Media market concentration and pluralism

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Abstract

Media market structures are changing constantly. Traditional media outlets such as newspapers are being hard-hit by the digitalization of content, causing market exit and long-term consolidation in many countries. Competition policy in media markets is not only concerned with this trend because of reduced economic competition, but also because of potentially reduced pluralism. Accordingly, this paper analyzes the relationship between media market concentration and pluralism. In particular, we distinguish between internal pluralism, namely the range of views offered by a single outlet, and external pluralism, which refers to the market supply of pluralism. We show that internal pluralism is high in concentrated markets, but external pluralism is not. There also exists no clear free market bias with respect to socially optimal internal and external pluralism.

JEL Classification: L13, L82

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1 Introduction

Pluralism is a basic general rule of media policy. In media markets, authorities are even more concerned with market concentration than in other markets because, besides protecting economic competition, they additionally wish to safeguard pluralism. Polo (2007) defines pluralism as the “objective of ensuring a balanced, fair and unbiased access of all the political opinions and views to the media.” Diversity of opinion is seen as a major public objective for the media sector, relating to political aims like deliberation, participation, and democracy, as well as to social aims like social cohesion and cultural diversity (see, e.g., the early works of Hayek (1945); Downs (1957), or more recent works of Armstrong (2005); von Hagen and Seabright (2007); Prat and Strömberg (2011)). The European Court of Justice therefore considers that, in the light of Article 10.2 of the Convention, there is a compelling public interest in maintaining a pluralistic media landscape.

The media landscape is undergoing constant structural change towards the digitalization of media content. According to the Pew Research Center\textsuperscript{1}, newspaper and cable news consumption is decreasing persistently, and newspaper circulation is falling from year to year. Conversely, digital media consumption is steadily increasing. The change in media consumption habits has direct consequences for the markets, with traditional media outlets such as newspapers continuing to be hard-hit. According to figures from the Pew Research Center, newspaper ad revenue has been declining 4\% each, to $19.9 billion in 2015, less than half of what it was a decade ago.

This structural change is causing a long-term trend of media market consolidation in many traditional media markets worldwide. For example, in the US, in April 2016, one of the leading media companies Gannett, which, among others, publishes the national newspaper USA Today announced its plan to acquire the Tribune Publishing Company which operates newspapers such as the Chicago Tribune, Los Angeles Times, and the Baltimore Sun. In Germany, in 2013, the Federal Cartel Office approved two major

\textsuperscript{1}See PeW Research Center, State of the News Media 2015.
takeovers, one of two regional dailies (Hamburger Abendblatt and Berliner Morgenpost) of Axel Springer AG by the media group Funke Mediengruppe and the other, of the daily newspaper Frankfurter Rundschau by Frankfurter Allgemeine Zeitung. In the same year, Ofcom approved a joint venture in the UK regional newspaper market involving DMGT, Yattendon Group, and Trinity Mirror.

This consolidation trend is spurring a debate on the consequences for pluralism in the markets, raising concerns for media policy that strive towards safeguarding pluralism in the markets. Media pluralism is usually seen as threatened by concentration trends in the media markets. The concern that higher levels of market concentration reduce pluralism, however, implicitly assumes that a single outlet only offers a single view, e.g., on politics, so that the diversity of views necessarily decreases with a declining number of outlets. What is often not considered is that pluralism may also be realized within media outlets, each providing a variety of views. This notion of pluralism is defined as “internal pluralism”. Thus, when making presumptions about the effect of reduced economic competition on pluralism, one should adopt two views, firstly, pluralism within an outlet, internal pluralism, and secondly, pluralism offered by the broader market, defined as “external pluralism”.

Our paper focuses on both definitions of pluralism. In particular, we analyze whether an increase in concentration, i.e., a reduction in the number of media outlets in the market, necessarily reduces the variety of views offered at the market. The underlying question from an industrial organization perspective is whether a single media outlet will also find it profitable to offer a variety of views. If the answer is in the affirmative, the effect of reduced economic competition on the market supply of views is not clear. This is the starting point of the present paper. We set up a two-sided market model and consider comparative static effects of the number of firms on a Salop circle on both internal and on external pluralism. We also distinguish between advertising-financed media and pay media, of which the latter is becoming more and more common especially in digital markets.

An increasing amount of work has been focussing on the effect of concentra-
tion on external pluralism. The underlying question from an industrial organization perspective is whether the market really offers a variety of views. Early normative works on media economics starting with Steiner (1952), Spence and Owen (1977), and Wildman and Owen (1985) conclude that external pluralism is low in a free market. Advertising-funded broadcasters seek to maximize their viewership by broadcasting the same kind of programs that appeal to the broadest possible audience. These early works, however, do not consider the two-sided market nature of broadcasting markets; advertising levels and prices are assumed fixed. Modern work paints a more diverse picture of competition on external pluralism. Gabszewicz et al. (2004) show that when there are negative advertising externalities, broadcasters are likely to differentiate their programs under competition. In a model of newspaper competition, Mullainathan and Shleifer (2005) show that newspapers segment the market when readers’ political beliefs differ. Readers with access to all news sources can obtain an unbiased perspective, and reader heterogeneity is more important for media accuracy than competition per se. In their model of broadcasting competition, Anderson and Coate (2005) obtain comparable results, namely that markets can provide too few or too many programs. Under-provision can occur when the benefits of programming to viewers are high, relative to the benefits for advertisers. Over-provision can arise when program benefits are low, relative to advertiser benefits and the nuisance costs of advertising are low. Common to all these works is the assumption that a single outlet only offers one type of content, so they do not focus on internal pluralism.

Few works focus on the effect of competition on those views of pluralism, so that our paper aims to fill this gap. Our approach is in line with Garcia Pires (2014), whose approach allows outlets to adopt a multi-ideology strategy, in the manner of Alexandrov (2008). We use the same technology as Alexandrov (2008) and allow outlets to be located not only on single points on the spectrum of views, but also over an interval. In particular, we use a Salop-model of a circular city to test the relation between economic

\footnote{Sieg and Stühmeier (2015) survey the literature on several market imperfections in media markets.}
competition, measured by the number of firms on the circle, and pluralism, measured by the variety of content offered. We show that higher levels of market concentration lead a single outlet to offer a higher level of internal pluralism. However, in total, the market level of pluralism (external pluralism) is lower, the lower the level of economic competition. There exists, however, no clear free market bias with respect to socially optimal internal and external pluralism. We find cases where internal pluralism is insufficient and external pluralism is excessive compared to a first best welfare standard. An increase in market concentration may then bring the market levels of pluralism closer to the social optimal ones. Our paper thus contributes to the general discussion on media market competition and the role of media in deepening democracy. We find that there is no clear cut result that reduced economic competition necessarily reduced into a socially insufficient supply of pluralism, and may thus, not necessarily cause harm on political stability and democracy.

There is some empirical evidence on the relation between media market concentration and internal pluralism. Berry and Waldfogel (2001) examine the effects of ownership concentration on programming variety in radio broadcasting. They find that consolidation reduces entry, but increases the number of radio formats broadcast, both absolutely and relative to the number of stations in a market. George (2007) demonstrates that increases in ownership concentration in the US newspaper market lead firms to differentiate products to a greater extent and cover a larger number of reporting topics. There is more empirical work on the relation between media market concentration and external pluralism. Empirical evidence on how mergers affect diversity is mixed, mergers may even increase diversity in the market (see, e.g., Berry and Waldfogel (2001); Sweeting (2010); Gentzkow et al. (2014)).

Our paper also relates to the literature on multiproduct strategic competition which derives that the free market may not supply the socially optimal variety of products. Excessive entry can result because entrants’ products are substitute for existing firms, so that entry steals business, resulting in too much entry compared to the entry costs (Dixit and Stiglitz (1977); Spence
(1976); Mankiw and Winston (1986)). We find the same excessive entry result in our model but find no clear cut result whether the market variety is excessive or insufficient compared to the socially optimal level because internal pluralism is decreasing in entry. Thus the total effect on the market supply of pluralism remains ambiguous. Since Spence (1976) the literature also emphasized that a monopolist may have more incentive to have more variety to successfully engage in product differentiation than firms under competition. We find that a monopolist offers the same level of pluralism than firms under competition under a subscription price regime, whereas it offers lower levels under an ad-financed regime. Our paper can be viewed as an extension of this literature and takes account of the two-sided market nature of media markets.\(^3\)

The remainder of the paper is organized as follows. Section 2 provides the basic model. Section 3 derives the market equilibria and provides comparative static effects of market concentration on pluralism. Section 4 assumes that all outlets are owned by a monopolist. Section 5 compares the free-market equilibria to the social equilibria while 6 concluding.

### 2 The basic model

We are interested in modelling the relation between media market concentration and pluralism both provided by a single outlet (a newspaper, a website, a broadcaster, ...) and by the market. We use a two-sided market model (see, e.g., Anderson and Coate (2005); Armstrong (2006); Choi (2006)) to analyze such relation. Assume there are \( n \geq 2 \) media outlets in the market, equidistantly located on a Salop circle\(^4\) with a perimeter of one, and located clockwise from outlet 1 to outlet \( n \). The perimeter of the circle is interpreted as the entire spectrum of available views, e.g., ideological views.

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\(^3\)Hagiu (2009) also extents these early literature and takes account of two-sided markets. His work focuses on the optimally pricing structure. He shows that when consumers have stronger demand for variety, a platform extracts more rent from the producers side relative to the consumer side.

on politics or on the economy. Typically, it is assumed that media outlets only offer a single view and that the variety of views in the market may therefore only be increased by market entry. What is often not considered is that a single outlet can also contribute to variety by itself offering a variety of views. Following Polo (2007), we refer to the former aspect as “external pluralism (EP)” and to the latter aspect as “internal pluralism (IP).” In line with Alexandrov (2008) and Garcia Pires (2014), we therefore assume that outlets can adopt a multi-characteristic strategy, so that an outlet at position 0 may offer an interval of content from $[-l_i, l_i]$ continuously around its core location. Due to outlet symmetry, we can directly assume that $-l_i = l_i$, i.e., outlets offer internal pluralism of $IP_i = 2l_i$. Also in line with Alexandrov (2008) and Garcia Pires (2014), an outlet’s core location determines where on the circle an outlet can position its content. There are basically two reasons for such assumption. The ideological position of the owners and stakeholders restrict an outlet to offer content too far away from its core. And second, viewers may only accept content, for example news, as credible if it is close enough to the core of the outlet.

**Consumer side**

Consumers (readers, users, viewers, ...) with unitary density are uniformly distributed on the circle. We assume full market coverage and that each consumer consumes one type of content only (i.e., we assume that consumers “singlehome”). Consumers within the range of views offered by the outlets can consume their preferred content, and utility is denoted as

$$U_i^{in} = 1 + \theta IP_i - \gamma a_i - p_i.$$  

(1)

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5Alexandrov (2008) examines a standard good market and thus, does not take account of the two-sided market characteristic of media markets, whereas Garcia Pires (2014) examines a two-sided market setup in a Hotelling duopoly, and thus, does not comment on market concentration.

6See also Garcia Pires (2014).
Consumers receive a gross utility from consuming media content of 1. Moreover, we assume that all consumers care for internal pluralism (IP), but we assume that the incremental utility from consuming less preferred content is less than one, i.e., we assume that $\theta \leq 1$. For example, liberal consumers (or voters) most prefer to read about the liberal parties’ view on some policy issue but also prefer to read about the conservative parties’ view to get a broad picture.\(^7\) Consumers face a disutility from consuming an amount of advertising $a_i$, where $\gamma a_i$ denotes the nuisance cost of advertising. Additionally, they may have to pay a per-unit price $p_i$. Consumers outside the interval incur additional disutility from not consuming their ideal content ($tx$ as “transportation cost”), so their utility is denoted as

$$U^\text{out}_i = 1 + \theta IP_i - \gamma a_i - p_i - t(x - l_i).$$

A consumer located at position $x$ is then indifferent between consuming from outlet $i$ or $i + 1$ if

$$1 + \theta IP_i - t(x - l_i) - \gamma a_i - p_i = 1 + \theta IP_{i+1} - t\left(\frac{1}{n} - l_{i+1} - x\right) - \gamma a_{i+1} - p_{i+1}. \quad (3)$$

Each outlet receives a market share of $s_i$ with

$$s_i = \frac{1}{n} - \frac{2\gamma a_i - \gamma(a_{i-1} + a_{i+1})}{2t} + \frac{2p_i - (p_{i-1} + p_{i+1})}{2t} + \frac{(t + \theta)2l_i - (l_{i+1} + l_{i-1})}{2t}. \quad (4)$$

for $i - 1$ and $i + 1$, the neighbors of outlet $i$ are to the left and to the right.

**Advertising side**

We consider advertising that informs consumers about new products that they would buy if they were aware of them (see Grossman and Shapiro, 1984), but which causes a utility loss for viewers (see also Anderson and

\(^7\)Kim and Serfes (2006) make a similar assumption. In their model, consumers have preference for variety and get an incremental utility from consuming a second, less preferred brand on a Hotelling line.
Coate, 2005; Choi, 2006). Our advertising side is the same as in the seminal paper by Anderson and Coate (2005) or as in Peitz and Valletti (2008). Advertisements are placed by a unit mass of monopoly producers of new products, each of which produces at most one good. Products are produced at constant marginal costs, which are set equal to zero. Products are characterized by some type $\sigma$ distributed in some interval $[0, \bar{\sigma}]$ where $\bar{\sigma} \leq 1$. Higher types are more likely to attract viewers. Specifically, a viewer has willingness to pay $\omega > 0$ with probability $\sigma$ for a good of type $\sigma$ and willingness to pay 0 otherwise. The fraction of producers with a type less than $\sigma$ is $F(\sigma)$ and we assume that $F(0) = 0$ and that $F$ is increasing and continuously differentiable, with a strictly log concave density. Advertisers can only sell to viewers which have seen the ad and are thus informed about the existence of the product. Consumers will pay $\omega$ or 0, and thus, each producer advertises a price of $\omega$. Since monopoly producers can extract all the consumer surplus from the transaction in the product market, viewers receive no additional expected benefit from advertising. Advertisers have to pay an endogenously determined advertising fee $r$. Accordingly, the number of advertisers willing to advertise is $a(r) = 1 - F(\frac{\omega}{r})$. This represents the demand curve for advertising which only depends on the per-viewer-price of advertising $r$. Thus, one could also write $r(a) = \omega F^{-1}(1 - a)$, which can be referred as the per viewer demand curve for advertising. Then, the per viewer revenue curve for advertising can be referred as $R(a) = r(a)a$. The distributional assumptions concerning $F$ then imply that $R(a)$ is concave in the advertising level $a$. We further assume that $R(a)$ achieves its maximum at $\hat{a}$. The advertisers’ surplus from advertising per viewer can be represented by the area under their inverse demand curve, that is, by $\int_0^a r(x)dx$.

3 Market provision

The profit of outlet $i$ is given as

$$\Pi_i = s_i(R_i + p_i) - \frac{\delta_i l_i^2}{2} - f.$$  \hspace{1cm} (5)
The first term gives the revenue from advertising and subscription and the second term reflects the cost associated with offering internal pluralism. We assume that it becomes increasingly more costly for outlets to provide more variety, for example, because they need to hire new journalists for every additional type of content. The parameter $\delta$ is a scale parameter of the cost and $f$ denotes some fixed lump-sum payment of operation.

The outlets decide simultaneously about advertising ($a_i$), subscription prices, ($p_i$) and internal pluralism ($l_i$) by maximizing equation (5).

Differentiating of (5) with respect to $r_i$, $a_i$ and $l_i$ and exploiting outlet symmetry $s_i = \frac{1}{n}$, we get

$$ p_i = \frac{t}{n} - R(a_i) \tag{6} $$

$$ \frac{\partial \Pi_i}{\partial a_i} = -\frac{\gamma}{t} (R(a_i) + p_i) + \frac{1}{n} \frac{\partial R(a)}{\partial a} \tag{7} $$

$$ \frac{\partial \Pi_i}{\partial k_i} = (1 + \frac{\theta}{t}) (R(a_i) + p_i) - \delta l_i. \tag{8} $$

Observe from equation (15) that there is a pass-through effect of advertising revenue into lower subscription prices (see, also Peitz and Valletti, 2008; Stühmeier and Wenzel, 2012). With higher advertising revenue a consumer becomes more valuable. Therefore, an outlet finds it attractive to attract consumers by charging lower subscription prices. From equation (15) it follows that prices are only positive if

$$ \frac{t}{n} > R(a_i), \tag{9} $$

8Technically, the total cost of offering internal pluralism of $2l_i$ is $\delta \frac{(2l_i)^2}{8}$ which reduces to $\delta l_i^2$.

9Since each outlet has a monopoly in contacting its viewers, its per viewer price depends only upon its own advertising level. Accordingly, one could also assume that outlets choose per viewer prices instead of advertising levels which yields equivalent results.
otherwise, the subscription price is zero.\textsuperscript{10}

**Lemma 1.** If and only if $\frac{t}{n} > R(a_i)$ outlets charge positive subscription prices, otherwise they are ad-financed only.

The relative importance of advertising revenues for total profit thus determines the optimal financing regime. We take account of the two different regimes and first provide the equilibrium under the subscription regime which is the superior regime, for example, if consumers are sufficiently ad averse.

Due to the full pass-through of advertising revenues into lower subscription prices, subscription prices consequently do not affect equilibrium profits. The optimal advertising level $a^{\text{pay}}$\textsuperscript{11} then just balances the marginal benefit of advertising $\frac{\partial R(a)}{\partial a}$ and the marginal cost incurred by consumers $\gamma$, so

$$a^{\text{pay}} \text{such that } \left. \frac{\partial R(a)}{\partial a} \right|_{a^{\text{pay}}} = \gamma. \quad (10)$$

The optimal advertising level is thus independent of the number of outlets and depends only on the nuisance cost. As expressed by lemma 1 this only holds if advertising revenue is sufficiently low, so subscription prices are strictly positive. Assume, for example, a uniform distribution of $\mathcal{F}$ in which the advertising revenue function becomes $R(a) = (1 - a) a$ so that according to equation (10) we have $a^{\text{pay}} = \frac{1 - \gamma}{2}$ and $R(a^{\text{pay}}) = \frac{1}{4}(1 - \gamma^2)$. Therefore, condition (9) becomes $\frac{t}{n} > \frac{1}{4}(1 - \gamma^2)$, i.e., if $\gamma$ is sufficiently low, the subscription price cannot be positive and outlets are ad-financed solely. This seems to be reasonable. A decrease in the nuisance cost of advertising makes advertisement more profitable (the shadow cost of advertisement drops), so that the media outlet offers free of charge subscriptions, making money only on advertisements.\textsuperscript{12}

\textsuperscript{10}We impose non-negativity of subscription prices

\textsuperscript{11}We indicate equilibria in the subscription regime with the superscript \textit{pay} and equilibria in the ad-financed regime with the superscript \textit{ad}. Remind, that also in the subscription regime outlets are financed by advertising income in addition to income coming from subscription.

\textsuperscript{12}I thank an anonymous referee for this comment.
For \( R(a_i) > \frac{t}{n} \) outlets are ad-financed only and \( p_i^{pay} = 0 \). Then first-order conditions are

\[
\frac{\partial \Pi_i}{\partial a_i} = \frac{\partial s_i}{\partial a_i} R(a_i) + s_i \frac{\partial R_i}{\partial a_i} = 0; \quad (11)
\]

\[
\frac{\partial \Pi_i}{\partial l_i} = \frac{\partial s_i}{\partial l_i} R(a_i) - \delta l_i = 0. \quad (12)
\]

From \( \frac{\partial s_i}{\partial a_i} R(a_i) < 0 \) in equation (11), it follows that outlets set lower advertising levels which would maximize per viewer revenue \( R(a) \), i.e., it follows that \( \frac{\partial R(a)}{\partial a} > 0 \) at optimal advertising levels of \( a_i^{ad} \). This stems from the two-sided market nature of the market. Consumers dislike advertising which puts pressure on the equilibrium level.

The optimal advertising level in the symmetric equilibrium is implicitly given as

\[
R(a_i^{ad}) = \frac{t \cdot \partial R(a)}{\partial a}, \quad (13)
\]

or using \( R(a) = p(a) a \) as

\[
a_i^{ad} = \frac{t}{n \gamma} (1 - \epsilon) \quad (14)
\]

where \( \epsilon = -\frac{\partial p(a)}{\partial a} \frac{a_i^{ad}}{p(a_i^{ad})} \) denotes the elasticity of advertiser demand. Observe that because \( \frac{\partial R(a)}{\partial a} > 0 \) at equilibrium, it necessarily follows that outlets set advertising levels in the inelastic region of the advertiser demand curve, i.e., \( \epsilon < 1 \) at \( a_i^{ad} \). We summarize the above findings:

**Proposition 1.** If \( R(a) < \frac{t}{n} \), outlets optimally choose a subscription regime with

\[
p_i^{pay} = \frac{t}{n} - R(a_i^{pay}) \quad (15)
\]

\[
\frac{\partial R(a)}{\partial a} \bigg|_{a_i^{pay}} = \gamma. \quad (16)
\]

If \( R(a) \geq \frac{t}{n} \), outlets optimally choose an ad-financed regime with

\[
a_i^{ad} = \frac{t}{n \gamma} (1 - \epsilon). \quad (17)
\]
3.1 Equilibrium pluralism

Having determined equilibrium advertising levels and subscription prices, we are now in the position to comment on equilibrium pluralism under both regimes. We first impose a technical restriction on the parameter values of the model.

Lemma 2. There is no pure strategy Nash equilibrium where outlets’ intervals overlap.

This lemma and its proof directly corresponds to Lemma 2 in the paper by Alexandrov (2008). Consider intervals overlap. Then, each outlet can marginally decrease the advertising level or the subscription price and capture a positive amount of consumers. Standard Bertrand arguments apply, competition drives profits down to zero, so that an outlet finds it more profitable to locate only on a point on the circle instead of offering costly pluralism. We therefore assume that parameters are such that in equilibrium the outlets’ intervals do not overlap, i.e., \( l_i^* \leq \frac{1}{2n} \). As we will see from the following equilibria, this restriction is fulfilled if offering pluralism is sufficiently costly, i.e., if \( \delta \) is high.

Proposition 2. Under the subscription regime, i.e., for \( R(a) < \frac{t}{n} \), the optimal level of internal pluralism is

\[
IP_i^{pay} = 2l_i^{pay} = \frac{2}{n\delta} \left( \frac{\theta + t}{n} \right).
\]

Under the ad-financed regime, i.e., for \( R(a) \geq \frac{t}{n} \), optimal internal pluralism is

\[
IP_i^{ad} = 2l_i^{ad} = 2\left(1 + \frac{\theta}{t} \right) \frac{R(a_i^{ad})}{\delta}.
\]

We can also define the equilibrium number of outlets under both regimes. Under the subscription regime the equilibrium number of outlets \( n^{pay} \) is given
such that $\Pi = 0$, that is,

$$n^{pay} = \frac{1}{2} \sqrt{2} \sqrt{\frac{\delta f (t(2(\delta - \theta) - t) - \theta^2)}{\delta f}}. \quad (20)$$

With free entry, an increase in $f$ would reduce the number of entrants in the market and thereby increase market concentration. This will be relevant when analyzing the effects of increased market concentration in the next section and comparing the market outcome to social welfare in section 5.

The equilibrium number of outlets $n^{ad}$ under the ad-financed regime is implicitly determined by the solution of

$$1 - nR(a^{ad}) - \frac{\delta}{2} ((1 + \theta) \frac{R(a^{ad})}{\delta})^2 - f = 0. \quad (21)$$

Under the subscription regime, the optimal level of internal pluralism is given by solving the FOC of equation (8) which gives the first part of proposition 2. The optimal level of internal pluralism is independent of advertising levels and is simply determined by the marginal benefit in terms of increased consumer surplus and reduced transportation cost $(\theta + t)$ and the marginal cost of providing variety $(\delta)$. This result has important consequences from a social planner’s perspective. Under a subscription regime, a regulator can regulate pluralism and advertising levels separately because both are determined by a different set of parameters. It could, for example, regulate advertising levels without affecting the market equilibrium level of internal pluralism and the free-entry equilibrium number of outlets. This is in contrast with the ad-financed regime.

Under the ad-financed regime, optimal internal pluralism is determined by condition (19) which gives the second part of proposition 2. Here, pluralism and advertising levels are determined by a joint set of parameters. Equilibrium advertising levels affect equilibrium pluralism and the free-entry equilibrium number of outlets. So a social planner has to consider the interdependencies of advertising and pluralism which renders optimal regulation more
difficult. A social planner has to consider the interdependencies of advertising and pluralism and should not regulate advertising levels in isolation. For example, the “Audiovisual Media Service Directive”\(^{13}\), codified in March 2010, regulates television advertising for all broadcasters in the EU and, among others, limits commercial advertising to 9 min per hour on average. Our analysis show, though, that such restriction of advertising also causes a decline in internal pluralism - an effect certainly not intended by advertising regulation.\(^{14}\) We provide a more comprehensive welfare analysis in section 5 and compare the market equilibria to the first-best and second-best outcome.

Comparing internal pluralism of equations (18) and (19), we can already conclude that internal pluralism is higher in an ad-financed regime than in a subscription regime. It holds that \(IP_{i}^{ad} \geq IP_{i}^{pay}\) for \(R(a^{ad}) > \frac{k}{n}\) which exactly corresponds to the condition under which the ad-financed is the superior one. If advertising revenue is high, outlets have a strong incentive to attract consumers. Under a subscription regime, they have two instruments at hand, subscription prices and internal pluralism. As can be seen from equation (18) equilibrium internal pluralism does not depend on advertising income, which is passed through into the lower subscription price. Therefore, outlets attract consumers via lower subscription prices. Under the ad-financed regime, outlets attract consumers via offering higher levels of internal pluralism and thus, internal pluralism depends positively on advertising revenue.

**Proposition 3.** For a given number of outlets, internal pluralism is higher in an ad-financed regime than under a subscription regime.

This is in contrast to the traditional wisdom (Steiner (1952); Spence and Owen (1977); Wildman and Owen (1985)) that reliance on advertising income leads to a low content variety. Here, the opposite is true, because if

\(^{13}\)This directive replaces the ”Television Without Frontiers Directive” from 1989 to account for further developments and on-demand services in the audiovisual sector.

\(^{14}\)Sieg and Rothbauer (2014) reach quite similar results. They conclude that because commercial broadcasting time and program content differentiation are interdependent, commercial ceilings may cause inefficient provision of program differentiation.
advertising revenue per consumer is high, outlets have a stronger incentive to compete for consumers by offering their preferred content. Technically, outlets balance the marginal benefit of providing more variety in terms of an increase per viewer profit \( R(a) \) against the cost of providing variety \( \delta \).

3.2 Market concentration and pluralism

We are next interested in the comparative static effects of concentration, i.e., a decrease in the number of outlets \( n \), for example, via an increase in \( f \), on pluralism.\(^{15}\) Media market concentration and pluralism are a perpetual topic of media policy. In media markets, authorities are even more concerned with increased market concentration than in other markets because diversity of opinion is regarded as to contribute to political aims like deliberation, participation, and democracy. We derive comparative static results on the two dimensions of pluralism, internal and external pluralism.

Under the subscription regime, equation (18) shows straightforward that equilibrium internal pluralism is increasing in market concentration (i.e., decreasing in \( n \)). Under the ad-financed regime equilibrium internal pluralism additionally depends on the advertising income. Therefore, first consider the effect of concentration on advertising.

Differentiation of equation (14) with respect to \( n \) yields\(^ {16} \)

\[
\frac{\partial a_{id}}{\partial n} = -\frac{t(1 - \epsilon) n^2 \gamma}{n^2 \gamma(1 + \frac{f c n^2 \gamma}{\partial a}).}
\]  

(22)

From \( \epsilon < 1 \) and from \( \frac{\partial c}{\partial a} \geq 0 \) it follows that \( \frac{\partial a_{id}}{\partial n} < 0 \) and thus:

Lemma 3. Under the ad-financed regime, the equilibrium advertising level is higher in more concentrated markets.

\(^{15}\)We take a long-run perspective on the market outcomes after relocation to symmetric market structures. We do not analyze the short-run strategic behaviour of outlets after market entry or market exit.

\(^{16}\)For details, see Appendix.
The higher the market concentration, the less intense the competition for viewers and thus, the higher the equilibrium advertising level. Internal pluralism is then affected by market concentration as

$$\frac{\partial IP_{ad}}{\partial n} = 2 \frac{\partial R(a) \partial a_{ad}}{\delta}. \quad (23)$$

From $\frac{\partial R(a)}{\partial a} > 0$ and from $\frac{\partial a_{ad}}{\partial n} < 0$ (see equation (22)) it then follows that $\frac{\partial IP_{ad}}{\partial n} < 0$.

**Proposition 4.** Both under the subscription and the ad-financed regime internal pluralism is higher in more concentrated markets.

Outlets respond to an increase in concentration by increasing their variety. With fewer outlets active in the market, the distance between the indifferent consumer’s taste and the outlets’ positions increases and so do transportation costs. This puts pressure on the advertising level and subscription prices, reducing per viewer profit. Outlets therefore respond by offering a higher level of internal pluralism in order to increase advertising levels and advertising and subscription revenue per viewer.

This result is backed by empirical evidence from Berry and Waldfogel (2001) and George (2007). Berry and Waldfogel (2001) show that consolidation in the US radio market, triggered by the Telecommunications Act of 1996, reduced entry but increased the number of radio formats broadcast. George (2007) demonstrates that increases in ownership concentration in US newspaper market lead firms to differentiate products to a greater extent and cover a larger number of reporting topics.

Next, we are interested in the effect of concentration on external pluralism, that is, on the market supply of pluralism. We first need to define how external pluralism should be measured. There is no sound and clear definition of pluralism; it remains a concept which is very loosely defined in many countries. The Commission staff working paper “Media Pluralism in the
Member States of the European Union” of 2007 describes media pluralism in the following way: “Media pluralism is a concept that embraces a number of aspects, such as diversity of ownership, variety in the sources of information and in the range of contents available in the different Member states. For many analysts or observers, media pluralism has come to mean, almost exclusively, plurality of ownership. Concentration of ownership, it is feared, may result in a skewed public discourse where certain viewpoints are excluded or underrepresented. [...]”\textsuperscript{17} However, we have seen above that a definition only in terms of ownership is too narrow, because each outlet also provides internal pluralism, offering a range of different views. External pluralism might therefore also be high in a concentrated market, if outlets provide a high level of internal pluralism. The market supply of variety therefore has to take into account both the number of outlets and internal pluralism. Also, the Commission then notes that “[a]lthough pluralism of ownership is important, it is a necessary but not sufficient condition for ensuring media pluralism.”\textsuperscript{18}

We operationalize external pluralism by looking at the aggregate transportation costs for consumers in the market\textsuperscript{19} and quantify external pluralism as

\[
EP = 1 - 2n \int_{l_i^*}^{1/2n} tx \, dx. \tag{24}
\]

The market supply of pluralism is thus a function of both the number of outlets and the variety of views offered within a single outlet. External pluralism is then maximized at \( EP = 1 \) if each consumer finds its preferred content, i.e., if transportation costs are zero. This is both more likely to be true for a large number of outlets \( (n) \) and due to high levels of internal pluralism within each outlet \( (l_i) \).

\textsuperscript{17}European Commission, DG Information Society and Media, 2007a, p. 5.
\textsuperscript{18}ibid.
\textsuperscript{19}One may also look at the aggregate distance between the indifferent consumer or at the level of internal pluralism or at \( EP = n \times IP^* \). This yields the same comparative static results, because aggregate transportation costs are a monotonic function of the aggregate distance or of \( n \times IP^* \). In a corner solution of zero internal pluralism both figures would, however, also predict zero external pluralism, although \( n \) might be large. This is avoided by looking at aggregate transportation costs.
Then, inserting equilibrium internal pluralism in both regimes, under the subscription regime external pluralism is given by

\[ EP^{\text{pay}} = 1 - \frac{t \delta^2 - 4t^2}{4\delta^2 n} \]  
(25)

and under the ad-financed regime by

\[ EP^{\text{ad}} = 1 - nt \left( \frac{1}{4n^2} - \frac{t^2 (\frac{\partial R(a)}{\partial a})^2}{n^2 \gamma^2 \delta^2} \right). \]  
(26)

From equation (25), it follows that under the subscription regime external pluralism is strictly decreasing with rising market concentration, because for \( l_i^{\text{pay}} \leq \frac{1}{2n} \) (see Assumption 1) it must hold that \( \delta \geq 2t \). The same result applies for the ad-financed regime. Differentiation of equation (26) with respect to \( n \) gives

\[ \frac{\partial EP}{\partial n} = (2tnl_i^{\text{ad}} \frac{\partial l_i^{\text{ad}}}{\partial n} + tl_i^{\text{ad}2} + \frac{t}{4n^2}). \]  
(27)

After some manipulation\(^{20}\), using the previous equilibria, it can be shown that \( \frac{\partial EP}{\partial n} > 0 \) if

\[ n(1 + \frac{t}{n \gamma \frac{\partial \epsilon}{\partial a}}) > (1 - \epsilon) \]  
(28)

which is always true, because \( \epsilon < 1 \) and \( \frac{\partial \epsilon}{\partial a} > 0 \).

Therefore, we can conclude:

**Proposition 5.** Both under the subscription and the ad-financed regime external pluralism is lower in more concentrated markets.

We hence conclude that a more concentrated market leads to a lower level of external pluralism. Although an individual outlet increases its variety of views offered, the direct effect of a reduced number of outlets dominates. This is certainly an important result for media policy taking care about pluralism.

\(^{20}\)For details, see Appendix.
Here, public policy should be concerned with excessively concentrated markets, not only because of reduced economic competition, resulting in higher nuisance advertising, but also because of lower pluralism.

Media policy deals with this concern by assessing and judging both market power and pluralism in the media sector. Most Member States of the European Union recognize that competition policy alone is not an adequate mechanism for ensuring media pluralism and the Member States have the right to impose stricter regulations to ensure media pluralism beyond what competition alone can provide. Therefore, in Germany, for example, concentration in private broadcasting markets is not only subject to competition law, but constitutional law mandates specific broadcasting-oriented precautions against concentration. The so-called Commission on Concentration in the Media (KEK) was established in 1996 to safeguard pluralism in private broadcasting. The Commission examines whether any single company is able to exercise dominant power over public opinion through its media activities, and can sanction excessively high levels of concentration, for example, through a change in ownership or by refusing to provide new broadcasting licenses. Similar tests also exist in other countries, for instance, the Diversity Index in the US (2003), the public interest or plurality test in the UK (2003), or the integrated communications market (SIC) in Italy (2004).

The total effect of market concentration on social welfare is, however, still unclear because a total welfare perspective has to take consider all interest groups, consumers, outlets, and advertisers which may be affected differently. Second, a well-known result from the Salop models is that there might be excessive entry in free market compared to a social level (Tirole, 1988; Choi, 2006, see, e.g.,). That is, we still have to consider whether an increase in market concentration might increase social welfare, though it reduces external pluralism. This will be done in section 5. Before, we compare the competitive market to a monopoly market.
4 Monopoly provision

So far, we have assumed that each of the $n$ outlets is owned by an independent corporation. In media markets across many Western countries, there is a high level of ownership concentration. Media mogules such as Rupert Murdoch and Silvio Berlusconi are just two instances of concentrated media markets. The Australian newspaper market, for example, is one of the most concentrated worldwide. According to figures of Harding-Smith (2011), 98% of circulation comes only from three corporations, with Murdoch’s News Corporation Australia controlling over 70% of metropolitan daily newspaper circulation. Such a concentration of newspaper ownership may pose a risk to overall media diversity. According to a study by the Pew Research Centers Project for Excellence in Journalism, newspapers are still the dominant source of current news.\(^{21}\) They therefore play a disproportionate role in driving the overall news cycle. It is relevant whether a monopolistic or oligopolistic control of the media market is accountable for the public interest in pluralism. We consider the most extreme case of ownership concentration, a monopolist which is a single owner of the $n$ outlets on the circle, and derive the monopolist’s choice of internal and external pluralism.

The monopolist maximizes the industry profit\(^ {22}\) of

$$\Pi = R(a) + \frac{p - n\delta}{2}l^2. \quad (29)$$

The optimal choice between a subscription and an ad-financed regime depends on the concavity of $R(a)$. When evaluated at $\hat{a}$ (which is the advertising level that maximizes advertising revenue per consumer) the indifferent consumer between any two outlets is left with positive utility, the outlet chooses a subscription regime. At $\hat{a}$ a further increase in the advertising level cannot be optimal, so that the remaining consumer surplus is extracted via the subscription price. The equilibrium subscription price therefore sets


\(^{22}\)We assume that there are no economies of scale or scope in delivering media content to consumers.
the utility of the indifferent consumer to zero and is given by

\[ p^M = 1 + \theta l^M - t\left(\frac{1}{2n} - l^M\right) - \gamma \hat{a}. \]  

(30)

The monopolist, for example, sets a positive subscription price if \( R(a) = 1 - a \), so that \( \hat{a} = \frac{1}{2} \) and \( \gamma \) is not too large.

Now, when setting the optimal level of internal pluralism, the monopolist exactly faces the same consideration as an outlet in competition. It simply balances the marginal benefit in terms of higher subscription prices and the marginal cost of providing variety, so optimal internal pluralism is given as

\[ IP^M = 2l^* = 2\frac{\theta + t}{n\delta} \]  

(31)

which is the same as in equation (18).

Next, observe from the optimal subscription price of equation (30) that there is again a pass-through of advertising income into lower subscription prices. If \( \hat{a} \) is sufficiently large, the optimal subscription price may fall to zero, so the monopolist chooses the ad-financed regime. This, for example, is always true for an advertising revenue function of \( R(a) = a^{1-\beta} \), so that \( \frac{\partial R(a)}{\partial a} > 0 \). In this case it is profitable to set an advertising level that sets the utility of the indifferent consumer to zero and thus it holds that \( a^M \leq \hat{a} \) so that \( \frac{\partial R(a)}{\partial a} \geq 0 \). Then, \( a^M \) satisfies

\[ a^M = \frac{1 + \theta l^M - t\left(\frac{1}{2n} - l^M\right)}{\gamma}. \]  

(32)

Given \( a^M \), the monopolist sets internal pluralism such that

\[ \frac{\partial R(a)}{\partial a} \frac{\partial a^M}{\partial l} - n\delta l = 0 \]  

(33)

which gives

\[ IP^M = 2\frac{\partial R(a)}{\partial a} \frac{t}{n\delta}. \]  

(34)

This is the same condition as (19). Again, as with any outlet in competition,  

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23We use the superscript \( M \) to indicate the optimal choice of the monopolist.
the monopolist balances the increase in per-user profit and the cost associated with providing internal pluralism. However, it sets a lower level of internal pluralism than outlets in competition. This follows from the concavity of $R(a)$ and from $a^M > a^{ad}$, so $\frac{\partial R(a)}{\partial a} |_{a=a^M} < \frac{\partial R(a)}{\partial a} |_{a=a^{ad}}$ and thus, $IP^M < IP^{ad}$.

**Proposition 6.** Consider that $a^M = \hat{a}$. Then, the n-outlet monopolist optimally chooses a subscription regime and sets the same level of pluralism as an outlet in competition for a given number of outlets. Otherwise, for $a^M < \hat{a}$ it chooses an ad-financed regime and sets lower levels of internal pluralism than outlets under competition.

It can be easily seen that the comparative static effects with respect to $n$ follow section 2:

**Proposition 7.** In a monopoly market, both under the subscription and the ad-financed regime internal pluralism is higher and external pluralism is lower in more concentrated markets.

## 5 Social provision

The previous analysis has implications for media market policy. Diversity of opinion is a major goal of regulation of media markets. In order to compare the private market outcome to the social outcome we first derive the first-best outcome and then comment on how to achieve the first best outcome.

### 5.1 First-best outcome

Consider a social planner who has full capability to control the advertising level, the level of internal pluralism, and the number of firms. It intends to
maximize total welfare in the market, so its objective can be written as:

$$\max_{a,l,n} W = 1 + 2\theta l - \gamma a - 2n \int_1^{1/2n} t x dx + \int_0^a r(x) dx - n \frac{\delta}{2} l^2 - nf. \quad (35)$$

Welfare in a situation with $n$ symmetric outlets consists of consumer rent $CS = 1 + 2n\theta l - \gamma a - 2n \int_1^{1/2n} t x dx$, benefits for advertisers $\int_0^a p(x) dx$, outlets’ costs for providing pluralism $\frac{\delta}{2} l^2$, and some additional fixed entry cost per outlet of $f$.\(^{24}\)

The social optimal solution is the given as

$$r(a^*) = \gamma$$

$$n^* = \frac{1}{2} \left( \frac{(\delta - 2t) \sqrt{t(f(\delta - 2t) - 2\theta^2)}}{f(\delta - 2t) - 2\theta^2} \right). \quad (37)$$

$$IP^* = \frac{4 \theta}{\delta - 2t}. \quad (38)$$

Optimal advertising levels are determined by balancing the marginal benefit of advertising to advertisers reflected in the inverse demand function ($r(a)$) and nuisance costs of advertising to consumers ($\gamma$). The optimal level of internal pluralism and the optimal number of outlets are determined by the preference for pluralism represented by $\theta$ and $t$, the cost associated with providing internal pluralism ($\delta$), and the entry cost $f$.

5.2 Comparison of the market outcome to first-best outcome

We can now compare the market outcome of section 3 with the social optimal one with respect to pluralism. Consider first the subscription regime. Here,\(^{24}\)The subscription price $p$ has no influence on social welfare because it is just a neutral transfer from consumers to the outlet.
equilibrium internal pluralism is unaffected by advertising which facilitates the comparison.\(^{25}\) It turns out that there is no free market bias with respect to socially optimal internal and external pluralism.

Consider first the level of entry. Comparison of the free-entry equilibrium number of outlets of equation 20 with the social optimal number of equation 37 shows that there is excessive entry under the subscription regime, i.e., \(n_{\text{pay}} > n^*.\)\(^{26}\) This is a well-known result in Salop’s free entry model and follows from too much business stealing between outlets (Tirole, 1988; Choi, 2006, see, e.g.). An individual outlet neglects the effect of its entry decision on others whereas the social planner internalizes the effect.

This has direct consequences for internal pluralism because the free-market level of internal pluralism depends on the free-entry number of outlets. Comparison of social optimal level of equation (39) with the free-market level of equation (18) shows that internal pluralism is insufficient compared to the social optimal level, if the free-entry number of outlets is sufficiently large, i.e., if

\[
n_{\text{pay}} > \frac{1}{2} \frac{(δ − 2t)(θ + t)}{δθ}.
\]  

(40)

This especially holds if \(δ\) is large and \(θ\) is small. Then, outlets can avoid offering costly internal pluralism because consumers rarely care about it. Competition on pluralism is thus weak and thus, equilibrium profits are large, which attracts entry into the market.

The comparison with respect to external pluralism then is ambiguous. On the one hand, because entry is excessive, also external pluralism might be excessive. On the other hand, internal pluralism might be insufficient, and thus, also external pluralism might be insufficient. Which of the two forces dominates depends ultimately on the parameters of the model. To demonstrate that all kind of market bias may exist consider the following example. Consider an advertising revenue per viewer of \(R(a) = a^{1−β}\) and set

\(^{25}\)It turns out that advertising levels under the subscription regime are insufficient compared to the social optimal levels (Choi, 2006, see also), but independent on \(n\).

\(^{26}\)For the proof see Appendix.
$t = 1, \beta = 0.2, \theta = 0.2, \gamma = 2, \delta = 5$, and set the entry cost to $f = 0.05$.\(^{27}\)

Then, both internal pluralism and external pluralism are insufficient compared to the social optimal level ($IP^{pay} = 0.12$ and $IP^* = 0.26$; $EP^{pay} = 0.98$ and $EP^* = 0.99$). Now, an increase in entry costs reduces both the free-market level and the social optimal level of entry. It therefore brings the free-market level of internal pluralism closer to the social optimal level because $IP^*$ is independent of $n$ and the free-market level decreasing in $n$ (see proposition 4). The result on external pluralism additionally depends on the relative magnitude of the effect of increased market concentration on internal pluralism and the number of outlets. Consider, for example, doubling the entry cost to $f = 0.1$. Then, internal pluralism is still insufficient ($IP^{pay} = 0.16$) but now external pluralism is excessive ($EP^{pay} = 0.98, EP^* = 0.94$).

Under the ad-financed regime, the optimal advertising level, the optimal number of outlets, and the optimal level of internal pluralism is determined by the same set of parameters which renders the analysis even more difficult. We can show, though, that again all kinds of market bias exist. Consider the same example as above but consider consumers are less ad-averse so the ad-financed regime is the superior one. Consider, for example, $\gamma = 1$ and $f = 0.05$. Then, again, internal and external pluralism are insufficient ($IP^{ad} = 0.10, IP^* = 0.26$ and $EP^{ad} = 0.95, EP^* = 0.99$). A marginal increase in market concentration thus brings the market level of internal pluralism closer to the social optimal level.

**Proposition 8.** Under the subscription and the ad-financed regime, internal and external pluralism might be both insufficient or excessive compared to the social optimal levels. An increase in market concentration may therefore bring the free-market levels of pluralism closer to the optimal ones.

This proposition has policy implications. In nowadays digital era, there are plenty of sources people can get news from, external pluralism might be

\(^{27}\)Given these parameters, the outlets indeed choose the subscription regime.
high at first glance. A study from the Pew Research Center\textsuperscript{28} highlights, though, the increasing reliance on partisan and/or ideological news sources on the right and left, and both sides have trended in that direction, with some taking extreme positions. Hence, in our terminology, internal pluralism seems to be decreasing, outlets focus on their core, left or right, to cater the taste of their target groups.\textsuperscript{29} According to Pew Research Center, fewer outlets offer a moderate and balanced view.\textsuperscript{30} It thus seems that the increased media options do not necessarily result in increased political knowledge or greater democratic cohesion but there are even trends to more authoritarian democracy some Western countries. Our paper can certainly not entirely explore the sources of this trend. But we point on one possible explanation, low levels of internal pluralism. Consumers of extreme news only get a very narrow and biased picture, possibly serving as one source to explain such partisan policy trends.

6 Conclusion

Digitalisation of media content and changing media consumption habits of consumer cause a structural change of the media landscape. Especially in the daily newspaper markets there is an ongoing trend towards market consolidation. This trend is spurring a debate on the consequences for pluralism in the markets. There are concerns that also pluralism may decline causing harm on political stability and democracy.

The present paper contributes to this discussion and analyzes the connection between economic competition and pluralism in media markets. Competition policy often assumes that more concentrated media markets lead to a lower variety of views or opinions offered in the markets. Such a perspective is based on the so-called external pluralism and assumes that outlets only offer

\textsuperscript{28}See http://www.pewresearch.org/packages/political-polarization/.

\textsuperscript{29}For example, according to the study, the Daily show or The New Yorker state is on the extreme left and Breitbard and Rush Limbaugh Show on the extreme right spectrum.

\textsuperscript{30}According to the study, NBC News and the Wall Street Journal are located in the middle of the spectrum.
one type of view, so that the market supply of views necessarily decreases with the number of outlets. The above analysis demonstrates, though, that higher market concentration leads outlets to increase what is referred to as internal pluralism, i.e., they increase the range of views offered within an outlet. We find that there is no clear cut market bias with respect to socially optimal pluralism. We find cases where external pluralism is excessive and internal pluralism is insufficient compared to a first best welfare standard. Thus, a reduction of economic competition may bring the market levels of pluralism closer to the socially optimal levels.

There is scope for future work on this topic along several dimensions. For example, one could focus additionally on media bias. A higher level of pluralism may reduce bias, since diverse political opinions find their way into the news market. Moreover, one could introduce multihoming on either the consumer and/or on the advertising side. With multihoming, outlets might set higher levels of internal pluralism to enlarge their number of consumers, but on the other hand, they also might set lower advertising levels for the same reason, which we showed reduces internal pluralism again. One could also focus on the role of media intermediaries. Increasingly, traditional media industries are being supplanted by digital gatekeepers, such as Google or Facebook. Although these are not traditional content creators, such companies are hitherto often the means by which consumers access digital media content. A general debate about pluralism in the media must certainly include the role of these gatekeepers.

A Appendix

Proofs of section 2

We derive the comparative static effect of concentration on the equilibrium advertising level given by equation (22). From equation (14), it follows that

\[
\frac{\partial a^*}{\partial n} = -\frac{t(1 - \epsilon)}{n^2 \gamma} - \frac{t \partial \epsilon}{n \gamma \partial n} \tag{41}
\]
or
\[
\frac{\partial a^*}{\partial n} = -\frac{t(1 - \epsilon)}{n^2\gamma} - \frac{t}{n\gamma} \frac{\partial \epsilon \partial a^*}{\partial a \partial n}. \tag{42}
\]
Dividing both sides by \(\frac{\partial a^*}{\partial n}\) gives
\[
1 = -\frac{t}{n^2\gamma} \frac{(1 - \epsilon)}{\frac{\partial a^*}{\partial n}} - \frac{t}{n\gamma} \frac{\partial \epsilon}{\partial a}. \tag{43}
\]
Rearranging gives
\[
\frac{t}{n^2\gamma} \frac{(1 - \epsilon)}{\frac{\partial a^*}{\partial n}} = -(1 + \frac{t}{n\gamma} \frac{\partial \epsilon}{\partial a}) \tag{44}
\]
and finally gives equation (22).

We next derive condition (28) and show that external pluralism is lower, the higher the market concentration. It holds that \(\frac{\partial EP}{\partial n} > 0\) if
\[
\frac{\partial EP}{\partial n} = (2n \frac{\partial l^*_i}{\partial n} + l^*_i + \frac{t}{4n^2l^*_i}) > 0. \tag{45}
\]
The last term is always positive. We thus check whether the sum of the first two terms is positive as well. Given equations (19) and (13), the first two terms can also be written as
\[
2n \frac{\partial R(a) \partial a^*}{\partial a \partial n} + \frac{t}{n\gamma} \frac{\partial R(a)}{\partial a}. \tag{46}
\]
Since at the optimum, \(\frac{\partial R(a)}{\partial a} > 0\), it holds that \(\frac{\partial EP}{\partial n} > 0\) if
\[
2n \frac{\partial a^*}{\partial n} + \frac{t}{n\gamma} > 0 \tag{47}
\]
or using equation (22) if
\[
2n(1 - \frac{1 - \epsilon}{n(1 + \frac{t}{n\gamma} \frac{\partial a^*}{\partial a})}) > 0. \tag{48}
\]
This is true if
\[ n(1 + \frac{t}{n\gamma} \frac{\partial \epsilon}{\partial a}) > (1 - \epsilon) \] (49)
which is always true, because \( \epsilon < 1 \) and \( \frac{\partial \epsilon}{\partial a} > 0 \).

**Proofs of section 5**

We show that entry is excessive under the subscription regime. The free-entry equilibrium number of outlets under the subscription regime is
\[ n^\text{pay} = \frac{1}{2} \sqrt{2} \sqrt{f(t(2(\delta - \theta) - t) - \theta^2)} \] (50)
and the social optimal number is
\[ n^* = \frac{1}{2} \frac{(\delta - 2t)\sqrt{t(f(\delta - 2t) - 2\theta^2)}}{f(\delta - 2t) - 2\theta^2}. \] (51)

It holds that
\[ \frac{\partial n^*}{\partial \delta} = -\frac{\theta^2 t}{2(\delta - 2t)\sqrt{f(\delta - 2t) - 2\theta^2}} < 0 \] (52)
and
\[ \frac{\partial n^\text{pay}}{\partial \delta} = \frac{\sqrt{2}(t + \theta^2)}{4\delta \sqrt{f(\delta - 2t) - 2t\theta - \theta^2}} > 0. \] (53)

In order to avoid complex regions we assume that \( \delta > \delta = 2t + 2\theta^2 f \). Evaluation of \( n^* \) and \( n^\text{pay} \) at \( \hat{\delta} \) shows that \( n^\text{pay}|_{\delta=\hat{\delta}} > n^*|_{\delta=\hat{\delta}} \) if
\[ \frac{\sqrt{(f+\theta^2)(3f^2-2f\theta-f\theta^2+4\theta^2)}}{2(f t + \theta^2)} > 0 \] (54)
which is always true. Together with \( \frac{\partial n^*}{\partial \delta} < 0 \) and \( \frac{\partial n^\text{pay}}{\partial \delta} > 0 \) this completes the proof.

It holds that \( IP^* > IP^\text{pay} \) if \( n^\text{pay} > \hat{n} = \frac{1}{2} \frac{(t+\theta)(\delta-2t)}{\delta \theta} \). We show that
this is true. It holds that \( \frac{\partial n^*}{\partial f} < 0 \) whereas \( \tilde{n} \) is independent of \( f \). That is, it suffices to show that \( n^{pay}|_{f=\bar{f}} > \tilde{n} \). It follows that \( n^{pay}|_{f=\bar{f}} - \tilde{n} = \sqrt{2} \sqrt{3 \theta (2\delta t - \delta^2 - 2\theta - \theta^2) - 2\delta - 2\theta + 2t^2 + 2\theta^2}. \)

References


