

# The Microeconomics of Television Markets: A Literature Review

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February 11, 2014

## Abstract

I consider the literature surrounding the television market. Two important issues in the literature are: the market's two-sided nature, and bundling of channels. I discuss how an asymmetric pricing structure arises in television markets. The literature on bundling in the television market is reviewed, with some authors finding that bundling is a first best solution. Other authors show that *à la carte* pricing is socially optimal. Interestingly, there is consensus that mixed bundling is unambiguously worse than pure bundling and *à la carte*. Public service broadcasting is described in four English speaking countries to provide context. Failures in the television market are identified and some policy responses are discussed. I include literature analysing a price cap on basic cable packages and a domestic content requirement.

## 1 Introduction

The television market is characterized by three groups. Advertisers, who impose negative externalities on viewers. Content producers, who produce programmes that viewers like to watch. And viewers, who want to watch the programmes but cannot directly contact the producers in order to procure the programme. Advertisers exist in most two sided markets, for example there are advertisements in retail outlets for the brands that outlet stocks, such as a Microsoft advertisement in Dick Smith. However, television viewing costs a viewer time. Therefore, an advertisement imposes a negative externality on the viewer (sub optimal use of time) in the television market. I discuss an important feature of two sided markets, that of asymmetric

pricing structures. One side is subsidized and another is overcharged. Introducing advertising modifies this asymmetric pricing structure by changing the strategies of the platforms (television providers). The best responses change from a *divide and conquer* to the solution given in Armstrong (2006)'s *competitive bottleneck*. Rather than the extra surplus conferred by one side of the market to the other being extracted, the platform uses its monopoly power over advertisers in providing access to its viewers. I review the literature that considers the effects of advertising on pricing structures and welfare in equilibrium. The article then reviews, in depth, important contributions to the literature of bundling in television markets from both sides.

I review the argument that bundling is the socially efficient outcome and consider the literature showing the opposite: *à la carte* is socially optimal. The optimality of bundling versus *à la carte* pricing depends on consumer preferences over content types and advertising. Mixed bundling, which is when a firm sells multiple bundles of its goods of different compositions is unambiguously shown to be the least socially efficient outcome. This is exactly the pricing structure we observe in New Zealand television markets. Sky sells a basic bundle with optional extra bundles of sport and movies. Vodafone and Television New Zealand offer pure bundles of all their channels in one bundle. Anderson and Coate (2005) show that depending how large is the nuisance cost, advertising can be under- or over- provided from a social perspective. The literature on optimal programme provision is discussed. Spence and Owen (1977) show that there is a bias against shows that have a small number of high valuing viewers (niche programmes) and those with high cost. Goettler and Shachar (2001) find, empirically, that differentiation in programming is a Nash equilibrium in the United States. Conversely, Gal-Or and Dukes (2003) consider a theoretical model and show that programmes are minimally differentiated in equilibrium.

Due to market failures in the television market, viewers may not receive the programmes they want or may be charged a socially inefficient price. Policy makers act to rectify these market failures. In this article policy responses are considered. I review, in detail, how a basic cable price cap is consumer welfare enhancing in Canada. The effect of a domestic content require-

ment, which are a common feature in Public Service Broadcasting (PSB), is also considered. It is found that, depending on preferences, a domestic content requirement can make consumers reshuffle their consumption bundle towards leisure. Consumers move away from stations with high domestic content, which reduces the consumption of domestic content. This result is the opposite of the objective for a domestic content requirement: to get viewers to watch domestically produced programmes. Conversely, if preferences are uniformly distributed and people are open to foreign cultures, it is found that a domestic content requirement actually does increase domestic content consumption.

Competition in the television market between providers is used to model various effects such as advertising and the optimal pricing structure. There are models of monopolists and monopolistic competition but no discussion on which would be optimal given the two sided nature of the television market. The competing network effects of advertising (negative externality) and content variety (positive externality) are also not considered in analysis of optimal market structure.

## 1.1 The New Zealand Situation

The television market in New Zealand raises many issues: which structure is optimal given the degree of platform horizontal and vertical integration? Whether it is best to connect viewers and content producers over a television industry and offer content via channels, or to connect viewers and content producers via ISPs and provide access to content on a pay per view basis? One must also consider how competitive the industry *should* be. Lastly, given New Zealand's small population; is bundling or *à la carte* television optimal from a social welfare perspective.

**Definition** An agent (or firm) that facilitates interaction between at least two other agents (or groups) that could otherwise not interact is called a *platform*.

In the case of television there are multiple stages of the television market; thus, there are multiple platforms. However, for this preliminary discussion I wish to use a simplifying assump-

tion that there is only one single stage between content and viewers. Thus, I only consider Mediaworks, Sky, Vodafone and TVNZ to be platforms.

Viewers want content to watch. In New Zealand viewers can choose to watch content on their television and receive content from Sky, Vodafone, TVNZ and Mediaworks. Or, a viewer can subscribe to an internet service provider (ISP) and stream specific television content from the four aforementioned platforms.<sup>1</sup>

Rights to content are an important issue; 95% of content New Zealand television viewers consume originates elsewhere. However, content rights are a legal issue and do not affect any of the models in this literature review.

The television market is an important part of the New Zealand economy, in 2012 it had revenues of \$1.30 Billion.<sup>2</sup> There exist four main platforms in the New Zealand television market; Sky, Vodafone, Television New Zealand (TVNZ), and MediaWorks.<sup>3</sup> Recently, questions have been asked about how best to structure and regulate the television market. The introduction of Igloo, a joint venture between TVNZ and Sky, has added another platform.

The content provision decisions by each broadcaster are made over timeslots. It is considered that different distributions of people view television at different times of the day. Television platforms sell access to viewers to advertisers. Advertising decisions are also made over timeslots. Television platforms sell different timeslots to different distributions of advertiser ‘types’. According to which viewer types are watching at certain times, the platforms broadcast certain genres of programme. These complications introduce interesting effects: Substitutability between timeslots, strategic programme provision (where a platform offers low value content on one channel at the same time as on another channel the platform offers high value content). To my knowledge, these effects have yet to be modelled in the literature.

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<sup>1</sup>The content available for streaming is a subset of all the content available on the channel.

<sup>2</sup>Data from The Screen Industry Survey 2011/12, published by Statistics New Zealand.

<sup>3</sup>There are other platforms that exist in certain localities. However, I concentrate on the four nationwide platforms.

Sky is privately owned, and publicly traded on both the ASX and NZX. Sky is essentially the monopolist for pay television in New Zealand. There are two other competitors in the pay television market, Vodafone and Igloo: Vodafone offers Sky's bundle while Igloo is a joint venture by Sky and TVNZ and also offers a subset of Sky's bundle. Neither of these two 'competitors' have control over their content procurement, nor do they offer any substantially different channel mix. Therefore, Sky can be regarded as a monopolist. This monopoly status would normally imply that it under-provides output and overcharges consumers. However, in a two sided market, a monopoly does not necessarily imply inefficiency. Section 5.1 will describe the effects of market structure in the television market.

Sky offers its content in various bundles; a basic bundle, additional sport, additional movies bundles and Soho/Rialto (among others) as *à la carte* offers. This structure is consistent with *mixed bundling*, which is unambiguously consumer welfare diminishing. Vodafone offers a single *pure bundle* of Sky's basic bundle with additional access to pay-per-view movies.<sup>4</sup> TVNZ also offers a *pure bundle* and is advertiser and government funded. Mediaworks offers a *pure bundle* of TV3 and C4, which are advertiser funded.

When a viewer subscribes to Sky or Vodafone TV they receive two additional TVNZ channels: Kidzone24 and Heartland. In this way TVNZ captures some of the revenue from the pay television market. Both of these channels provide niche programming: Kidzone24 offers educational television for children, while Heartland offers domestically produced, documentary style, content.

Vodafone TV is the result of Vodafone buying Telstraclear in 2012. Before that time, Telstraclear offered a subset of Sky television over coaxial cable lines. Vodafone also operates a

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<sup>4</sup>In this article I include no discussion of movies provided by television networks. The modelling of pay-per-view movies offered by television providers is, to my knowledge, unexplored in the literature. The caveat to this is that such a problem is almost identical to a one sided monopolist pricing any other good. However, there may be effects from the substitutability between a provider's channels and the pay-per-view movies.

telephone network. An interesting feature of our broadcasting market is that Sky and Vodafone offer exactly the same service in terms of bundles of channels. As is discussed in section 2.1.2 programme duplication is a Nash equilibrium. However, Vodafone duplicates Sky's *bundle* of channels. There is certainly scope for research examining the rationale behind Vodafone's decision to offer only Sky's service rather than compete as an independent pay television provider.

TVNZ is owned by the New Zealand Government and is a commercial broadcaster with some public service broadcasting objectives as per The Television New Zealand Act 2003. TVNZ is a constrained profit maximiser; it maximises profit but must also adhere to its Public Service Broadcasting (PSB) objectives.

Mediaworks is currently owned by Mediaworks Holding ltd. It emerged from receivership as of the 8th of November 2013. To my knowledge there is no reasonable way a consumer could subscribe to TVNZ without also subscribing to Mediaworks.<sup>5</sup> Therefore, when I describe how TVNZ is broadcast this is also how Mediaworks is broadcast.

There are three 'stages' connecting content producers and viewers. The stages are; Programme provision and aggregation, channel bundling, and distribution. Sky engages in all three stages; TVNZ engages in programme provision and channel bundling; Mediaworks engages in programme provision and channel bundling; Vodafone only engages in distribution (it buys Sky's basic bundle to resell and distribute over its coaxial cable network). See Figure 1 for a flowchart showing the flows of content and revenues in the New Zealand television industry.

Each of the three 'stages' in bringing content producers and viewers together are modelled in the literature as a single stage, covered by a platform(s). An interesting complication in New Zealand is that Sky engages in multiple stages of the system; it is vertically integrated into procurement and distribution. This vertical integration implies that there are incentives for Sky that other platforms in the television market do not face. Sky has complete market power over

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<sup>5</sup>One would, presumably, have to modify their Freeview set top box. There is no incentive to do so.

	Content procurement	Content platform	Transmission platform	Consumer billing
TVNZ	Yes	Yes	-	-
Mediaworks	Yes	Yes	-	-
Kordia	-	-	Yes	-
Sky	Yes	Yes	Yes	Yes
Vodafone Cable	-	Yes	Yes	Yes
Vodafone ISP	-	-	Yes	Yes
Other ISPs	-	-	Yes	Yes
Igloo	Yes	Yes	-	-
Itunes	Yes	Yes	-	Yes

Table 1: The sections of the broadcasting market each platform engages itself in.

the selling and distribution of its non-basic bundle.<sup>6</sup> If a viewer wishes to watch Sky’s non-basic bundle they *must* subscribe to Sky’s distribution service. This market power implies that it can set the subscription fee to extract all the surplus of the subscribers.

The second option for a viewer to access the content is to subscribe to an ISP. Three of the four main television platforms all have ‘on demand’ services available via the internet. These services allow viewers to access specific programmes without watching a specific channel at a specific time.<sup>7</sup> Each platform has a ‘preferred’ ISP; if a viewer accesses that platform’s content and is subscribed to the ‘preferred’ ISP the content streamed is not counted against their data cap. This is consistent with Caillaud and Jullien (2003)’s model and solution to their *chicken and egg* problem of how to attract both groups to the platform simultaneously, which is described in section 2.

As of November 2013 TVNZ and Mediaworks are broadcast to viewers who own a Freeview set top box. The spectrum previously allocated to these channels has been leased to phone companies. The mobile phone companies have each leased part of this spectrum and introduced 4G mobile internet networks over it.

The layout of the remainder of this paper is as follows; section 2 explores the theory of two sided markets in a general view and discusses advertising, which has peculiar effects in

<sup>6</sup>The basic bundle is also sold via Vodafone, this represents some competition.

<sup>7</sup>For Sky’s on demand service a viewer *must* be subscribed to Sky.

Distribution

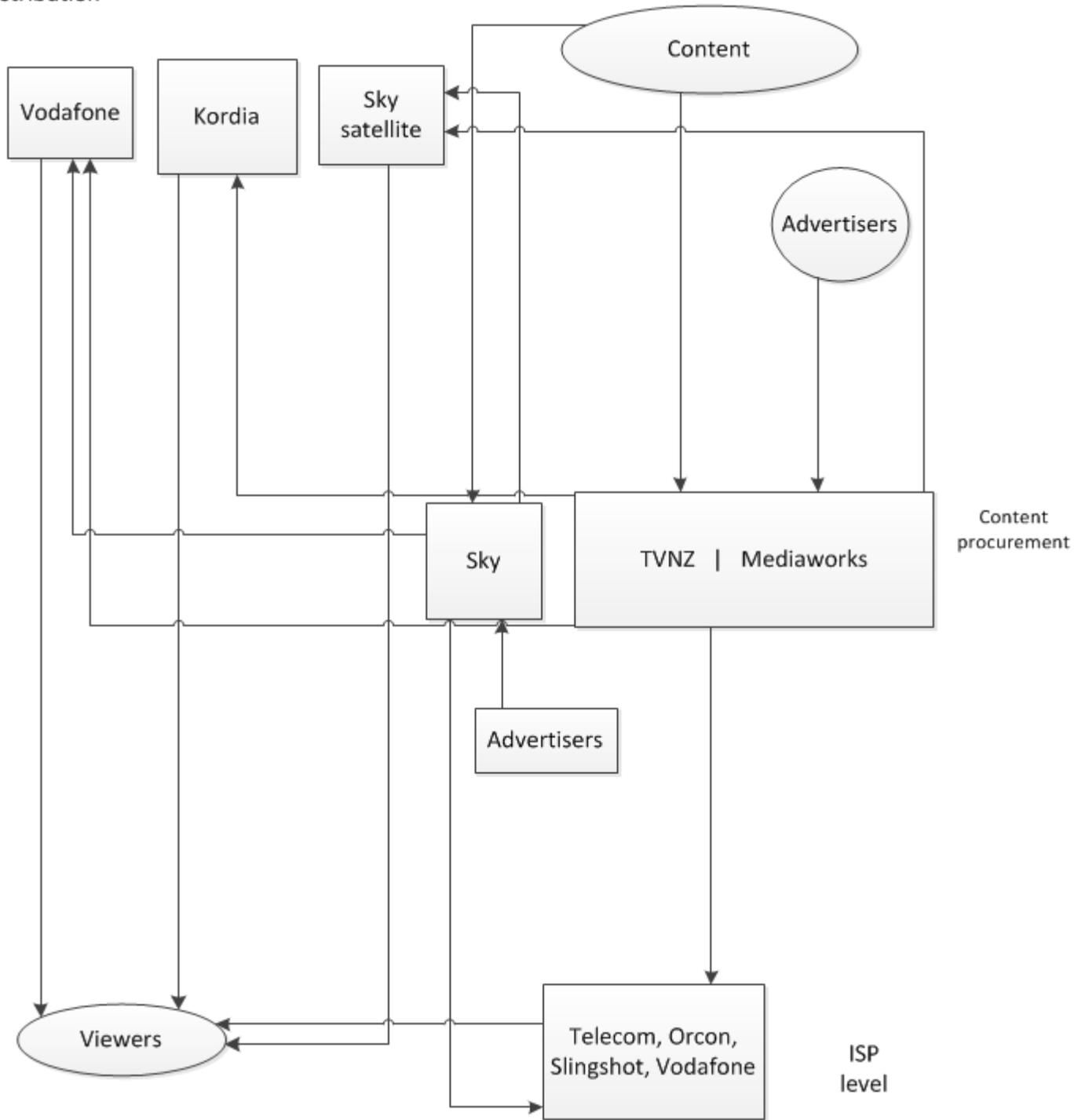


Figure 1: Flowchart showing the basic flows of content for the television market in New Zealand.

media markets. Section 3.1 provides the arguments in favour of bundling. Section 3.2 reviews the argument that *à la carte* pricing is optimal. Section 4 describes in Australia, Canada, The U.S. and the U.K. public service broadcasting. Section 5 considers policy responses, including the joint venture between Sky and TVNZ, Igloo: Section 7 concludes.

## 2 The Microeconomics of two-sided markets

### 2.1 The Theory

**Definition** A market consisting of at least two agents wishing, but unable, to trade without being facilitated by a third agent (The Platform) is a *two sided market*.

Two sided markets have been the subject of an extensive literature. Rochet and Tirole (2004) provide an article that brings much of the literature together into concise ideas.

First I describe how the broadcasting market can be viewed as a two sided market: Viewers form one side, advertisers and programme producers form the other side. In the middle Sky, TVNZ and Mediaworks work independently to get the programmes, and combine them onto channels. The platforms bundle their channels, which they sell to viewers with heterogeneous preferences. Consumers want programmes to watch and advertisers want consumers to see their advertisements.

By definition a two sided market is one where there are two (or more) groups connected by a firm (the ‘platform’). Each group has something to offer the other group but they cannot communicate directly, so the platform exists to mediate trade between the two groups. A simple example, given by Wright (2003), is a nightclub. In a nightclub two groups (men and women) wish to transact (to exchange phone numbers, say). The men gain surplus from women being present and so do the women from the men.

**Definition** *Cross group externalities* If one side of a two sided market confers surplus to the other side by its presence on the platform this is a situation where there exist *cross group externalities*.

To continue Wright's example, in a nightclub agents gain surplus from the drinks and the music. However, assume that the male agents gain surplus by being in the presence of women (and vice versa). In this way there are *cross group externalities*.

Following the logic of Wright (2003) we can model a simple broadcasting two-sided market. In this market there exists at least one platform and two groups of agents on either side of it; viewers and content producers. If a producer is on the platform then the platform can charge price  $p$  to that producer. If a viewer is on the platform then the platform can charge a price  $r$  to that viewer ( $r$  will, in general not equal  $p$ ). Viewers want to watch programmes, producers want to sell programmes to viewers but cannot contact them directly, so the platform facilitates the interaction. Therefore there exist cross group externalities, the producers would like to subscribe to a platform more if they knew there would also be many viewers subscribed to that platform. How the platform chooses the optimal  $r$  and  $p$  involves accounting for these cross group externalities and solving the problem of enticing both groups to subscribe.

Consider two competing platforms and two groups of agents (content producers and viewers). The agents can subscribe only to a single platform. Armstrong (2006) shows that in this specification, both platforms will exist in the market and make positive profits. The interesting part, however, is how prices are structured. Armstrong (2006), Rochet and Tirole (2004) and Wright (2003) show that when there are positive externalities the platform's best response is to target the group that causes larger benefits more aggressively.

This asymmetric pricing structure is worth closer examination. This section describes Cailaud and Jullien (2003)'s model and their results.

Consider a model of two intermediation service providers and two groups who wish to transact. Neither group can transact without the provider. The market exhibits *cross group externalities*; each group gains more money metric utility the more people from the opposite group are also subscribed to the provider. Intermediaries offer exclusive services, each agent can subscribe to only a single intermediary. Because of this exclusivity the most efficient outcome will be one where all agents subscribe to the same intermediary.<sup>8</sup> The presence of *cross group externalities* and exclusivity in intermediaries implies that there exists what Caillaud and Jullien (2003) term a *chicken and egg problem* (what group came to the intermediary first?). The model is one of competing intermediaries, an incumbent and a potential entrant in a Bertrand game.<sup>9</sup> Therefore the *chicken and egg problem* implies that each intermediary must, in equilibrium, act to attract the side of the market that confers the larger money metric utility to the other.

In their model there are two stages, in the first stage the intermediaries set prices. In the second stage the agents decide which intermediary to subscribe to. The second stage introduces the notion of the expectations the agents have of how many agents of the other type will also subscribe to the intermediary. If agents have poor expectations about the entrant (i.e. they expect few agents on the other side to subscribe to the entrant after a price deviation) they are unlikely to subscribe to the entrant. Therefore, an equilibrium will be such that no pricing strategy allows the entrant to earn positive profits even under these poor expectations. So to gain a positive market share the entrant must adopt the *divide and conquer strategy*. First, the entrant subsidizes one side by offering them a price less than the price of the incumbent minus the expected surplus from subscribing to the incumbent. Now, since the entrant has attracted all those agents it has power over the other type of agents to set a price that captures all the surplus they gained from the coordinated subscription to one intermediary. The entrant then conquers these agents and charges them a price plus their expected money metric utility.

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<sup>8</sup>Caillaud and Jullien (2003) show that all equilibria are efficient dominant firm equilibria.

<sup>9</sup>Where price is the choice variable used to compete. In general the equilibrium is characterized by the competitive price level because each firm undercuts its opponent until price equals marginal cost.

Following from this, the incumbent will want to prevent entry. It must set its prices such that no *divide and conquer* strategy is profitable by the entrant. Caillaud and Jullien (2003) prove that the only equilibria are dominant firm equilibria, one intermediary captures all users with a *divide and conquer strategy*, charges the largest possible transaction fee, subsidizes registration, and makes zero profit.<sup>10</sup>

The results from Caillaud and Jullien (2003)'s model are of interest to policy makers considering the television market. However, some differences between the television market and the intermediation services in their model must be described.

First of all, the model is such that each agent on either side has exactly *one* possible trading partner on the other side. This assumption is invalid in the television market, each programme producer wants to sell its programme to as many viewers as possible. Similarly, viewers are very likely to value a number of programmes with strictly positive utility (rather than just a single programme). Therefore, the model is no longer a pairwise matching model. Secondly, Caillaud and Jullien (2003)'s model includes a term capturing the efficacy of the matchmaking technology, whether or not an agent will find their trading partner. For television this is invalid; the platform will always be able to match viewers with programme producers.

In light of these disparities there exists scope to model a similar game to Caillaud and Jullien (2003) for the television market. The model should be able to conclude which side (viewers or content producers) is being subsidized, and the magnitude of this subsidy. This is of particular interest in television markets where there exists no advertisements, such as Australian PSB and some pay television channels. The models are only of interest in television markets without advertisements because, as will be discussed in section 2.1.1, the presence of advertisers removes the *divide and conquer* pricing strategy as a best response by replacing it with a situation where the platform gains monopoly power over advertisers for access to its viewers.

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<sup>10</sup>Proposition 1 Caillaud and Jullien (2003).

As can be seen in Figure 1 there exist multiple two sided markets in the New Zealand television market. There is the two sided market between the viewers and content producers, with TVNZ and Mediaworks acting as the platform. There is the market between content producers and Vodafone where Sky is the platform. In this market, Vodafone wants content to distribute to viewers, but cannot procure content directly (or it is prohibitively expensive to do so). Therefore, we should observe asymmetric pricing structures (as per Caillaud and Jullien (2003)) emerging between Vodafone and content producers connected by Sky. There also exists a two sided market between Sky, TVNZ, and Mediaworks connected to viewers via the ISPS who fill the role of platforms.

It should be noted that *most* of Sky's channels carry no advertising.<sup>11</sup> The results derived by Caillaud and Jullien (2003) are applicable in the market between viewers and producers connected over Sky, and the market between producers and Vodafone, connected over Sky. Sky's on demand service carries no advertising, presumably because it is subscriber funded.<sup>12</sup> Therefore we should observe asymmetric pricing designed to extract the surplus generated by cross group externalities between Sky and viewers. Indeed this is the case. Consider the two sided market between viewers and Sky, connected over an ISP as the platform. If a viewer uses a 'preferred' ISP, the streamed programme is not counted towards their data cap. This represents a subsidy in the form of reduced streaming costs which is consistent with the *divide and conquer* strategy of subsidizing the group that confers the greater surplus to the other. The decision to subsidize viewers depending upon which ISP they also subscribe to is not a result of Caillaud and Jullien (2003)'s model and represents a potential area for research. A model investigating this strategy would need to show show it is a Nash equilibrium and could consider the effect of regulation prohibiting platforms choosing a 'preferred' ISP; all ISPs must be treated as 'preferred' or no preferential treatment must be given.

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<sup>11</sup>Exceptions include Cartoon Network.

<sup>12</sup>An interesting question is why we don't observe Sky 'double dipping' - charging viewers to access the content as well as selling slots to advertisers. A model to answer this question must consider the nuisance cost of advertising and the trade off between receiving a viewer's willingness to pay and the marginal revenue of airing an advertisement.

Asymmetric pricing (price discrimination) in one sided markets can be shown to be detrimental to consumer welfare because no consumer in such a market will gain positive surplus. However, Armstrong (2006) shows that in two-sided markets when a firm engages in price discrimination it makes consumers better off because both groups subscribe to the platform and trade occurs. This is particularly true if the price discrimination has more to do with the asymmetry of benefits than competing to attract the group being given the lower price.

Thus far, I have ignored the role of advertising. I now move on to consider this.

### 2.1.1 Introducing Advertising

It is useful to consider the case when there are at least two competing platforms and where there is a third group looking to engage in trade . This group is the advertisers. Because advertisers have a desire to trade the same goods (advertisements) to multiple people, we need a concept that will allow them to belong to one or more platforms. We can call the people who use a single platform exclusively *single homers*, and those who use multiple platforms *multi-homers*.

Anderson and Coate (2005) consider a model of advertising provision where viewers can costlessly access programmes and cannot be excluded.<sup>13</sup> Anderson and Coate include a *nuisance cost* of advertising (i.e. how much a viewer's enjoyment of a programme is harmed by that programme carrying advertising). In their proposition 1 Anderson and Coate (2005) show that the under- or over- provision of advertising by the market (conditional on at least one programme being provided) depends on this nuisance cost. If the nuisance cost is high, advertising is over-provided. If it is low, then advertising is under-provided. An interesting feature of this market is that there is no economic force ensuring that the market price of advertising is equal to a Pigouvian corrective tax.<sup>14</sup> Although internalizing the nuisance cost externality of the advertisements is not in the interests of the television provider, it represents a failure in the market that may be of interest to policy makers.

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<sup>13</sup>This is consistent with TVNZ and Mediaworks in New Zealand.

<sup>14</sup>A tax equal to the negative externality imposed by the nuisance cost of advertisements.

I include a brief description of Hotelling models of firm ‘location’ because much of the models in the literature follow this specification.

**Definition** A *Hotelling model* is a model of monopolistic competition where firms are ‘located’ on a line of fixed length. All consumers are located on the line. The preferences of consumers are represented by the distance between the firm and the consumer; the larger the distance the less the consumer likes that firm’s products. The distance between firms and consumers is assumed to also carry a ‘transport cost’ which is a measure of substitutability between products.<sup>15</sup>

Using a Hotelling style model Anderson and Coate (2005) show that when the transport cost of the programmes is low (i.e. they are close substitutes). Platforms will compete by offering lower amounts of advertising to win viewers. This will result in the underprovision of advertisements.

As was argued by Wright (2003), and shown by Anderson and Coate (2005), in a two sided market with two populations of single homing agents, pricing structures are designed to subsidise the group that provides the greater surplus to the other group. However, introducing advertisers as a third population wishing to access platforms (and one that can subscribe to multiple platforms as multi-homers) modifies this result. This idea was explored by Armstrong (2006) who considers a model of a two sided market with competition between platforms. He argues that that when multi-homing is possible, a situation arises that Armstrong (2006) refers to as a *competitive bottleneck*: if a *multihoming* advertiser wishes to interact with a *single homing* viewer, it has no choice but to subscribe to the platform chosen by that viewer. Thus that platform gains monopoly power in providing access to its viewers for the advertisers. This monopoly power leads the platform to charge high prices to the advertisers and to charge low prices to the viewers. We observe the (counter intuitive) existence of ‘free to air’ television provided by a profit maximising channel. For example, in New Zealand TV3 (owned by Mediaworks, a profit

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<sup>15</sup>For Hotelling’s original discussion see Hotelling (1929).

maximising company) competes in the free to air market.

Armstrong (2006)'s *competitive bottlenecks* exist in the New Zealand television market. As in the author's original discussion, advertisers are multihomers while viewers are single homers. Therefore, we should expect to observe the platforms exercising monopoly power over the multihoming advertisers.

### 2.1.2 Programming

The first model examining programme choice in television markets I review is that of Spence and Owen (1977). The authors consider a model of consumers choosing between  $n$  channels ( $x \in (1, \dots, n)$ ). Each consumer makes choices on the hour, so that they can consume *one* programme at a time. Each viewer has a reservation price for each programme that gives them the money metric utility of viewing that programme. The slope of each demand curve for programmes is downward sloping. Reservation prices are summed to give what the authors term a *benefit function*. The benefit function is such that it sums the demand curves for each  $x$  and subtracts the sum of the measure of substitutability of other programme types. This measure of substitutability is such that the larger it is the closer substitutes the programmes are. This form measures the benefit to consumers of watching a programme, net of opportunity cost. Viewers act to maximise their benefit function over allocation  $x$  minus the sum of prices and  $x$ 's chosen. In addition, the demand functions are concave and include a parameter of the slope of the inverse demand curve. The slope of individual's inverse demand curve for a particular television programme is akin to the own price elasticity of the television show for the viewer. It measures how responsive quantity demanded is to a change in price. Because of this relationship, there exists a bias against shows that have high slope of inverse demand. These types of programmes have small groups of high valuing viewers and are not highly valued by the majority. They also conclude that the maximised revenues for a programme are a fraction of the maximised gross benefits of that programme. Maximising the benefit function involves offering programmes with a high substitutability parameter. This implies that the programmes provided are lowest

common denominator type programmes.<sup>16</sup> Spence and Owen (1977) also argue another bias exists against shows with a high cost. This implies that programmes with high cost are loss making.

The bias in programmes is caused by the failure of the price to fully signal the preferences viewers have for programmes. A solution to this bias is to allow the television channel to perfectly price discriminate: charge users on a pay per view basis. This perfect price discrimination is a feature of a one sided market where there exists a monopolist or oligopolistic producer. It can be shown that when firms can perfectly price discriminate in this way, then the price is a perfect signal of the preferences of each individual. Thus programmes with extreme preferences will be produced precisely for those who wish to purchase them. The results of the models in the literature are heavily influenced by how preferences are modelled and specified, this calls into question the empirics of modelling preferences.

Gal-Or and Dukes (2003) show that when there is competition in the product market and competition between television channels to attract advertisers, there is a unique equilibrium in the location choice of each television channel.<sup>17</sup> This contrasts with one sided markets where it has been shown that differentiation is a Nash equilibrium because firms must create monopolies for *their* products by product differentiation. Each television channel anticipates that it cannot enhance profit by moving away from its competitor's location, i.e. all channels provide homogeneous content.<sup>18</sup> Goettler and Shachar (2001) estimate a model of viewer choice of programmes and find that firms in the U.S. television industry do, in fact, differentiate their programmes and it is a Nash equilibrium.

As discussed in section 4, the differences between the television industry in the U.S. and New Zealand are stark. A possible area for future research is to develop a similar model in New Zealand to test the degree to which television channels differentiate themselves. Related to this, there is scope to examine the effect of such differentiation on welfare. Goettler and Shachar

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<sup>16</sup>See equation (17) Spence and Owen (1977).

<sup>17</sup>As per the Hotelling model.

<sup>18</sup>As shown in proposition 3 of Gal-Or and Dukes (2003).

(2001) use panel data containing an individual's demographics and quarter-hour viewing choices:

We estimate [our model] for the weekday prime-time hours 8:00 P.M. to 11:00 P.M. using individual-level data from Nielsen Media Research for the week of November 9, 1992. The dataset contains each individual's demographic data and viewing choices at each quarter-hour. Observations are recorded by a Nielsen People Meter (NPM) for each television in the house. If the television is on, the NPM records the channel selected and the members of the household watching. Viewers are assigned codes to enter on the NPM when they enter and exit the room. Observations are recorded every minute by the NPM, but the data we use only specify choices at the mid-minute of each quarter-hour.

I have included Goettler and Shachar (2001)'s description of their data because it is interesting that they used a device that respondents recorded their viewing habits with. A similar technology could be employed in data collection of this type for the New Zealand market to replicate the authors' analysis.

These programme choice theories and models are very similar to platform choice in games used to model political candidate's behaviour. The result that there is a bias for programmes that appeal to the lowest common denominator is akin to the median voter theorem. The general result of the median voter theorem is that competing political parties in a single dimension policy space will choose the same policy.

Where this result fails to hold is in introducing multiple dimensions in policy choice; the programme provision choice of a television channel is characterized by at least two dimensions. At the very least the dimensions that must be modelled in programme provision choice are genre and time of broadcast. The multi dimension nature of the broadcast market implies that a pure strategy Nash equilibrium will be characterised by differentiation.

Spence and Owen (1977) Consider the welfare effects of programme decisions to be irrelevant

unless someone was to value differentiation for its own sake. However, they provide an analysis of various television regimes: pay television with advertiser support, pay television without advertisements, and those two specifications allowing for unconstrained and constrained radio spectrum (over which channels are broadcast). Spence and Owen (1977) Argue that when programmes are artificially constrained, which is the New Zealand situation, then changing from advertiser supported television to pay television leaves consumers worse off. Consumers are especially harmed if advertising is prohibited on pay channels. Removing barriers to channel entry by removing the spectrum constraints would make pay television with monopolistic competition optimal. This could be achieved by installing a cable network or improving compression technology.

Programme provision and duplication market failures represent an area of interest in the New Zealand television market. Policy makers attempt to rectify the failures through the introduction of PSB requirements on TVNZ and the subsidies provided to content producers by New Zealand On Air. These provisions act to correct the bias against high cost programming and niche programming. The ‘effectiveness’ of these corrective measures is an area for possible research, both empirical and theoretical.

Another area where programme provision decisions are of interest is in the offering of ‘on demand’ television over ISPs. This programme provision is pay per view, which implies that programmes should be provided for those who wish to purchase them.<sup>19</sup> We should observe no bias against niche or expensive programming on the ‘on demand’ services.

### 3 Bundling

It is generally accepted that bundling is used as a profit maximising price strategy; Bakos and Brynjolfsson (1999) show that this is true for information goods. Bundling of television channels

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<sup>19</sup>I consider it pay per view because each viewer subscribes to an ISP and viewing the programme costs data (in the absence of the subsidies described in section 1.1) Other pay per view services in the On-Demand market include offerings such as Netflix, which is a subscriber service.

is in the best interests of the television providers. However the effects on consumer welfare from bundling are the subject of debate. Among other places, the United Kingdom has recently made the decision to require the unbundling of cable and satellite television channels. This provides a natural experiment to assess the welfare implications of *à la carte* pricing versus bundle pricing regimes.

There exists fierce academic debate as to the effects of bundling in the television market on welfare and a burgeoning literature on either side of the issue. Before considering this debate it is useful to define some terminology that has evolved in the literature.

**Definition** A firm selling all its goods in a single bundle and no other specification is said to engage in *Pure Bundling*.

**Definition** A firm selling multiple bundles of its goods, each with a different number of goods or different goods is said to be *Mixed Bundling*.

**Definition** A firm selling each good individually is said to be selling goods *À la carte*.

### 3.1 Arguments in Favour of Bundling as the Desired Equilibrium

Jeon and Menicucci (2012) consider a model of a two sided market in which the buyer (the platform) has a number of slots ( $k$ ) and there are producers wishing to rent those slots in order to sell their goods to consumers.

**Definition** Jeon and Menicucci (2012) define this renting as *technology renting*; a seller rents technology at a flat fee such that upon paying the fee the buyer can buy any subset of the seller's portfolio at marginal cost of producing that subset.

Jeon and Menicucci (2012) then consider a general model of a two sided market of this nature and show that under *à la carte* pricing of digital goods there exists no pure strategy equilibrium.

Let  $V_i^j$  denote the value of provider  $i$ 's  $j$ th channel to the platform  $C$ .

As an example of Jeon and Menicucci (2012)'s reasoning consider the following scenario. There are two television providers,  $A$  and  $B$ .  $A$  has two channels that have a value of  $(V_A^1, V_A^2) = (6, 5)$  while  $B$  has a single channel of value  $V_B^1 = 4$ . The channels must occupy one of  $C$ 's two slots in order to be valuable. Therefore for efficiency we would require that both slots of  $C$  be occupied by  $A$ 's channels.

Now suppose providers  $i \in (A, B)$  simultaneously set prices  $p_i^j$ . If  $C$  is indifferent between products, it purchases that with the highest value  $V_i^j$ .

**Proposition 3.1** *There does not exist a pure strategy equilibrium in this game. However, allowing the firm to bundle restores the pure strategy equilibrium.*

Proof:

**Proof** Here I show that there does not exist equilibrium in pure strategies of  $A$  selling *only* his best product.  $A$  can make a profit of 6 by setting  $p_A^1 = 6$  and  $p_A^2 > 5$  and selling only channel 1. The best response of  $B$  is  $p_B^1 = 4$ . However, here  $A$  has a profitable deviation, it can set  $(p_A^1, p_A^2) = (5.9, 4.9)$  sell both channels to  $C$  and get a profit of  $10.8 > 6$ .

Now I show that an equilibrium in which  $A$  sells both channels does not exist; for  $A$  to sell both products it must set  $p_A^1 \leq 3$  and  $p_A^2 \leq 1$  otherwise  $B$  can set  $p_B^1 > 0$  such that  $4 - p_B^1 > \min\{6 - p_A^1, 5 - p_A^2\}$ . Thus the profit from  $A$  selling both channels is not larger than 4. This is inconsistent with equilibrium since  $A$  could make a profit of 6 by selling channel 1 by itself.

□

In order to obtain the efficient allocation of both slots being occupied by  $A$ 's channels, Jeon and Menicucci (2012) argue that bundling must occur;  $A$  must set a price  $p_A \geq 0$  for a bundle of its two channels and  $B$  sets  $p_B \geq 0$  for its channel. The unique equilibrium is  $p_A = 7$  and

$p_B = 0$  with  $C$  buying  $A$ 's bundle for an efficient outcome. This is an equilibrium because  $A$  will not charge  $p_A > 7$  as  $C$  will then prefer  $B$ 's channel. Given that  $B$  makes a profit of 0 for any  $p_B \geq 0$  its best response is clearly  $p_B = 0$ .

Jeon and Menicucci (2012)'s model can be used to investigate the market between TVNZ and Mediaworks connected to viewers over Kordia. Kordia has  $k$  slots; constrained by spectrum and compression technology. TVNZ and Mediaworks engage in technology renting from Kordia in order to deliver their bundles to viewers. As discussed, a pure strategy equilibrium does not exist if bundling is disallowed and is restored under the presence of bundling. Therefore, following the logic of Jeon and Menicucci (2012) the *pure bundling* we observe by TVNZ and Mediaworks may be socially efficient. A decision inconsistent with Jeon and Menicucci's model is that Mediaworks and TVNZ both occupy the same number of slots on Kordia. Kordia is Government owned, this implies it is constrained in many decisions to make a socially optimal decision rather than a profit maximising one. Therefore, in order to ensure a great variety of content is provided both TVNZ and Mediaworks can broadcast four channels over Kordia.

Similarly, Liao and Tauman (2002) describe a game where firms make two products that are perfect compliments and, when consumed together form a *system*. The socially optimal outcome will be for both products to be sold in equilibrium. For similar reasoning as the previous game only one product is sold in equilibrium under *à la carte* pricing.

Liao and Tauman (2002) argue that bundling restores the socially efficient outcome due to pre-commitments. Under *à la carte* pricing firms must pre-commit to a strategy of component pricing. The authors show that in this scenario the system consumed is not socially optimal. Allowing firms to bundle means one firm will offer the socially optimal system as a bundle for a price slightly less than the value consumers place on it, consumers will purchase this in equilibrium and gain positive surplus.

Neither Jeon and Menicucci (2012) nor Liao and Tauman (2002) consider an important aspect of the television market: advertising.

In an attempt to rectify this, Chen (2010) considers a model where television networks sell slots to advertisers who impose a nuisance cost on viewers of  $t$ . The authors first consider a one sided model as a base case to show that *à la carte* pricing enhances consumer welfare; to which a two sided model is compared.

Considering a two-sided market, Chen (2010) shows that in the dominant strategy equilibrium of pure bundling, the amount of advertising is lower, with higher advertising fees. The author argues that an increase in advertising fees has two effects. First, demand for advertising decreases. Second, an *indirect effect* is that since advertising has decreased, the demand for television increases, leading to an increased number of viewers. This results finally in an increase in advertising. In Chen (2010)'s model this *indirect effect* is dominated by the direct effect of a decrease in quantity demanded in a pure bundling equilibrium.

The welfare effect in Chen (2010)'s model is driven by advertising. In *à la carte* pricing the level of advertising is much higher so consumers lose more, *ceteris paribus*. However, if the monopolist platform can react (*ceteris non paribus*) it will reduce the subscription fee, which it will do so to a larger degree in the *à la carte* equilibrium. The monopolist will decrease subscription fees in the *à la carte* equilibrium in order to attract the same number of multiple demand viewers (viewers who want to purchase multiple channels) as it had when bundling was allowed. In the *à la carte* equilibrium the monopolist has more 'room to move' in subscription fees because of the effect advertising on each channel has on advertiser demand.<sup>20</sup>

Finally, Chen (2010) argues that under a situation of *mixed bundling*, the advertising levels will actually be the same as in the *à la carte* equilibrium. Consumer surplus is lower than in pure bundling or *à la carte*, because the mixed bundling firm extracts as much surplus as possible. Consider two types of consumers; some like to purchase a bundle of goods, others like just a single good. In the *à la carte* equilibrium all consumers buy each good they like and pay an amount equal to or less than their willingness to pay. Some enjoy positive surplus, others enjoy

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<sup>20</sup>See section 1.2.4 Chen (2010).

zero surplus. In a pure bundling equilibrium, the consumers who like the bundle enjoy some surplus. The consumers who like a single good may or may not engage in trade (depending on the way preferences are modelled). In the mixed bundling equilibrium, all consumers pay an amount equal to their willingness to pay for the goods they receive, therefore they all receive zero surplus.

In order to apply Chen’s model to the New Zealand television market one must consider the role advertising plays. On the one hand, advertising, as I have argued in section 2.1.1, has the net effect of being a nuisance. On the other hand advertising can be argued to have some informational benefit. Therefore, before Chen (2010)’s model is applied to New Zealand an empirical estimate of the ‘net effect’ of advertising is required.

The television market is characterized by significant up front and sunk costs to produce programmes and invest in infrastructure. Marginal costs to distribute content to viewers are negligible. Chae (1992) considers these reasons to be the primary driver for pure bundling. Chae (1992) argues that pure bundling is required in a first-best solution. The author finds that consumer surplus is always highest under a pure bundling equilibrium, but the effect on total welfare is ambiguous and depends on the cost structure of distribution. For a low cost of distribution, total welfare is shown to increase.<sup>21</sup>

Assume consumers can be assumed to have optimal *baskets* of goods given *à la carte* pricing.

**Definition** A good that a single consumer (or type of consumer) values highly but that confers a lower level of utility to other types of consumers is defined here to be a *high value good*.<sup>22</sup>

Further, assume the following regularity condition on preferences holds: *Consumers fall into three groups, depending how many high value goods are in their optimal basket; the first group consists of those with a number greater than some threshold. The second group are those with*

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<sup>21</sup>Proposition 6 of Chae (1992).

<sup>22</sup>To illustrate, consider Table 2; good  $W$  would be a *high value good* to  $V_1$ .

*strictly lower than the threshold and the third are those who have exactly the threshold number of high value goods.*<sup>23</sup>

In a two good case this is interpreted as the goods not being perfectly positively correlated. See Table 2 for a numerical example.

Fang and Norman (2010) agree with Chae (1992) that pure bundling is optimal. However, they argue that when preferences are private information, the first best solution is a non bundling full information equilibrium. This solution is impossible because there is no incentive for consumers to reveal their preferences. Fang and Norman (2010) show that if the above regularity condition is imposed, bundling improves the market's allocation; socially efficient goods are provided.

Television channels are unlikely to be perfectly positively correlated, as this would imply certain channels strictly dominate other channels, for all consumers. Empirical work is required to estimate the degree of correlation between the preferences for television channels in order to assess if the above regularity condition holds in New Zealand.

A final way that bundling has been argued to be beneficial for welfare is proposed by Adilov (2011). Quality of the information goods is the welfare affecting variable. Adilov (2011) shows that under *à la carte* pricing a firm will choose a lower quality good because the quality of each product is independent under *à la carte*. In contrast, Adilov (2011) shows that, under bundling the firm will produce goods of higher quality. This is because when goods are bundled their quality becomes complimentary for the producer, as the result of production efficiencies.

Quality in Adilov (2011) affects both producer and consumer surplus. He shows that under bundling these are both higher, because the price-adjusted quality of the goods is greater.

Introducing advertising, Adilov (2011) finds that under both pricing structures, the prices

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<sup>23</sup>See equation 21 of Fang and Norman (2010).

fall as the advertising component of revenue increases. This is because firms have more incentive to cut prices. An increase in advertising has the effect of decreasing quality. Quality, in the model, is more costly than decreasing the price, so the firm has less incentive to invest in quality.

Adilov (2011) concludes that consumer surplus is higher under bundling. Consumers do not necessarily benefit from lower prices when there has been a decrease in quality. This result clearly depends on the specification used for the utility function of consumers, whether they value quality greater than price or which of those has faster diminishing returns.

### 3.2 Arguments against bundling as the desired equilibrium

**Definition** Consider two equally priced baskets. If a consumer strictly prefers the basket containing multiple *differentiated* goods to the basket containing an equal number of less *differentiated* goods, then that consumer is said to have a *preference for variety*.

The most important result for this argument comes from Rennhoff and Serfes (2009). Consider a model of a market between upstream firms (content producers) and downstream firms (platform). Assume that the content producers each have two programmes to sell to the platform. Further, consider that consumers have a *preference for variety*. They show that three equilibria can exist. The first is No Bundling (NB; also called *à la carte*). The second is Pure Bundling (PB: All a firm's goods in one bundle and only that bundle sold.). The third is Mixed Bundling (MB: Multiple bundles of products, each a slightly different mix.). Which equilibria occurs depends on the consumer's preference for variety.

**Definition** When a consumer in a *Hotelling model* can choose a second heterogeneous good and exists on a line of infinite length then the model can be called a *Salop Circle*.<sup>24</sup>

Rennhoff and Serfes (2009) consider a Salop circle model with six representative consumers choosing among four options of two platforms offering either product *a* or *b*. Consumers can

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<sup>24</sup>For the original derivation and discussion see Salop (1979).

either choose  $1a$ ,  $1b$ ,  $2a$  or  $2b$  which are platform 1 or 2 offering  $a$  or  $b$ .

In their proposition one, Rennhoff and Serfes (2009) prove that:

1. An NB equilibrium exists when there is low preference for variety.
2. An MB equilibrium exists when there is medium preference for variety.<sup>25</sup>
3. A PB equilibrium exists when there is a high preference for variety.

In addition Rennhoff and Serfes (2009) characterize the prices the content producers charge the downstream firms for content. This too is dependent on preference for variety.

1. When preference for variety is low, producers firms charge high but constant prices.
2. When preference for variety is in a medium range, the optimal pricing structure for the producer is at first lower than the low preference price but rises above that price toward the maximum value of the medium range.
3. When preference for variety is high, the optimal price for the producer is the highest and increases as the preference increases

In order to illustrate this, consider Figure 2 which characterizes, using arbitrarily chosen values, the form of the above discussion.

Rennhoff and Serfes (2009) note that;

The [platforms] always have incentives to offer the bundle and the two contents *à la carte* (MB) provided that two constraints are met: (i) the demand for the bundle is positive and (ii) the price of the bundle is less than the sum of the prices of the *à la carte* products.

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<sup>25</sup>Such that the preferences lie somewhere between the uppermost range of the low and the lowermost range of the high.

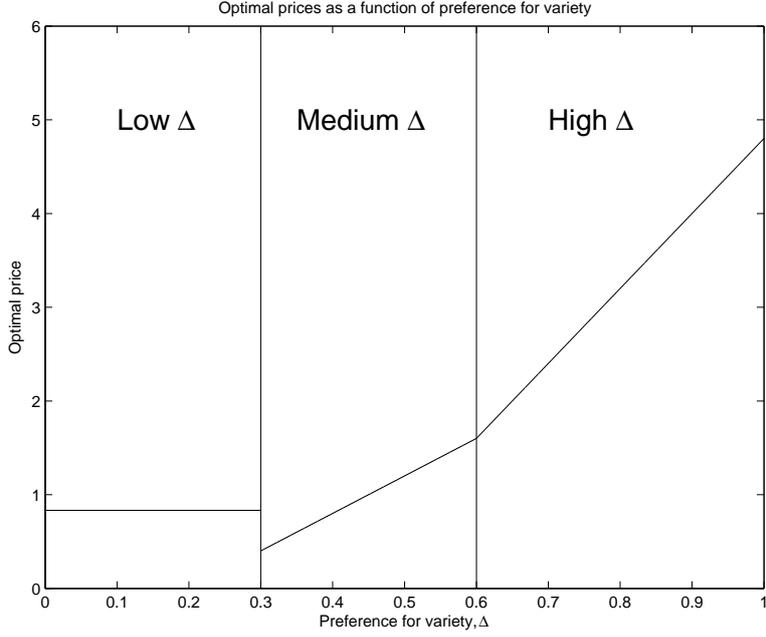


Figure 2: The optimal price charged by the upstream firms (content producers) as a function of the preference for variety of consumers for baskets of channels.

Upstream firms can influence these constraints through their pricing decisions, and thus have an influence over the bundling decisions of the downstream firms. Next, I explore the implications of these strategic interactions.

Let  $Q_L$  denote the price upstream firms (content producers) charge in low preference for variety,  $Q_M$  the price in medium preference, and  $Q_H$  the price in high. let  $\Delta$  denote the preference for variety. Following their specification of the Salop circle with six representative consumers choosing among four options ( $1a, 1b, 2a, 2b$ ) Rennhoff and Serfes (2009) derive:

$$Q_L = \frac{5}{6} \tag{1}$$

$$Q_M = a\Delta + W, \quad a > 0 \text{ and } \frac{5}{6} > W > 0 \tag{2}$$

$$Q_H = b\Delta + V, \quad b > a > 0 \text{ and } V > \frac{5}{6} > W > 0 \tag{3}$$

When  $\Delta$  is low, the price is given by (1). The platform will offer the content *à la carte* (the

NB equilibrium). Consumers do not value having access to a second unit of content highly so they will not purchase the bundle as the price of the bundle would be less than the incremental benefit.

When  $\Delta$  is in a medium range, the price is given by (2). The platform will find it optimal to offer both the bundle of its content as well as all content *à la carte* (the MB equilibrium). Some viewers will buy the bundle and the platform can extract their surplus through price discrimination. Others will buy the *à la carte* content.

Finally, when  $\Delta$  is high enough that the price is given by (3) platforms will find it optimal to offer their content all in one bundle (the PB equilibrium). Rennhoff and Serfes (2009) show the price will be equal to marginal cost with an additional fixed fee.

Let  $Q_L^{NB}$  denote the NB price the platform charges to viewers when  $\Delta$  is low,  $Q_M^{NB}$  the price for medium in NB  $\Delta$  and  $Q_H^{NB}$  the price for high  $\Delta$ .

Next, Rennhoff and Serfes (2009) exogenously impose a restriction that the platform is not allowed to bundle. However, the viewers can still purchase content and make their own bundles. In their proposition two, Rennhoff and Serfes (2009) prove that:

1. When  $\Delta$  is low no consumer will bundle and the downstream price is a constant  $Q_L^{NB} = \frac{4}{3}$ <sup>26</sup>.
2. When  $\Delta$  is in a medium range some consumers will bundle and the downstream price will be  $Q_M^{NB} = e\Delta + f$ ,  $f > 0$ .
3. When  $\Delta$  is high then all consumers will bundle and the downstream price will be  $Q_H^{NB} = \Delta - u$ ,  $u > f$ .

An interesting case appears when  $\Delta$  is high and platforms are not allowed to bundle. In this case, if the equilibrium was characterized by pure bundling or mixed bundling (which it

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<sup>26</sup>Consumers will not choose to bundle because their preference for variety is low.

would have been, given high  $\Delta$ ), consumer surplus is strictly greater than it would be under the unregulated bundling regime.

Rennhoff and Serfes (2009) explain this using two ideas: a *downstream effect* and an *upstream effect*. The *downstream effect* is the incentive for the platform to unilaterally lower its prices following an *à la carte* regulation, holding producer prices fixed. The *upstream effect* refers to the incentive of the producer to unilaterally change its prices while allowing the platform to react.

When  $\Delta$  is high, and the equilibrium is characterized by PB, an *à la carte* regulation will make the demand of platforms more elastic and consequently lower prices. If we fix the producer prices, then in equilibrium the platform charges one price (the bundle price). It will have no incentive to deviate from this price. Consider introducing an *à la carte* regulation, each platform now sets  $n$  standalone prices (where  $n$  is the number of channels it offers). Let each standalone price equal the pre regulation bundle price divided by  $n$ . Consumers have a choice: some will purchase just one product, others will purchase both. This choice by the consumers reflects their gain in surplus in this equilibrium. The consumers who choose to purchase just a single product will have previously been those whose surplus was appropriated by the firm using bundle pricing.

A second increase to the surplus of consumers is given by the increased incentives for the platform to unilaterally lower its prices following this *à la carte* regulation. In order to increase the quantity demanded for its product. This price reduction leaves consumers with more surplus.

The results derived by Rennhoff and Serfes (2009) rest on the preference for variety parameter. In order to draw conclusion for the New Zealand market based on this model, an empirical estimate of the preference for variety is required. The mechanics of estimation are beyond the scope of this literature review. However, the preference for variety exists in an individual's demand function, so estimation of this, following Byrne (2012)'s method may yield the required

result.<sup>27</sup> Another method to estimate preferences is the one employed by Crawford and Yurukoglu (2012) though the data available may make it difficult to identify the preference for variety.

Other authors also argue that *mixed bundling* is harmful to consumer surplus. Crampes and Hollander (2005) consider a further complication: that of capacity constraints. The capacity constraint is such that the total number of channels in a bundle is restricted.

Consider multiple types of people: type 1 people value one type of programme above all others and type 2 people who value that type of programme somewhat less. A third group (type  $Q$  people) are the union of all other types (not type 1 or 2) of individuals with different preferences over channels.

Crampes and Hollander (2005) show that when types 1,2 and  $Q$  all watch television the following happens:

1. The platform offers either one or two bundles, regardless of the number of consumer types;
2. When the firm offers two bundles, one bundle is a subset of the other (this is consistent with *mixed bundling*);
3. It is possible that two-bundle equilibria exist where all consumer surplus is removed from all types of consumers, but it is equally possible that that some consumer types retain positive surplus;
4. In contrast to a standard one sided model (where the type with the lowest willingness to pay enjoys no surplus), one can obtain equilibria where either several or all consumer types have their entire surplus removed.
5. The channel allocation is not chosen to maximize the utility of the class that purchases the bundle of all channels (the *pure bundle*).

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<sup>27</sup>Byrne (2012) is reviewed in section 5.2.

It is argued by Crampes and Hollander (2005) that a platform offering two bundles offers them at prices that capture the entire surplus of consumers. People of type 1 purchase the bundle of all channels. This implies they have a binding self selection constraint, they receive more utility from the bundle targeted at them than the other bundle. While type 2 people have a binding participation constraint; they receive utility equal to that of not consuming television.

The platform offers two types of bundle, one targeted at the type 1 people, another targeted at type 2. Therefore this argument only holds if the type 1 people get zero utility from the bundle targeted at type 2. Both types get equal surplus from the bundle containing an equal number of channels of each type. Therefore, the type 2 people get zero from purchasing the bundle targeted at type 1 people. This implies the firm can set the price to remove all the surplus from them.

Depending on the components, a bundle yields greater utility to one type. This makes it possible for the provider to threaten to offer a single bundle offering equal utility to both types. The bundle price can be such that all surplus is removed from both types. This threat allows the provider to offer two bundles and price the one to remove all surplus from its target. Without a capacity constraint the provider finds it optimal to offer a bundle two bundles: one which maximises the utility of one type of consumer, the other is built to be less attractive to these consumers. The results of the optimization problem absent capacity constraints are the standard results of a price discrimination problem: that one type receives positive utility.

Capacity constraints exist on all platforms engaged in distribution of content in New Zealand. Notably, Kordia has a natural restriction based on compression technology and available spectrum. The number of channels broadcast over Kordia cannot exceed this. Likewise, Sky is restricted in the number of channels it can offer by compression technology and the available data transmission from satellites.

In a numerical model, Crawford and Cullen (2007) consider full *à la carte* pricing and find;

Valuation	$W$	$Q$	Total
$V_1$	\$13	\$8	\$21
$V_2$	\$8	\$13	\$21
maximum combined price	\$16	\$16	
<i>À la carte</i> revenue			\$32
bundling Revenue			\$42

Table 2: A simple bundling example, showing perfectly negatively correlated television channels  $W$  and  $Q$ . The table also shows the revenue from bundling and *à la carte* pricing.

1. Gross surplus falls
2. Consumer surplus rises
3. Producer surplus falls

It is argued that, because of perfect negative correlation between channels (channels are perfect substitutes) bundling allows the provider to extract all the consumer surplus.

A simple example can be set up to show the mechanics of this, see Table 2. Consider two channels:  $W$  and  $Q$  each with a cost of \$20 to produce, and two viewers  $V_1$  and  $V_2$ . The maximum combined price under *à la carte* pricing (\$16) does not cover the costs of \$20 so neither channel will be produced. The provider can bundle the two channels and sell the bundle for \$21. Because each of  $V_1$  and  $V_2$  have valuations that add to \$21 they receive consumer surplus of \$0 while the provider earns a profit of \$1.<sup>28</sup>

It can be shown that under an *à la carte* pricing structure, a sub optimal amount of channels and programmes are provided and they are not differentiated.<sup>29</sup> This, it is argued, reduces consumer surplus. However, Crawford and Cullen (2007) concludes that the increase in consumer surplus from *à la carte* pricing outweighs the negative effect from the sub optimal provision of channels and duplication of programmes. There is scope to build a model similar to Crawford and Cullen's and test if the conclusions hold for a wide variety of specifications.

<sup>28</sup>It is worth noting that if the market were contestable or competitive the bundle price would be \$20. Section 5.1 will elaborate on market structure and consumer welfare

<sup>29</sup>See Gal-Or and Dukes (2003) or Spence and Owen (1977).

As explained in section 2, the television market is a two sided market involving both interactions between the platform and viewers, along with interactions between the platform and content producers. Crawford and Yurukoglu (2012) consider bargaining between the platform and content producers. The authors find that for a wide variety of preferences, the input costs determined in the bargaining game using *à la carte* are higher than those of the game using bundling. How much higher the inputs costs are will be determined by preferences and relative bargaining power of the provider and content producers.

The authors consider that, if input costs do not rise much, *à la carte* pricing results in higher consumer surplus and lower producer surplus. Overall or gross surplus is lower, however the increase in consumer surplus is argued to outweigh this (as per Crawford and Cullen (2007)). Conversely, if the input costs become large then *à la carte* pricing may harm consumers more. The higher input costs will be passed on to them in the form of higher prices.

The model developed by Crawford and Yurukoglu (2012) has interesting implications for New Zealand. The structure of the television market is such that the three main platforms who engage in content procurement have asymmetric bargaining power. Sky is large and privately owned so has a great amount of bargaining power. In contrast, TVNZ is constrained under the provisions of the Television New Zealand Amendment Act (2011) and has somewhat less bargaining power. Mediaworks has two channels to distribute content and has recently come out of receivership, it is likely to have less bargaining power than Sky.

Crawford and Yurukoglu (2012) consider viewership data (ratings) and market data measuring household purchasing decisions and firm production decisions. These data are used to estimate preferences and costs, then test, empirically, the effects of an *à la carte* pricing regime. They find, if one disallows for renegotiations, *à la carte* pricing results in higher consumer surplus. Disallowing for renegotiation, however, is not realistic and Crawford and Yurukoglu (2012) find that input costs do rise due to these renegotiations. To what extent the cost increases are

passed on to consumers will be a function of the competitiveness of the market.<sup>30</sup>

An interesting feature of the television market is that bundling takes place both within TVNZ and Mediaworks but also at the distribution level. Kordia bundles Mediaworks with TVNZ to offer to consumers. This is unlikely to be discriminatory pricing because Kordia derives revenue from TVNZ and Mediaworks, not from viewers or advertisers. However, it is still of interest to policy makers to consider the effects of TVNZ and Mediaworks being offered *à la carte*. As explored previously, Chae (1992) argues that in the presence of *à la carte* pricing the level of advertising is lower; would we observe this result?

## 4 Public Service Broadcasting

I describe Public Service Broadcasting in four English speaking areas.

1. United States of America
2. Canada
3. The United Kingdom
4. Australia

The intention of this section is to provide a brief summary of the English speaking world's PSB structure. This, it is hoped, will aid in future work on the relevance of PSB in New Zealand. There is scope for research into what effect PSB has on correcting the market failures of free market broadcasting in terms of provision of content.

**Definition** If a television platform is government owned, has an obligation to broadcast content of a certain type and is funded, either solely or in part, by the government, it is a *Public Service Broadcaster (PSB)*.

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<sup>30</sup>It may be fruitful to repeat Crawford and Yurukoglu (2012)'s empirical work using New Zealand data to inform policy makers here.

PSBs exist to correct the market failures of the television market, most often, sub-optimal programming.<sup>31</sup> They are often state owned enterprises (like TVNZ). Boardman and Vining (1996) argue that the rationale for government support of PSB is to provide content that would not be provided in an unregulated market. To ensure the market failure is corrected, they are constrained by law to provide certain programme types or to broadcast fewer advertisements. The reasoning is that certain programme types have a positive externality of consumption. Dijk, Nahuis, and Waagmeester (2006) argue that consumers are not sufficiently long sighted to assess the benefits of viewing certain programmes; for example, a science documentary imposes an *ex ante* cost on the viewer of education and the benefit of the documentary accrues in the future. The example used by the authors is classical music; to enjoy classical music one usually needs to listen for some length of time, during which the utility gained is not optimal. This suboptimal utility imposes a ‘cost’ of ‘learning to love’ classical music. This is a variant of the argument of externalities, where consumers behave rationally but not optimally from the point of view of society. Arguably, certain programme types may include a positive externality of consumption not internalized by the viewer. An example of this is the belief that watching classical music concerts increases one’s productivity and makes one a ‘better person’. This increase in productivity is not one that is compensated by wages. It is of benefit to society but not the individual, so the individual does not have as much incentive to consume classical music as society does. This a paternalistic argument for the existence of PSB.

#### **4.0.1 The United States of America**

The PSB network in the USA is known as the Public Broadcasting Service (PBS), it consists of 354 television stations.

Aufderheide (1996) describe the market structure for PSB in the USA as consisting of a large number of small firms. Some firms span states, others exist in single states and do not produce any of their own content. A small number of large stations span many states and pro-

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<sup>31</sup>See section 2.1.2.

duce their own content. All the stations compete with the commercial stations for programmes. In a two sided market setting this can be interpreted as the market exhibiting strong upstream competition for content.

The Telecommunications Act (1996) contains the provision:

SEC. 399A. [47 U.S.C. 399a] USE OF BUSINESS OR INSTITUTIONAL LOGOGRAMS. (a) For purposes of this section, the term ‘business or institutional logogram’ means any aural or visual letters or words, or any symbol or sign, which is used for the exclusive purpose of identifying any corporation, company, or other organization, and which is not used for the purpose of promoting the products, services, or facilities of such corporation, company, or other organization. (b) Each public television station and each public radio station shall be authorized to broadcast announcements which include the use of any business or institutional logogram and which include a reference to the location of the corporation, company, or other organization involved, except that such announcements may not interrupt regular programming. (c) The provisions of this section shall not be construed to limit the authority of the Commission to prescribe regulations relating to the manner in which logograms may be used to identify corporations, companies, or other organizations.

This section means that in America the PSBs are prohibited from earning revenue from advertising in its usual form, instead they turn to underwriting. Underwriting is when a firm pays the PSB to mention them rather than an advertisement slot. There are free-to-air platforms in the USA such as the ABC which do broadcast advertising as a means of revenue generation. These platforms are not consistent with the above definition of a PSB because they are not constrained in programme provision choice by the government. Therefore they do not exist to serve the public in the way PSBs are generally thought.

Models of broadcasting that consider advertising generally contain a term that represents the demand for a firm’s product based on that product being advertised. The law prohibits the

product being mentioned, therefore in models containing American PSBs a new term is needed that captures the demand for the firm's goods being affected by the mentioning of the firm.<sup>32</sup> Apart from these limited cases this legislature is an interesting but moot point.

Aufderheide (1996) further argues that PSBs rely on donations in America rather than government funding. Therefore they tend to broadcast content that is preferred by their main donors, who are often conservative. This content bias seems to contradict the general point of PSB, to provide content that otherwise would not be provided.<sup>33</sup>

#### 4.1 Canada

Canada's PSB is similarly run to New Zealand's. It is government funded and has an obligation to show Canadian made content and regulated under the Canadian Radio-television Telecommunications Commission, but also acts in a commercial capacity by selling slots for advertisements to firms.

An interesting feature in Canada's PSB is that the PSBs must compete with broadcasters from the US. Frequencies from the US can be received by viewers in Canada due to the geographic proximity. The US may also have such a concern: a Canadian PSB may broadcast a high rating US programme which some US viewers will be able to receive.

Boardman and Vining (1996) note that technological change was a major force threatening the Canadian Broadcasting Corporation (CBC). They note that oligopolistic conditions in distribution during the time of publication were soon to be undone, driven by new cable and satellite delivery systems.

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<sup>32</sup>An example of this is when a programme contains an announcement at the end to the tune of 'this programme brought to you by ...'

<sup>33</sup>Boardman and Vining (1996).

## 4.2 The United Kingdom

Like Canada and New Zealand, ITV and Channel 4 (the UK's PSB) are government funded and commercially oriented. They are regulated by the Independent Broadcasting Authority (succeeded by Independent Television Commission - ITC). It is required by the ITC that ITV and Channel 4 broadcast 'positive programming requirements'. This is a similar requirement to Canada's and New Zealand's that local and minority content be provided even if it is not profit maximising.

Cave (1996) argued

There may be difficulties in combining within the same organization a public service mission and highly commercial activities, undertaken in a very competitive world market.

This is as relevant today for New Zealand as it was in 1996 for The United Kingdom. The mismatching of incentives in these types of organizations is something that requires examination and could be a topic for research.<sup>34</sup>

The British Broadcasting Corporation (BBC) is worthy of mention because it operates under a royal charter to show a mix of programmes by subject matter on ITV but is also an exporter of programming. In New Zealand both Sky and TVNZ import many BBC programmes. It is funded by television licences, each household faces a yearly subscription fee to watch 'free' television.

New Zealand also had television licences in the past. It would be interesting to conduct a welfare analysis comparing the current funding regime for TVNZ, and that which existed under television licencing.

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<sup>34</sup>A model of the asymmetric information game between policy makers and platforms constrained under a PSB contract would be a natural start.

### 4.3 Australia

As New Zealand's nearest geographical neighbour and partner in various trade agreements Australia is a logical comparison in terms of PSB policy.

Australia has two PSBs; Australian Broadcasting Corporation (ABC) and Special Broadcasting Service (SBS), with different objectives.

If we think of the broadcasting market as a Hotelling style line then ABC sits in the middle and covers everything while SBS sits at one of the sides and covers a little.<sup>35</sup> The ABC is required to broadcast to as many people as possible and therefore becomes either the sole or one of a few operators in regional areas and completely dominated by commercial stations in metropolitan areas.

The ABC is prohibited from advertiser funding and chartered to provide certain programmes with guaranteed funding for this charter.

However, Davis (1988) had this to say:

If it confines itself to cultural and educational programmes, the ABC can be certain of low ratings, accusations of elitism and questions about why compulsory taxation should support a privileged minority of regular ABC viewers. If, on the other hand, the ABC seeks legitimacy through popularity, it may simply repeat the programming of the commercial sector. The dilemma is reflected in endless debates about whether the Corporation should pursue 'ratings' or some vague entity labelled 'quality.'

In contrast to the ABC, the SBS acts in the interests of minority viewers providing foreign language content to Australia's many varied ethnic groups. The SBS is allowed to sell advertising slots for funding. Section 2.1.2 has examined the differences in content outcomes that result from pay versus advertising funded TV.

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<sup>35</sup>See section 2.1.1 for a description of Hotelling models.

#### 4.4 Comparisons with New Zealand

The US has a large number of PSB networks, New Zealand has a single PSB; TVNZ. This implies that, in the two-sided PSB market, there is weak upstream competition for content.

Technological change is something threatening to change the paradigm in New Zealand's broadcasting industry. Ultra Fast Broadband (UFB) is being rolled out, and there are plans for another undersea cable linking NZ to the US (among other places). This cable should result in faster download speeds for many New Zealand internet users. This may entice many to download, legally or otherwise, programming rather than subscribe to a platform. This threat is being taken seriously by the industry. In order to control download of programmes Retail Service Providers (RSPs) in New Zealand have an agreement with Sky not to allow access to video streaming services like Netflix. At the time of writing, the Commerce Commission is looking into these agreements.

Australia and the US both prohibit advertising on PSB channels. Australia does so explicitly while the United States uses the provisions of The Telecommunications Act (1996) as previously cited. In New Zealand, PSBs have no such prohibition. I have explored the effects advertising introduces in television markets on programming and pricing decisions. To my knowledge, the literature includes no estimation of whether or not prohibition of advertising on PSB is socially optimal. In section 5.2 I will explore an empirical study conducted by Byrne (2012) on price controls in basic Canadian cable. Byrne (2012) estimates the consumer surplus change resulting from the price cap on basic cable. A similar model could be used to estimate the consumer surplus resulting from a change in allowing advertising on PSB. The method I suggest is a differences in differences approach; using New Zealand as the case where advertising is allowed and Australian data for the advertising prohibited case.

Like Canada and Australia, New Zealand has a domestic content requirement on TVNZ. TVNZ is required under the Television New Zealand Amendment Act (2011) to provide foreign

and domestic content to appeal to a wide range of audiences and content that reflects Māori perspectives. The effect of a domestic content requirement is explored in section 5.3.

Related to the domestic content requirement, in Australia the SBS is required to show content produced in the home countries of various ethnic minorities. New Zealand has no such requirement on TVNZ. However, we do observe some platforms in certain localities providing this content.<sup>36</sup> Optimality of regulated or voluntary provision of this type of content is unexplored in the literature. As explored in section 2.1.2, programme provision choices are made to target the largest group of viewers, so niche content is sub optimally produced in an unregulated market.

## 5 Policy

There are obvious market failures occurring in the television market: suboptimal differentiation; over (under) provision of advertising; *mixed bundling*, when the literature generally agrees that pure bundling and *à la carte* are more socially efficient. So the question remains: what should the regulatory response be?

In this section, I consider three policy options: regulating the market structure, price regulation and a domestic content requirement (DCR).

### 5.1 Market Structure

In one sided markets, it is accepted that the more competitive the market becomes, the more socially optimal are the prices and quantity of goods sold. In a two sided market, there is some ambiguity to this result. As discussed in section 2, in a two sided market, an asymmetric pricing structure arises to solve the *chicken and egg problem* or as a result of *competitive bottlenecks*.<sup>37</sup> It is argued by Wright (2003) that a monopolist in a two sided market will still choose the pricing

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<sup>36</sup>For example Triangle TV.

<sup>37</sup>See Caillaud and Jullien (2003) and Armstrong (2006).

structure consistent with a *divide and conquer* strategy as per Caillaud and Jullien (2003). To wit, it will offer a subsidy to the population who impose positive surplus on the other population by being party to the platform, and charge the other party a price above cost. Competition, in the television market is predicted to lower the average price, but it will not change the structure of prices, and we should still observe free to air television.

In section 3.2, I presented an example of a firm that was able to extract some surplus while extracting all surplus from both consumers by charging a high price for both channels. Consider the case where this market is contestable. Specifically, consider a monopolistic competition Bertrand game between the incumbent platform with prices as shown in Table 2 and a potential entrant with the same cost structure. It can be shown that the incumbent platform has a best response to charge a lower price for the bundle to ensure the potential entrant remained out of the market. This price is equal to the assumed costs so the market price would be the same as in a competitive equilibrium consumer surplus would be maximised.

Crampes and Hollander (2005) develop a model of a monopolist television provider considering how to bundle and price channels of different types; those containing more documentaries, and those containing more sport. Consumers in this model value variety over any specific channel. The more channels containing documentaries, say, in a bundle the greater chance there will be a specific documentary the consumer wants to watch. Therefore such a consumer would have a preference for a bundle containing more documentary channels.<sup>38</sup>

The authors show that: firstly, In a two bundle case, the firm offers a smaller bundle which is a subset of the larger bundle. Secondly, if the firm bundles, then it offers the bundles at prices such that all surplus is removed from all consumers.

Crampes and Hollander (2005) also prove that a private monopolist allocates too many

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<sup>38</sup>Crampes and Hollander (2005) focus on intra-genre variety for computational reasons. Similar reasoning could potentially hold in the case of inter-genre variety.

channels to one genre when the average viewer has weaker preferences for that genre. This contrasts to the standard result of models considering programme provision choice given consumers with heterogeneous preferences: that channel types provided are those that appeal to the largest group of homogeneous viewers (i.e. a lowest common denominator type provision).

In New Zealand, as explained in section 1.1, the pay television market is dominated by Sky. Therefore the model of Crampes and Hollander (2005) is useful in explaining Sky's rationale for offering a basic bundle as well as non basic bundles that all contain the basic bundle. Their model provides a starting point for empirical work considering the optimal market structure and level of competition in the television market. Of particular interest is the effect an increase in competition would have on bundle prices. Specifically, would all surplus still be removed from all consumers? Consideration should also be made for the effect of an increased level of competition on optimal bundle composition. Would increasing competition result in a socially optimal provision of channel types? In one sided markets more competition is unambiguously optimal. In two sided markets one must consider the changes to *upstream effects* and *downstream effects* as per Rennhoff and Serfes (2009).

The optimal pricing structure for the television market is a potential area for future research. Many authors in the literature (Chae (1992), Armstrong (2006)) build models comparing *à la carte* to bundling equilibria.

## 5.2 Price regulation

Given that sky is a monopolist in the provision of pay television, a natural policy response may be to regulate the price of Sky's basic bundle. To maximise total surplus, the price should be regulated to be equal to that which would arise in competition, in order to remove monopoly rents and maximise consumer surplus.

If regulators believe that advertising is being over-provided then price regulation could be

implemented through advertising levels on free to air television. Advertising, as detailed in section 5.3 is the *virtual price* of a television channel, or bundle of channels. Therefore, regulation of advertising levels is akin to price regulation in effect.

Wright (2003) argues that price regulation in a two sided market is not competitively neutral. To be competitively neutral, a regulation must not provide any competitive advantage for rival unregulated firms. In a sufficiently competitive ‘normal’ market, regulating the prices of one firm will result in competing firms lowering their prices. So long as the price is above marginal cost, each firm has a best response to lower their price. In a two sided market, regulating a lower price to one side of the market (which could also be in the form of reduced advertising) will not be matched by a competitor platform.

Consider a regulation forcing one television platform to cut advertising (i.e. the ‘price’ to free television viewers). Will the other television providers also lower advertising? Advertising is the source of revenue for free to air television; a significant cut in advertising revenue is likely to affect the quality and type of content each platform can purchase. So long as consumer preferences are such that consumers are willing to view advertising in order to watch high quality content, it will be in the interests of maintaining its viewers by providing appealing content, a competing provider will not lower its advertising. This will result in a competitive advantage for the unregulated firm. If the regulated provider does not wish to cut back on quality or type of content, it may be forced to charge a subscription fee to its viewers. A subscription fee implies consumers would, *ceteris paribus*, prefer the rival provider. Thus there will be a competitive disadvantage for the regulated platform.

There is empirical literature on price regulation experiences in television markets; Byrne (2012) provides an analysis of such regulation in Canada. Byrne (2012) uses data from the Canadian Radio-television Telecommunications Commission (CRTC) master files for the 1990 – 1996 period. These data contain information on revenues, costs, and subscriberships aggregated at licence year level broken down by basic and non basic services. Byrne (2012) also uses

data from the CRTC decision and notices archive. These data are used to estimate a reduced form analysis of acquisition and firm size effects.<sup>39</sup> Byrne finds acquisitions have an insignificant impact on the price of basic cable. This is explained by price regulation that sets an upper bound on the price of basic cable.<sup>40</sup>

Byrne then develops a multi product monopoly model; arguing that each cable company is effectively a local monopolist who potentially faces basic cable price caps. He finds that the removal of the basic cable price cap increases basic and non basic cable prices, and slightly increases the channel count on non basic services. It also results in increased profit for the cable providers. Byrne (2012) notes that this large increase in price and little increase in quality (as measured by channel count) is consistent with a decrease in consumer surplus which is confirmed in the sample average of mean monthly consumer surplus estimates.

Byrne concludes that the best outcome from a consumer perspective is one with a price regulation and a laissez-faire attitude to consolidation.

If data were available, it would be worth repeating Byrne (2012)'s analysis using data from New Zealand and building a similar model to assess the impact of price regulations for New Zealand's television market.

### 5.3 Content Requirements

Mukhtar and John (2005) design a theoretical model of the effects of a domestic content requirement imposed on a broadcaster (radio in this case). Consumers are assumed to value international content over domestic content stations even after a domestic content requirement (DCR) is imposed. The authors show that introducing a DCR reduces the consumption of domestic content when demand is elastic, the preference for foreign content is high and oppor-

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<sup>39</sup>Byrne (2012) is considering the effects of consolidation on the television market in Canada.

<sup>40</sup>*Broadcasting Act* prior to 2001.

tunity costs of viewing are high. Mukhtar and John (2005) model utility as a function over domestic content, foreign content, and leisure: all other activities one could engage in apart from listening to the radio. It is argued that when the DCR is imposed a consumer will reshuffle their consumption bundle toward leisure, away from stations with high domestic content. This reduces the consumption of domestic content.

I begin by defining some of the terms used in Mukhtar and John (2005).

**Definition** *virtual price*, each genre has a weighting attached to it, the virtual price is the inverse of this weighting. Virtual price it is decreasing in weight of preferences over that genre.

**Definition** *Content effect*; the attractiveness of the genre decreases as the weight of domestic content increases.<sup>41</sup>

**Definition** *Advertising effect*; A lower advertising level decreases a station's virtual price.

The authors consider how changing a DCR marginally affects content consumption. The overall effect of an increase in a DCR is shown by Mukhtar and John (2005) to be an increase in the number of broadcasters constrained by the DCR. More importantly, there is a decrease in the consumption of constrained broadcaster's content and an increase in consumption of the content from unconstrained broadcasters.

When a regulator imposes a DCR such that the share of domestic content on a station is fixed at a certain fraction, say  $\delta$ , this will change the virtual price of content. This change in virtual price has an ambiguous sign because only stations whose fraction is less than  $\delta$  experience a drop in price. The constrained stations with fractions between  $\delta$  and  $\delta \frac{\sigma}{(\sigma-1)}$ , where  $\sigma$  is the elasticity of substitution between that genre and leisure, increase their price when a DCR is imposed. This increase results because the stations with a fraction lower than  $\delta$  face the *content effect* with an *advertising effect* insufficiently great to offset the fall in attractiveness. In contrast the *advertising effect* dominates the *content effect* for the stations with fractions between  $\delta$  and  $\delta \frac{\sigma}{(\sigma-1)}$ . Mukhtar and John (2005) explain this phenomenon:

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<sup>41</sup>In the model, foreign content is unambiguously preferred to domestic.

As the elasticity of substitution between genres goes up, the range of stations that raise prices in response to the policy shrinks. This is attributed to the fact that *ceteris paribus*, the consumer values the composition of desirable content higher than the nuisance caused by advertising.

Using numerical analysis, Mukhtar and John (2005) consider the case for a country where individual preferences over genre are uniformly distributed. A uniform distribution of preferences would exist in countries where there is no language barrier to consumption of domestic content, and where people are more open to foreign cultures. This may or may not apply to New Zealand, for example on our PSB station ‘Maori Television’ there are many programmes broadcast in the Māori language; this is a significant language barrier. Under this specification the effectiveness of the DCR to increase domestic content consumption increases in the elasticity of substitution between genres. This is because DCR constrained stations (those with a fraction less than the DCR) become less competitive by offering a less attractive mix of foreign and domestic content. The higher elasticity of substitution lowers the cost to the listener of switching between stations to ones that offer a more attractive mix. These stations also provide a relatively higher domestic content ratio so the overall consumption of domestic programs is argued to increase.

Consider the case where New Zealand cannot be included in countries with uniform preferences because of a high language barrier. Assume instead, that preferences are skewed very strongly toward stations with low domestic content. Under this specification Mukhtar and John (2005) find that the larger the elasticity of substitution between genres and leisure, the smaller is the optimal DCR ( $\delta$ ) from a consumer welfare maximising standpoint. When preferences are skewed, a consumer finds low domestic content stations more attractive. The skewness yields different virtual prices and the higher elasticity leads to higher consumption of leisure. Therefore, when a DCR is imposed the relative undesirability of high domestic stations is lessened. Therefore, the effect of falling consumption of broadcasting is large and overcomes the effect of increasing the share of domestic programs. Consumption of domestic programming falls.

Although Mukhtar and John (2005) study radio, their model can be used as a basis for similar work considering the effects of a DCR in television. A first glance reveals that the assumption of each channel serving a single genre is unlikely to hold in television. Also television channels are not owned and provided individually like many radio stations are. This introduces cross channel effects; where broadcasters strategically place a popular programme on one channel and at the same time slot on another channel a less popular programme is broadcast. A broadcaster would do this in order to target the right mix of viewers for the advertisers. However, during primetime a broadcaster might find it optimal to target one distribution of viewers with one channel, and another distribution on another channel. For example, we observe during the 7:00 pm slot TVNZ broadcasts Shortland Street (targeting young adults) and also Seven Sharp (targeting an older audience).

There is some literature mentioning content and other requirements to which public service broadcasting (PSB) are held, notably Dijk et al. (2006). What is missing, is a model of the interaction between a private television provider and a publicly funded one that is subject to content requirements. Firstly, how does a game between competing platforms evolve when one platform has a DCR and the other platform is free to make unconstrained profit maximizing decisions? Secondly, what is the effect of the decrease in bargaining power the constrained broadcaster faces in content procurement? Are they forced to provide ‘worse’ content than the unconstrained broadcaster?

## 5.4 Igloo

An important recent development in New Zealand’s television market has been the joint venture between Sky Television Limited and Television New Zealand Limited (TVNZ), Igloo.

Igloo is a hybrid of free to air and pay television; a consumer pays an upfront cost to purchase the set top box and has access to all the free to air channels. The consumer may, if they choose, pay an additional fee to access pay television content in a *pure bundle* of eleven channels from

Sky's channel list. A comprehensive investigation report was carried out by the New Zealand Commerce Commission (2012), which concluded, *inter alia*, that the entry of TVNZ into the pay television market is unlikely to significantly increase competition in the market. Given the number of other likely new and potential entrants, any loss in competition would not be substantial.

The Commerce Commission (2012) does not consider any provisions of the joint venture agreement will have the effect, or likely effect, of lessening competition in a market contrary to section 27 of the Commerce Act.

The introduction of Igloo provides a natural experiment to assess the impact of a regulation compelling providers to offer television in *pure bundles*.<sup>42</sup> Empirical analysis could be done on the effect of this introduction on consumer surplus following the method of Byrne (2012).

## 6 Content Delivery

Ultrafast broadband (UFB) is currently being rolled out across New Zealand. This implies more viewers will be able to access the on demand services provided by the four main platforms. This raises the question of which content delivery method is optimal: channels, or pay per view?

In order to answer this question, models such as those given by Caillaud and Jullien (2003) would be useful. The issue is how to model the two sided market between the viewers and television provider over the ISP as the platform. The television provider still must make content procurement decisions as in Rennhoff and Serfes (2009), so the relative bargaining power in the upstream market for content will have an effect on the prices each platform charges.

Consider a structure such that consumers can buy a set of  $m$  goods from a larger set of

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<sup>42</sup>A bundle containing all the channels.

Consumer/good	$a$	$b$	$c$	$w^i(1)$	$w^i(2)$	$w^i(3)$
1	1	0.1	0.4	1	1.4	1.5
2	0.4	1	0.1	1	1.4	1.5
3	1	0.4	0.1	1	1.4	1.5

Table 3: Hypothetical valuations for three goods by three consumers to illustrate the ability of customized bundling to replicate mixed bundle pricing.

$N$  goods, for a fixed price  $p$ . This is a pricing structure that Hitt and Chen (2005) define as *customized bundling*.<sup>43</sup>

Consider three conditions that are likely to hold in the television market:

1. Consumers are budget constrained.
2. Marginal cost is low but non-zero.
3. Consumer valuations are concentrated on small numbers of goods.

Under these conditions Hitt and Chen (2005) show that *customized bundling* is an attractive pricing strategy for a monopolist.

To show how *customized bundling* replicates the profit from *mixed bundling*, consider three consumers (1,2,3) and three goods ( $a, b, c$ ) each consumer has a willingness to pay (WTP) function  $w^i(m)$  where  $m$  is the number of goods (out of the available three) the consumer buys. Consider the following valuations given in Table 3.

The mixed bundling solution would be to offer three bundles of two goods each at a price of 1.4. This is the same as the optimal price for the customized bundling of two goods.

The authors then consider the following conditions in order to obtain comparative statics. let  $r$  and  $s$  be bundles of different sizes from  $N$  goods.  $i$  and  $j$  index consumer types.

$$w^i(r) \geq w^j(r), \forall i > j \quad (4)$$

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<sup>43</sup>We observe this pricing structure in *pick n mix* confectionery for sale in supermarkets. A consumer can choose any number of different confectioneries for a fixed price per 100 grams.

$$w^i(r) - w^i(s) \geq w^j(r) - w^j(s), \forall r > s, i > j. \quad (5)$$

Higher  $i$  consumer types must place a weakly greater value on any customized bundle and the value is weakly increasing in bundle size.

Under these conditions the authors prove that the monopolist will offer customized bundles with the following properties.

1. The lowest type customer served is charged a price equal to their WTP (they receive no surplus).
2. All other consumers that are served gain positive surplus because the prices are set to put the lowest type on their incentive compatibility constraint.
3. The highest type customer is always given the bundle size they would have been given, had they been the *only* type.
4. All other consumer types are given a (weakly) smaller size bundle than they would have been if they were the *only* type.
5. There may exist a cutoff type such that any consumer below this type is not served.
6. the optimal size of the customized bundle is weakly decreasing in marginal cost.

This model deals with a monopolistic seller of goods. New Zealand's television market is oligopolistic. An area of research required is a model examining whether these *customized bundles* are a Nash equilibrium in a Bertrand style game between three platforms. The different revenue structures of the three types of platforms that offer on demand services are of interest. Sky is subscriber funded, its on demand service is exclusive to subscribers, and carries no advertising, as explored previously Sky offers *mixed bundles*. TVNZ and Mediaworks are advertiser funded and their on demand services also carry advertising, these platforms offer *pure bundles*. Therefore in these models we should observe *divide and conquer* strategies as per Caillaud and Jullien (2003) on Sky's on demand service. Because both Sky and the viewers will be single homers. While the on demand services by TVNZ and Mediaworks should exhibit

*competitive bottlenecks*.<sup>44</sup> ISPs offer *customized bundles* in the form of charging an up front data cap for any bundle of entertainment goods a consumer wishes to purchase. Therefore the results presented by Hitt and Chen (2005) are useful in considering policy options in this market.

## 7 Conclusion

In this literature review I have described the theory of two sided markets and shown how an asymmetric pricing structure arises in equilibrium due to positive network externalities. One side of the market (those that confer more surplus to the other side) is subsidised in order to subscribe to the platform. Also included was an exploration of the effects of adding advertising into models of two sided markets. Advertising is a feature of media markets and is a source of revenue for platforms while imposing negative externalities on viewers. The effect of introducing advertising is that we observe the (counter intuitive) existence of free to air television provided by private companies. Advertising also changes the asymmetric pricing equilibrium of the television market because of Armstrong (2006)'s *competitive bottlenecks*. The viewers are subsidised with zero subscription fees (free television) while the advertisers are conquered. If the advertiser wishes to access the platform's viewers they *must* subscribe to that platform so the platform has monopoly power over the advertiser and exercises this through monopoly pricing. The programme provision choice of platforms has been considered.

I have reviewed literature showing that programmes are targeted towards the lowest common denominator. Other literature concludes that programme duplication is a Nash equilibrium. This was found to be fallacious in an empirical study that concluded that differentiation was a Nash equilibrium in The U.S.<sup>45</sup>

I have reviewed both sides of the academic debate over the subject of bundling in the television market. Whether it is a first best, second best or welfare harming equilibrium is a source

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<sup>44</sup>See section 2 for a discussion of these concepts.

<sup>45</sup>See Goettler and Shachar (2001).

of much academic disagreement. The literature on bundling shows only that the welfare effects of bundling in the television market are argued by all to stem from preferences of viewers and advertising's nuisance effect. One side of the bundling literature argues that bundling is always detrimental to consumer surplus, this was demonstrated using the example in Table 2. The other side of the literature argues that *pure bundling* (selling all goods in one bundle) is necessary for the existence of a Nash equilibrium in pure strategies and is consumer surplus enhancing. Both sides of the literature agree that bundling is used by firms as a profit maximising pricing structure and that *mixed bundling* (selling multiple bundles of different sizes and prices) is always a source of price discrimination and detrimental to consumer surplus.

Empirically, Byrne (2012) found that a price cap on basic cable in Canada improves welfare despite decreasing channel count. Section 5.3 reviews the literature investigating the theory behind a domestic content requirement. Detailed in this section is the finding by Mukhtar and John (2005) that, under uniform preferences the effectiveness of the DCR is increasing in the elasticity of substitution between genres and leisure.

Finally, an interesting development in the New Zealand television market, Igloo is described and the important findings from the Commerce Commission's report into the joint venture are provided. Igloo provides an opportunity for a natural experiment in the competition between a *pure bundling* provider (Igloo) and an unregulated provider (Sky Television).

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