quality investment as well as prices. Under exclusivity, equilibrium strategies are given by[41]

$$\begin{aligned} p_A^{excl} &= t + \frac{3tv\gamma}{9t\gamma - 2}; \quad q_A^{excl} = \frac{1}{3\gamma} + \frac{v}{9t\gamma - 2}; \\ p_B^{excl} &= t - \frac{3tv\gamma}{9t\gamma - 2}; \quad q_B^{excl} = \frac{1}{3\gamma} - \frac{v}{9t\gamma - 2}, \end{aligned}$$

giving equilibrium profits

$$\begin{aligned} \pi_A^{excl} &= \frac{1}{18\gamma} \frac{(9t\gamma - 1)}{(9t\gamma - 2)^2} (9t\gamma - 2 + 3v\gamma)^2 ; \\ \pi_B^{excl} &= \frac{1}{18\gamma} \frac{(9t\gamma - 1)}{(9t\gamma - 2)^2} (9t\gamma - 2 - 3v\gamma)^2 . \end{aligned}$$

For the market to be competitive under exclusivity we require $9t\gamma - 2 \geq 3v\gamma$.

Under non-exclusivity, equilibrium outcomes are symmetric with $p_i^{ne} = t + v$ and $q_i^{ne} = \frac{1}{3\gamma}$; market shares are equal. Equilibrium profits are then

$$\pi_A^{ne} = \tfrac{1}{2}t - \tfrac{1}{18\gamma} + v; \qquad \pi_B^{ne} = \tfrac{1}{2}t - \tfrac{1}{18\gamma}.$$

Thus A's gain from exclusivity, $\pi_A^{excl} - \pi_A^{ne}$, is

$$G_q = \frac{1}{2}\gamma v^2 \frac{9t\gamma - 1}{(9t\gamma - 2)^2} - \frac{1}{3} v \frac{18t\gamma - 5}{9t\gamma - 2}.$$

Proof of Proposition 4. (a) The proposition follows from the properties of $G_q(v)$.

(i) If $(18t\gamma - 5) \leq 0$, $G_q(v)$ is positive for all $v > 0$.

(ii) Otherwise, for $(18t\gamma - 5) > 0$, $G_q(v) = 0$ has two roots, 0 and $\widehat{v}_q = \frac{2}{3\gamma} \frac{(9t\gamma - 2)(18t\gamma - 5)}{(9t\gamma - 1)} > 0$. For $v = 0$, $\frac{dG_q}{dv} < 0$. $\frac{d^2 G_q}{dv^2} = \gamma \frac{(9t\gamma - 1)}{(9t\gamma - 2)^2} > 0$. Thus $G_q > 0$

[41] Note that as $\gamma \to \infty$ (raising quality becomes prohibitively expensive), quality investment falls to zero and outcomes approach the static equilibrium of section 2.1; i.e. this model encompasses the static model as the limiting case.

for $v > \widehat{v}_q$.

(b) $\frac{dG_q}{d\gamma} < 0$, and at $(18t\gamma - 5) = 0$, $G_q > 0$.

(c) $\frac{dG_q}{dt} < 0$, and at $(18t\gamma - 5) = 0$, $G_q > 0$. ■

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