Intermediaries in Two-Sided Markets: An Economic Analysis of the TV Advertising Industry

Marina Balandina,[†] Azamat Valei[‡]

Abstract

In this paper, we build a model of a two-sided market with intermediaries and analyze how the number of intermediaries influences the functioning and performance of two-sided markets. The model considers TV-advertising industry and determines equilibria in each level of the two-sided market, taking into account the network effects and interdependence of the markets. We investigate the optimal number of intermediaries which gives the greatest social surplus. To do this, we build a social welfare function and analyze its reaction to different numbers of intermediaries. The results suggest that the number of intermediaries and the maximum amount of advertising per channel are substituting regulation policies. Socially optimal regulation depends crucially on the profitability of advertising and the externalities present on both sides of the two-sided market.

Keywords: *advertising, competition policy, industrial organization, intermediaries, network effect, two-sided market*

Jel: D43, D47, L13, L22, L96

[†] Graduate School of Economics and Management (GSEM), Ural Federal University, Yekaterinburg, Russia

[‡] Laboratory for International and Regional Economics, GSEM, Ural Federal University
CERGE-EI, a joint workplace of Charles University and the Economics Institute of the Czech Academy of Sciences, Prague, Czech Republic

Introduction

Nowadays there is no precise economic and legal foundation able to specify the criteria of an effective market structure in two-sided markets, especially if there is an intermediary which relates platforms and end-users. The question of how intermediaries influence the functioning of two-sided markets remains unclear. The existing literature concludes that platforms interact with both sides of the market directly, but in practice some two-sided markets have intermediary agents operating on one side of the market. For example, TV channels and some other media transfer the right to trade advertising to intermediaries – media-sellers. Movie-makers do not directly sell their films to cinemas but through entitled film distributors. Producers of game consoles (e.g. Nintendo) also use the services of intermediaries (exclusive distributors) to sell their products.

TV advertising industry is a prime example of a two-sided market. In some countries, the right to trade advertising belongs to media-sellers, the number of which is regulated by the government. Interestingly, there is no economic theory that would justify the necessity of these intermediaries and their number. This creates serious concern among market participants and antitrust regulators as the number of intermediaries changes over time.

Two types of intermediaries can operate in this market. The first is a distributor of a TV channel's signal (cable, satellite, IPTV), to whom a TV channel delegates the right to determine the prices that viewers have to pay. The second is a media-seller – an intermediary which receives an exclusive right to sell advertisement on a certain TV channel. The TV industry is two-sided and characterized by a high concentration of intermediaries, both media-sellers and distributors.

TV distributors have obtained a gatekeeping position in the TV industry in many countries due to the cost structure of a natural monopoly, high economies of scale and high barriers to entry; these make it difficult to introduce competition. To increase competition among signal distributors, the authorities of some countries, for example Spain and the USA, try to facilitate the access of independent TV channels to broadcasting.[1]

The market of media-sellers is also highly concentrated, but surprisingly less studied. A media seller who specializes in selling ads has the ability to work with lower "search and bargaining" costs in the advertising market than an independent TV channel. National TV channels have headquarters in capital cities, while advertisers are usually located all over the country. The geographical multiplicity and differentiation of advertisers in particular make the costs of "search and bargaining" significant. Media-seller can sell ads to multiple channels, eliminating the need for an advertiser to negotiate with each channel separately: this in turn reduces costs. A media seller working with multiple channels makes regular similar deals with advertisers. This increases the efficiency of a

[1] See Bell at al. (2007) for more details.

media seller due to scale economies. For instance, the intermediaries have lower costs when it comes to the legal control of advertising: an intermediary checks the compliance of the advertising with the state advertising laws for all channels at once, whereas without a media-seller each TV channel would need to incur the control cost individually.

A media-seller has another advantage due to the fact that it specializes only in the sale of advertising: it can improve its skills and technology (thus offering a better service to advertisers) through learning by doing. [2].

Media-sellers exist in many countries: Spain, Germany, China, Russia, Romania, etc. They serve not only national TV channels but also niche or thematic channels. The number of media-sellers differs across countries and changes over time. A high concentration of media-sellers raises serious concern, as evidenced by numerous changes in antitrust legislations.

To demonstrate these changes, let us consider the example of antitrust practices in the Russian TV advertising industry. There was no strict regulation of TV advertising distribution in Russia until 2011, although the market was highly concentrated (a monopoly or duopoly in different years) and thus needed to be controlled. In accordance with the amendments to the federal law "On Advertising",[3] national TV channels were not entitled to enter into contracts for the provision of advertising services with a dominant media-seller. In 2011-2015 the formal requirements of the advertising laws were fulfilled: four media sellers worked in the market.[4] Later, on July 4, 2014, the amendments to the federal law "On Advertising" were abolished leading to the creation of a monopolistic media seller (which was replaced by an oligopoly in 2015). Since 2017, the Russian TV advertising market is again served by one media-seller: LLC "National Advertising Alliance".

Previous attempts to regulate the number of media-sellers seem to have no consistent economic logic since antitrust legislation was not persistent and effective. As a result, the question what market structure is optimal at the level of media-sellers remains unclear.

Our article offers a model that answers this question, implementing welfare analysis to find a market structure that maximizes social surplus. We apply equilibrium analysis at all levels of the two-sided market and determine the optimal number of media-sellers. The rest of the article includes a literature review, the model and concluding results.

[2]The media seller collects information on specific needs of advertisers and uses the results from the previous advertising campaigns to optimize media plans.

[3]About changes in p. 14, 33, 36 of Federal Law "On Advertisement": Federal Law of Russian Federation from 18.12.2009 №354 // Rossiskaya Gazeta.-2009 – 29 December. –pp.11.

[4]Videointernational, Alkasar, Everest-S and RTR-Media.

Literature Review

The economic analysis of advertising began with Marshall (1890, 1919) and Chamberlin (1933), and was further developed by Stigler (1961), Comanor and Wilson (1969, 1974), Sutton (1974), Anderson and Renault (2006), Etro (2014) and others. These seminal articles point out the main views on advertising and its effects on welfare and competition.

The economic analysis of two-sided markets was introduced in Roche and Tirole (2003, 2006), Evans (2003), and Caillaud and Jullien (2003). This topic immediately attracted many economists and consequently the amount of papers devoted to two-sided markets increased dramatically. One of the recent important works is Weyl (2010), who investigates pricing in multisided platforms.

Different aspects of the functioning of the TV advertising industry as a two-sided market have been considered extensively in the recent literature: Goatler (2001), Andersen and Kout (2005), Gantman and Shy (2007), Armstrong (2006), and Peitz and Valletti (2008). However, there is no research devoted to intermediaries in the two-sided markets which typically exist in the TV industries of most countries.

The only papers to model a media industry with an intermediary distributor are Crawford and Cullen (2007), and Crawford and Yurukoglu (2012). They investigate bundling strategies by TV distributors, but do not use a framework of two-sided markets, so the TV-advertising market is not taken into account.

Literature that examines pricing in two-sided markets involving a platform and an intermediary is extremely scarce. The paper of Berg et al. (2012) is a pioneering article that analyzes the strategic interaction between intermediaries and a platform. The authors consider a case of two competing distributors of one independent TV channel. The authors assume that the distributors set end-user prices for viewers while the TV channel sets advertising prices. Their main result is that the distributors have incentives to internalize a negative externality imposed on viewers with TV advertising, but no incentives to internalize the effect of the TV channel's profit from advertising which is affected by end-user prices. The presence of an intermediary and imperfect vertical coordination between a TV channel and a distributor leads to three interesting results: end-user prices may be higher in a TV channel with ads than without ads; distributors may make a positive profit even when they are perfect substitutes; and an advertising cap may be welfare-improving even when the non-regulated advertising level is too low compared to the social optimum.

First identified in Berg et al. (2012), imperfect vertical coordination is studied in Kind et al. (2014). The paper shows that these coordination problems hamper platforms when they coordinate prices in two-sided markets. When two platforms let an independent distributor set viewer prices in order to reduce competition between TV channels in the market of viewers, it does not lead to a la cartel outcome (as might be the case in a

one-sided market). The problem is that inter-firm price coordination on one side of the market complicates intra-firm price coordination. The authors show that this may lead to inefficiently high generalized prices, and possibly more if the wholesale contracts between a distributor and a TV channel consist of a two-part tariff rather than a simple fixed fee.

Gabrielsen et al. (2015) also shows that the presence of intermediaries in two-sided markets creates an additional externality to platforms. The paper studies how competing platforms can internalize the externalities by imposing resale price maintenance (RPM) on intermediaries. RPM allows platforms to fully appropriate the revenue from both sides of the market, realizing its own incentives, and thus restoring its monopoly profits. The authors also derive the welfare effects of RPM for some utility functions and find that when cross-group network externalities are positive in both ways, there is a threshold degree of platform competition above which RPM reduces welfare; when platform competition is higher than the threshold, RPM always improves the surplus.

To conclude, all the models of two-sided markets with a platform and intermediaries presented above do not take into account a number of important factors. Firstly, intermediaries do not operate at zero cost: the costs of an intermediary specializing in some activity and providing services to several platforms at once may be lower than the sum of the platforms' costs, mainly because of economies of scale. Secondly, it remains unclear how the level of competition among intermediaries affects prices and social welfare. The latter is an important concern of antitrust policy.

The present paper studies a particular type of intermediaries in this market – media-sellers – and offers a model that analyzes the function of intermediaries and their welfare effects.

The Model

The TV advertising market is a two-sided market with intermediaries (media-sellers) which consists of two terminal markets and one intermediate market (see Fig.1). Market 1 relates advertisers (firms looking to place an advertisement) and media-sellers which trade advertising on behalf of TV channels. In Market 2, TV channels produce content to attract viewers and incentivize watching. In other words, TV channels sell TV content and viewers pay by watching. In intermediate market, TV channels trade with media-sellers.

Market 1: Advertisers and Media sellers

Advertisers are looking to place their advertising in the broadcasts of TV channels. They cannot directly deal with TV channels and therefore interact with media sellers, which are the official traders of the broadcast. There are C perfectly competitive advertisers

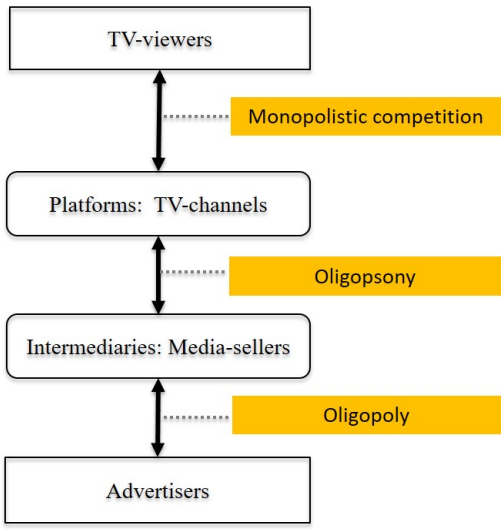

Figure 1: A TV advertising market with intermediaries.

(price-takers) and N sellers. The number of sellers is very small and regulated by the government. This fact determines Market 1 as an oligopoly.

Each advertiser i has a payoff function $U_i^a = \theta_i \alpha - p_a$, where α is the maximum profit per unit of advertising and θ_i is the advertiser's type, which is uniformly distributed in $[0, 1]$. The price paid for a unit of advertising is p_a. Advertisers are willing to advertise if their payoff is non-negative and therefore the market demand for advertising is $A = C\left(1 - \frac{p_a}{\alpha}\right)$. The corresponding inverse demand function is $p_a(A) = \alpha\left(1 - \frac{A}{C}\right)$.

Media-seller j buys a_j amount of advertising broadcast from the TV channels and sells it to advertisers. There are many TV channels and a small number of media-sellers, therefore media-sellers are oligopsonists in an intermediary market. Media-sellers can affect the price charged by the TV channels and thus the unit cost of advertising for media-sellers is a function of their total demand A: $W = \omega A$. W is a unit price of advertising charged by the TV channels, $A = \sum_{j=1}^{N} a_j$ and $\omega > 0$. As one can see, media-sellers can influence the market price W due to their market power. The corresponding profit function of media-seller j is as follows: $\Pi_j^s = \alpha\left(1 - \frac{A}{C}\right) a_j - W a_j$.

Media sellers compete *a la* Cournot and F.O.C. with respect to a_j gives a symmetric solution $a^* = \frac{\alpha C}{(1+N)(\alpha+\omega C)}$. Total advertising $A^* = \frac{\alpha C N}{(1+N)(\alpha+\omega C)}$ is sold to advertisers at market price $p_a^* = \alpha\left[\frac{\alpha+\omega C+N\omega C}{(1+N)(\alpha+\omega C)}\right]$. TV channels sell their advertising broadcast at price $W^* = \frac{\alpha\omega C N}{(1+N)(\alpha+\omega C)}$. Each media-seller obtains the profit $\Pi_j^s = \frac{\alpha^2 C}{(1+N)^2(\alpha+\omega C)}$.

Market 2: Viewers and TV channels

There is a unit mass of homogeneous TV viewers which enjoy TV content and dislike watching advertising. TV access is free and therefore viewers are willing to watch if the total amount of advertising X does not exceed the threshold level R. In other words, all

viewers enjoy TV content and receive the total utility R but this utility is reduced by the value of the total advertising noise X on TV. Thus viewers watch TV only if $R - X \geq 0$[5]. This condition implies a negative network effect of advertising for consumers. In contrast, advertisers' demand for advertising depends crucially on whether viewers are willing to watch TV and thus advertisers possess a positive network externality (these two-way network effects are a core attribute of any two-sided market).

Intermediate market: Media sellers and TV channels

TV channels produce TV content to attract viewers and sell advertising broadcasts to media-sellers. A TV market is a monopolistic competition where a large number of TV channels produce highly differentiated content. The production of TV content is costly and each TV channel k incurs $F(x_k; n)$ monetary units as production costs. The cost function $F(x_k; n)$ depends on the amount of advertising x_k on TV channel k and the number of TV channels n. A greater amount of advertising on a given TV channel forces the channel to produce more interesting and quality content to incentivize viewers to watch the channel. Therefore $F(x_k; n)$ is increasing in x_k. Moreover, a larger n also increases the production costs because a larger number of competing TV channels makes it more expensive to differentiate the content and attract viewers.

The corresponding profit of TV channel k is equal to $\Pi_k^{ch} = (W - d)\, x_k - F(x_k; n)$, where x_k is the amount of advertising broadcast (sold to media sellers), W is the price of advertising and d is the unit cost of advertising for TV channel. Let us consider a linear cost function $F(x_k; n) = \gamma x_k + \beta n$, where γ is the marginal content cost of the additional view[6] (an increase in the content cost due to the additional unit of advertising). Parameter β reflects an additional increase in the content costs due to greater competition for viewers.[7]

Each TV channel chooses the optimal amount of advertising x_k. Constant return to scale technology suggests that all channels choose to operate at the maximum allowed level of advertising $\overline{x}$.[8]This result is not surprising since, in practice, all TV channels

[5]This inequality implies a rectangular demand of viewers for watching TV. Since the watching of TV is free, viewers watch TV if $R - X \geq 0$ and do not watch otherwise. R can be interpreted as the maximum utility gained from TV content without advertising.

[6]One can interpret γ as the price paid by the channel to viewers to watch one more advertisement. The value of x_k is the advertising noise on channel k.

[7]Parameter β means a unit differentiation cost: the entry of a new TV channel makes it more expensive to secure the loyalty of viewers by producing more quality content.

[8]Remember that the government not only regulates the number of media sellers but also juridically limits the maximum amount of advertising on TV. Therefore each TV channel is allowed to broadcast $\overline{x}$ units of advertising at maximum. For instance, in Russia the maximum amount of advertising is 9 minutes during one hour. In Europe, the maximum amount of advertising is determined by the European Convention on Transfrontier Television (ETS N 132): the limit is 12 minutes per hour or 9 minutes on average. In many countries TV channels report almost full sellouts: 90-95% (according to the media audit of Etat Control International in 2016). This fact suggests that TV channels operate at $\overline{x}$.

choose to exploit the whole advertising capacity and therefore, in our model, all channels operate at $\overline{x}$.

The zero-profit condition in monopolistic competition determines the equilibrium number of TV channels: $n^* = \frac{\overline{x}(W-d-\gamma)}{\beta}$. We can see that this number depends positively on the unit profit of advertising and the threshold value $\overline{x}$: a larger unit profit stimulates new entries and larger $\overline{x}$ expands sales. A greater differentiation cost β lowers industry profits and respectively the equilibrium value of n.

The total sales of advertising is $X = n\overline{x} = \frac{\overline{x}^2(W-d-\gamma)}{\beta}$. The market clearance condition in the advertising market implies that the total sales of advertising by TV channels are equal to the total sales of advertising by media-sellers: $X = A^*$. This condition suggests a very important result: the maximum allowed amount of advertising $\overline{x}$ and the number of media-sellers are not independently chosen. It turns out that $\overline{x}$ and N are related through the following identity: $X = \frac{\overline{x}^2(W-d-\gamma)}{\beta} = \frac{\alpha CN}{(1+N)(\alpha+\omega C)} = A^*$. Therefore $\overline{x}$ is a function of N. The government chooses N to support a target level of the allowed advertising noise. The corresponding dependence is derived as $\overline{x} = \sqrt{\frac{N\alpha C\beta}{\alpha\omega CN-(d+\gamma)(1+N)(\alpha+\omega C)}}$. It can be easily verified that $\frac{d\overline{x}}{dN} < 0$, which suggests a negative relationship between N and $\overline{x}$. This result will be explained later in more detail.

The equilibrium number of TV channels is therefore $n^* = \sqrt{\frac{\alpha CN[\alpha\omega CN-(d+\gamma)(1+N)(\alpha+\omega C)]}{\beta(1+N)^2(\alpha+\omega C)^2}}$. It can be shown that $\frac{dA^*}{dN} > 0$ and $\frac{dn^*}{dN} > 0$. Given these results, if the government chooses to have a greater number of media-sellers the total amount of advertising increases, while the total amount of advertising per channel decreases: in turn, this raises the equilibrium number of TV channels. Intuitively, the government chooses a larger N if it wants to support a higher level of advertising in the market, A^*. This leads to a greater equilibrium price W^* and therefore unit profit of TV channels increases. Higher profits in a market with monopolistic competition results in new entries, therefore n^*increases. In addition, the zero-profit condition can be also maintained with a lower amount of the allowed per channel advertising, so $\overline{x}$ decreases with greater N.

Social Optimum

In this part, we consider the optimal number of sellers. The government as a social planner maximizes social welfare and chooses N which gives the greatest social surplus. We define social welfare as a sum of net surpluses in all markets: $SW = CS^a + \Pi^s + \Pi^{ch} + [R - X]$. The aggregated profit of media sellers is $\Pi^s$and surplus of advertisers is CS^a. The aggregated profit of all TV channels is $\Pi^{ch} = 0$. The total surplus of TV viewers is $R - X$. However, for the social planner $X = A$ because the total supply of advertising must be equal to the total demand.

$$SW = \int_0^{A^*} \alpha \left(1 - \frac{A}{C}\right) dA - W^*A^* + R - A^*$$

The social planner maximizes the welfare function. The corresponding F.O.C. gives the optimal $N^* = \frac{(\alpha-2)(\alpha+\omega C)}{2\alpha-(\alpha-2)\omega C}$. The optimal number of media-sellers is positive only if the condition $\alpha > \frac{2\omega C}{\omega C-2}$ holds[9].

To ensure that N^* is the maximum, it must be that $\frac{d^2SW}{dN^2} = \frac{-3\alpha^2-2(1+N)(\omega C-2)\left(\alpha-\frac{2\omega C}{\omega C-2}\right)}{(1+N)^4(\alpha+\omega C)} < 0$. This inequality always holds if $\alpha > \frac{2\omega C}{\omega C-2}$ and $\omega C - 2 > 0$, which are necessary to have $N^* > 0$. This result suggests that if optimal $N^* > 0$ then the S.O.C. is automatically satisfied.

Let us look at how the optimal number of media-sellers varies with α and C. $\frac{\partial N^*}{\partial C} = \frac{\alpha^2\omega(\alpha-2)}{(\alpha(\omega C-2)-2\omega C)^2} > 0$ and the optimal number of media-sellers increases with the number of advertisers. This result is not surprising since the larger market capacity facilitates entry. However, the sign of $\frac{\partial N^*}{\partial \alpha} = \frac{\alpha(4\omega C-\alpha(\omega C-2))}{(\alpha(\omega C-2)-2\omega C)^2}$ crucially depends on the value of α. It is negative for $\alpha > \frac{4\omega C}{\omega C-2}$ and positive otherwise. Intuitively, a large α means a greater reservation price of advertisers, which consequently lowers the demand elasticity. In turn, the market may accommodate fewer media-sellers. In contrast, when α is rather small,[10] the corresponding demand curve is elastic enough to allow for more media-sellers.

Finally, we should also check if viewers are willing to watch TV because otherwise the two-sided market does not exist. The viewers watch TV if the total amount of advertising $X^* = A^*$ does not exceed the threshold level R: $R - A^* > 0$. This condition not only guarantees the existence of TV market, but also puts a restriction on the number of advertisers: $R - A^* = R - \frac{C}{\alpha}(\alpha - 2) > 0$. Thus the maximum number of advertisers is equal to $C_{max} = \frac{\alpha R}{\alpha-2}$. The latter condition also implies a positive network effect between the number of advertisers and the willingness of consumers to watch TV: since viewers have rectangular demand for TV, a larger R increases the advertising opportunities of advertisers.

Results

There is a range of interesting results that may suggest important policy implications. To start with, let us discuss the maximum per channel amount of advertising which is regulated by the government in each country. Firstly, our model shows that this variable is determined jointly by the number of media sellers, and this relationship is negative. The government treats these two as substitutes and thus it may either reduce per channel advertising to allow for more media-sellers or relax the advertising restrictions but with fewer media sellers. Secondly, the model predicts that TV channels operate at the maximum allowed level of advertising: this result supports the fact that, in practice, TV channels report almost full sellouts. Also, it is interesting that an extension of the per channel advertising limit leads to a lower equilibrium number of TV channels. Due

[9] This condition is similar to $\omega C > \frac{2\alpha}{\alpha-2}$ and also guarantees that $\alpha - 2 > 0$ and $\omega C - 2 > 0$.

[10] $\frac{2\omega C}{\omega C-2} < \alpha < \frac{4\omega C}{\omega C-2}$

to CRS technology, each channel increases its market share if the limit is extended and thus fewer channels remain in the market.[11]Therefore the government can regulate the number of TV channels choosing the maximum per channel amount of advertising.

The socially optimal number of media-sellers maximizes the welfare function and crucially depends on the profitability of advertising and the number of advertisers. In our model, the profitability of advertising is indicated by the reservation price of advertisers. The value of the reservation price affects the slope of the demand curve and thus the higher profitability of advertising makes the demand of advertisers less elastic. This increases the marginal revenue of media sellers and thus extends the market share of each. In turn, there are fewer media-sellers in equilibrium. In contrast, when advertisers possess a low advertising profitability, the corresponding demand curve is elastic and thus there are more media-sellers.

The number of advertisers expands the market capacity for media sellers and consequently the market can accommodate more media sellers. However, the maximum number of advertisers is limited by the willingness of viewers to watch TV. Since a greater amount of the total advertising noise reduces the willingness to watch TV, the market is not able to serve an unlimited number of advertisers. With a rectangular demand of viewers, the maximum number of advertisers mainly depends on the threshold level of the total advertising noise. If the threshold level is high, more advertisers may place their advertisements on TV. This result implies a positive network effect: advertisers value the number of viewers.

Conclusion

The TV advertising industry is a two-sided market where advertisers and viewers are terminal sides and TV channels are platforms. Advertisers are willing to place their advertisements and possess a positive network effect from the number of viewers. In turn, viewers dislike advertisement and therefore TV channels should produce quality TV content to make the viewers watch their telecast. In some countries, TV channels do not directly sell their advertising but delegate this role to media sellers, who become a reseller of advertising on an intermediate market.

However, the existence of media sellers and their number is a matter of antitrust policy. Therefore the government makes three main decisions: 1) it decides whether to allow the operation of intermediary sellers of TV advertising; 2) it directly regulates the number of these media-sellers; 3) it juridically limits the maximum amount of TV advertising.

Surprisingly, literature on media economics has not yet considered the functioning of

[11]With CRS technology, TV channels operate at the maximum allowed amount of advertising and thus the limit directly determines the level of TV market concentration through the number of TV channels.

the TV advertising industry with media sellers. Thus it is of a great interest to study how the traditional operation of TV advertising industry changes if we allow for media sellers. Moreover, since the government regulates the entry and the number of media sellers, it becomes important to define their socially optimal number. The investigation of this question would shed more light on the functioning of two-sided markets with intermediary resellers (e.g. the game console market has the same structure).

Our paper builds a model that describes the functioning of TV advertising industry with media-sellers and defines their optimal number. We incorporate the two-sided network effects possessed by viewers and advertisers, consider different markets structures at different levels of the industry and build the social welfare function to investigate what number of media sellers brings the largest social gain.

The results suggest that the optimal number of media-sellers depends crucially on the willingness to advertise and the demand elasticity of advertisers. If the marginal profitability of advertisers is rather large, their demand becomes less elastic and therefore the market can accommodate few media-sellers. The socially optimal number of media-sellers also depends on the number of advertisers, which is limited by the willingness of consumers to watch TV. If viewers possess a rather low tolerance for advertising, the maximum number of potential advertisers is smaller and therefore society needs fewer media sellers. Our model also finds that the maximum amount of advertising per channel and the number of media-sellers are interdependent and that the government increases the amount of advertising per channel if the number of media-sellers is low. Thus the government chooses the best combination between the amount of advertising and the number of media sellers. Finally, we also investigate how the number of media sellers affects the total amount of TV advertising, the equilibrium number of TV channels and the price of advertising in the TV industry.

Our methodology and conclusions may be used in antitrust and governmental regulation of TV advertising industry and other two-sided markets with intermediaries on either side.

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