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Centralized Bargaining in Press Wholesale

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Abstract

This paper studies the institutional design of newspaper and periodical wholesale. Motivated by recent developments in Germany, we compare the efficiency properties of two alternative regimes for the determination of wholesale margins: collective bargaining (as practised in Germany for the last decades) on the one hand, and local bargaining (as customary in the UK and lately aspired by some German publishers) on the other. We point out several advantages of centralized bargaining: While, in the short run, local bargaining appears more attractive to publishers, it may lead to higher prices for readers and, in the long run, higher total costs of delivery.

Keywords: Hold-up; collective bargaining; mass media; wholesale.

JEL classification: L82; C78; L41; D42.

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1 Introduction

The last decade has witnessed newspaper and magazine publishers all over Europe struggle with plunging advertising and readers unremittingly moving online. In view of declining revenues, media managers explore novel ways to cut costs. After the editorial departments have been “squeezed dry”, directing the attention towards the distribution system seems a promising avenue. Press distribution costs are quite substantial, with wholesale margins typically accounting for 20-30% of a newspaper’s cover price.

Within the vertical division of labour, it rests on the wholesalers to establish a spatially inclusive and comprehensive delivery network and operate it as cost efficient as possible. From the point of view of social policy, the performance of the press distribution system is of similar importance as the resourcefulness of editorial departments, because it determines the degree of diversity of publications actually finding their way to the marketplace. In order to take part in the competition of ideas, a newspaper has to be brought to the readers’ attention and held available for sale locally. This is true even in countries where subscription sales dominate street sales, because the daily competition between headlines takes place in the retailers’ displays, not in the subscribers’ letterboxes. In addition, readers usually sample a press product on the newsstand before they decide on a subscription.

The organization of press wholesale differs markedly across countries (see Haller 2012). In the United Kingdom, SmithNews and Menzins Distribution dominate the wholesale trade, making up for 90% of the market share. By contrast, the market structure in Germany is characterized by a large number (about 70) of mostly independent wholesalers acting as local monopolies¹; only about 10% of German wholesalers are vertically integrated with publishing corporations.

With regard to a particular sales region, the delivery of press products is characterized by a subadditive cost-structure; it is cheaper to have one wholesaler supply all retailers located in the region than to split this task between multiple firms. Therefore, from an economic point of view, the delivery network constitutes a natural monopoly. The cost-savings that accrue by granting exclusive territories can, in principle, be shared between wholesalers and publishers. But this is exactly where the practical problems arise.

¹With the exception of the cities of Berlin and Hamburg, each of which has two companies sharing the market.

While wholesale margins in France and Italy are essentially government-administered prices (see Otter 2009), in Germany they have traditionally been negotiated on a centralized level between the wholesale association (“Bundesverband Presse-Grosso”) and the associations of newspaper and magazine publishers (“Bundesverband deutscher Zeitungsverleger” and “Verband deutscher Zeitschriftenverleger”, respectively).

Recently, one of the four leading publishers of popular magazines in Germany² has launched an attempt at changing customary trade practices, which critics fear could fundamentally alter the entire organization of press distribution. After the company had terminated its long-term contracts with some wholesalers in northern Germany and set up a proprietary distribution system in the respective regions, it tried to opt out of the centralized bargaining regime in order to negotiate individually with the remaining independent regional wholesalers. These bold moves have sparked several lawsuits. The latest ruling, a decision by the regional court of Cologne (“Landgericht Köln”), declared centralized negotiations in press wholesale as anti-competitive. The fact that, in the bargaining process, local distributors are represented by their trade association, setting a uniform wholesale margin for all regions, was held to constitute a cartel agreement in violation of European competition law.

We contribute to this debate by pointing out several favourable aspects of centralized negotiations which have so far escaped attention. Especially, we discuss centralized bargaining as a means of regulating local monopolies. Since the problem of double marginalization is dealt with by the widespread use of resale price maintenance in the market for press products³, the important issue is how to discipline local monopolists against slack and create appropriate incentives for distributional effort. Publishers often criticize that wholesalers operate unthrifty and fail to invest adequately in rationalizing their distribution network (see, for example, Brandt 2009). Against this backdrop, we compare the efficiency properties of centralized versus local bargaining in a simple model, where an upstream publisher relies on two downstream wholesalers with exclusive territories to deliver his press product to the ultimate consumers.

²The Bauer Media Group, whose titles account for approximately 20% of the market share.

³While, in some European countries, resale price maintenance for press products is mandated by law (Germany, France, Spain, Portugal), or customarily practised (Italy), in others, albeit officially prohibited, it is factually sustained by adhering to recommended retail prices (UK). See Haller (2012) for details.

Although highly stylized, our model sheds light on some features of the current debate in Germany and thereby yields useful insights for the institutional design of newspaper and periodical wholesale. We show that, in the short-run, the publisher has a preference for bargaining to be carried out on the local level, because this may put him in the position to better play off his threat point against the wholesalers. Notably, whenever threatening to quit for an outside option is credible only in one region can the publisher secure for himself a higher share of the transaction rent in local bargaining. While, for the same reason, wholesalers in the aggregate prefer centralized bargaining, the transition to local bargaining entails an intra-group redistribution of profits that benefits the wholesaler operating with the higher average costs, impairing the more cost-efficient wholesaler.

In the next step, we show that the bargaining regime, albeit ostensibly confined to the publisher-wholesaler nexus, may well have an impact on the newspaper's cover price. Under resale price maintenance, in order to avoid charges of abusive practices, the newspaper has to choose a single cover price for all distribution areas. If the publisher's outside option constraint is binding in only one region, the demand conditions prevailing in this local market gain a higher weight in his pricing calculus. This is because increasing the rent accruing from this particular market by changing the newspaper's uniform cover price does not raise the margin paid to the local wholesaler. Under the realistic condition that the outside option constraint tends to bind in "bigger" submarkets, i.e. submarkets yielding a higher marginal revenue in equilibrium, local bargaining increases the newspaper's cover price. This is a rather surprising result: Although local bargaining may lower the newspaper's distribution costs in the short-run, not only do the readers fail to share in this economy, but actually find themselves confronted with a higher cover price.

In a final step we investigate the influence of the bargaining regime on the wholesalers' long-run investment incentives. A wholesaler's efforts at cost reduction increase the transaction rent subsequently to be shared with the publisher in bargaining over the wholesale margin. This situation gives rise to the classic "hold-up" problem (see Grout 1984; Williamson 1985): inasmuch as the publisher can appropriate a part of the returns to investment, the wholesaler's incentives to devise more efficient ways of distribution are curbed. The influence of the bargaining regime are reflected in the fact that, while in local bargaining an individual cost saving measure immediately lowers the margin of the investing wholesaler, in centralized bargaining this effect is

only felt in proportion to the respective wholesaler’s market share. Uniform margins take into account the average industry distribution costs, thereby mitigating the hold-up problem inherent in press wholesale. Therefore, centralized bargaining proves superior with regard to the long-run evolution of distribution costs.

A similar effect has been noted in the labour-market context: because more efficient firms can retain a larger portion of their super-normal profits if the wage calculation complies with the average industry productivity, centralized wage negotiations may foster efficiency and industry growth (see Rehn 1952 for the general argument). Formally, the workings of the “productivity whip” of centralized bargaining in the labour market have been expounded by Moene and Wallerstein (1997), Haucap and Wey (2004), and Braun (2011).⁴

Of these papers, Haucap and Wey (2004) is most closely related to our analysis. Within the framework of a duopoly patent race, where the opportunity to implement a cost reducing innovation is assigned randomly to the participating firms, the authors demonstrate that the innovation incentives are highest under a bargaining regime that enforces a uniform industry wage.

Our analysis differs in two fundamental respects: Firstly, while in our model downstream wholesalers are local monopolies, the labour economics literature cited above has in common that heterogeneous firms deploying labour inputs are competitors in the market for the final good. Secondly, the investments we discuss are non-rivaling, in the sense that a cost reduction by one firm does not preclude the other from investing, whereas in Haucap and Wey (2004) they take the form of a “winner-take-all” contest.⁵

To our knowledge, the role of centralized bargaining in mitigating hold-up has so far not been discussed in the context of media markets, or distribution systems more generally. To be sure, there is a literature on investment incentives in the producer-distributor nexus, and especially the studies by Inderst and Wey (2003; 2007; 2011) on the influence of buyer power on suppliers’ technology choice share many features with our approach. While we examine

⁴A macroeconomic analysis within the framework of a two-sector endogenous growth model is provided by Agell and Lommerud (1993).

⁵In a series of papers Ulph and Ulph (1994; 2001; for a survey see 1998) show that the intuitions derived from general studies of the hold-up problem in a unionized labour market (Grout 1984; Van der Ploeg 1987) may not carry over to investments in R&D, where employers facing a firm-union engage in a patent race. The present paper is more in line with the traditional approach.

centralized bargaining by independent wholesalers, the authors discuss retail mergers and find that larger buyers may spur suppliers' efforts at cost reduction.⁶ Although the distinction between "cartelizing" for the sake of negotiation and full-fledged merger may seem immaterial at first sight, the fact that, in our model, the downstream wholesalers assume the role of the investing party makes for a subtle difference. Our centralized bargaining results would, in principle, also apply to the case of mergers, but the investment results do not, because horizontally integrated firms would not run into the prisoners' dilemma-type situation we encounter in Section 5: Because each wholesaler's individual efforts at cost reduction exert a negative externality on the other wholesalers via a reduction of the uniform margin, non-cooperative investments may exceed the level that maximizes wholesalers' aggregate profits (albeit still falling short of the first-best optimum).

We spell out conditions under which uniform retail margins indeed raise efficiency in a model tailored to the peculiarities of press wholesale. Our analysis suggests that centralized bargaining should be viewed as an institutional device for regulating local monopolies rather than a cartel agreement, since all parties – including readers – benefit from a more cost-efficient distribution of press products. In principle, our results are of wider applicability, because they pertain to any retail system characterized by exclusive territories on the distribution level cum resale price maintenance, as it is often found in licenced dealership or the trade of designer fashion. In contrast to these more mundane industries, the press market has an additional societal relevance because it provides the forum for the competition of ideas.

On these ground, the present paper can also be related to the growing literature in media economics on the role of media competition for improving the knowledge of individuals in their capacity as consumers, voters, citizens etc. (see Gentzkow and Shapiro 2008 and Prat and Strömberg 2011 for surveys). With respect to the free marketplace of ideas, newspapers and

⁶Inderst and Wey (2011) is the only paper to highlight the role of outside options. It is found that threat point buyers can play out if they have recourse to an outside option is the motivating force behind the supplier's investment incentives. Buyer power is irrelevant as long as the threat of opting out is not credible. It only matters because, with larger buyers, the outside option constraint is more likely to be binding. In our model, by contrast, collective bargaining *per se* fosters investments by wholesalers, independent of whether the publisher's outside option constraint is binding in local bargaining or not. The existence of an outside option to the publisher only improves his share in the short-term distribution of rents.

magazines are widely regarded as particularly important, not least because of their potential of more in-depth investigation as compared with other, more ephemeral news media.⁷ While theoretical modelling has focussed on distortions from the supply and demand side (where, in addition to traditional market failures, “publisher bias” and “reader bias”, respectively, have been singled out as peculiar to the industry), there is a serious potential for distortions arising from limited distribution that has so far not been fathomed. Therefore, our contribution can be seen as complementing this literature by drawing attention to the institutional factors that foster competition in the market for news: Even if supply- and demand-side biases are absent, not all the news actually printed may be available to the ultimate reader (at economically justifiable costs). Only press items that make their way to the newspaper stand can take part in the competition of ideas. By way of international comparison, the German market is characterized by a high variety of press products available at the point of sale (see Haller 2012), and many commentators fear that individual bargaining might be to the disadvantage of small publishers, tilt the playing field in favour of large established titles, and eventually lead to higher media concentration.⁸ To these concerns our analysis adds several more.

The paper is organized as follows: Section 2 sets out the model. Section 3 derives predictions for the bargaining outcomes of the alternative regimes. The determination of the newspaper’s cover price is analyzed in Section 4. Section 5 studies the wholesalers’ incentives to invest in cost reduction and shows that centralized bargaining mitigates the hold-up problem. Section 6 probes the robustness of our results using a different bargaining solution. We summarize and briefly discuss further implications in Section 7.

2 The model

Consider a newspaper distributed in two regions $i = 1, 2$. As mentioned in the introduction, many European countries impose legal constraints such that

⁷See Economist (2011): “The health of newspapers is particularly important because they tend to set the agenda for other news media and employ the most journalists”.

⁸For example, the Frankfurter Allgemeine Zeitung commented on 14.02.2012: “Der Bauer-Verlag nimmt den Presso-Grosso und damit die Medienvielfalt auseinander. Sollte er sich durchsetzen, wäre die Chancengleichheit des bis dato neutralen Pressevertriebs dahin.”

newspapers cannot charge different prices in different regions. Accordingly, the newspaper is sold at a uniform cover price p . To keep things simple, we assume that the newspaper's production costs are zero.⁹ The number of readers in region i is given by the differentiable demand function $n_i(p)$, with $n'_i(p) < 0$, and revenue $R_i(p) := pn_i(p)$ is strictly concave. In practice, local conditions may differ substantially across sales regions. To capture this observation, let demand and marginal revenue at any price $p > 0$ be higher in region 1:

$$n_1(p) > n_2(p) \text{ and } R'_1(p) > R'_2(p). \quad (1)$$

Furthermore, we focus on the case where both markets are always served, i.e. the publisher pursues a strategy of ubiquitous obtainability.

There are two wholesalers, one in each region, acting as local monopolists. Their fixed costs of operation are equal to $f_i = f - e_i$, where $f > 0$ is a parameter common to both, and e_i represents wholesaler i 's individual efforts at cost reduction. These cost reducing investments come at a cost $C(e_i)$, with $C(0) = C'(0) = 0$, $C'(e_i) > 0$, and $C''(e_i) > 0$ for all $e_i > 0$. The first-best efficient investment level e_i^{FB} minimizes $f - e_i + C(e_i)$ and is given by $C'(e_i^{FB}) = 1$. We assume that $f > C'^{-1}(1)$ in order to rule out corner solutions where the delivery costs drop to zero.

The timing of the game is as follows. First, wholesalers independently choose their investments e_i . Second, the newspaper sets the uniform cover price p . Third, there is bargaining over the margins between the newspaper and the wholesalers. The choice of the timing reflects the fact that investment decisions are comparatively long term. Moreover, newspaper prices are quite stable over time, and publishers seem reluctant to change prices frequently.

The publisher has at his disposal an alternative channel of distribution which serves as an outside option in bargaining. Hence, the local monopolists are faced with the threat of entry. A simple way to investigate the question how potential competition disciplines the incumbents is to assume that the publisher's outside option consists in self-distribution. This sidesteps the intricacies of bargaining with third parties. Let $\underline{f}$ be the publisher's cost per region of setting up his own channel of distribution. We assume that $\underline{f} > f$,

⁹For our purposes, the first-copy costs of producing the newspaper content can be thought of as independent from the interactions on the wholesale market, because they are, by and large, determined by considerations concerning subscription sales. Furthermore, constant marginal costs of producing and printing newspapers, as well as the inclusion of additional revenues from the advertising market, do not substantially change our results but only clutter the notation.

so that taking up the outside option is never the efficient outcome. This assumption can be justified with reference to the fact that, in reality, incumbent wholesalers carry the product of several publishers that all contribute to the common costs of distribution. Since there is no such cost sharing if a publisher opts out in favour of a proprietary delivery system, his standalone costs will be higher. In contrast to the newspaper, wholesalers do not have a reasonable outside option, except to shut down their business. Thus, we assume that wholesalers' outside option constraints are not binding.¹⁰

Our main objective is to compare centralized bargaining to local bargaining. With centralized bargaining, the wholesalers are represented by a delegate who aims at maximizing the wholesalers' aggregate profit. The main difference between the two bargaining regimes concerns the newspaper's outside option. With local bargaining, the outside option consists in delivering a particular region on its own account. With centralized bargaining, by contrast, taking up the outside option essentially means that the newspaper has to set up its own delivery system *in every region*. The threat to quit a single incumbent for self-delivery is, of course, more credible than to set up a proprietary distribution system everywhere. Therefore, it seems reasonable to assume that the outside option constraint is never binding when bargaining takes place on the centralized level, while it might be binding in one region with local bargaining. Some of our results below make use of this assumption.

3 Bargaining over the wholesale margin

In this section, we study the bargaining process at stage three of the game. Thus, we take the newspaper's cover price p and the wholesalers' delivery costs f_i as given and disregard investment costs $C(e_i)$, which are sunk at this stage. We suppose that bargaining enables the wholesaler(s) to capture a fraction $\alpha \in (0, 1)$ of the gain from reaching an agreement with the publisher. This is the unique perfect equilibrium outcome in a model of alternating offers as proposed by Rubinstein (1982), where α depends on the relative time preferences of the bargaining parties and the order of moves. Since it does not seem reasonable that these institutional factors should vary systematically if the locus of bargaining is shifted from the centralized to the local level, we

¹⁰See footnote to equation (3) below for an assumption on the fundamentals of the model that ensures that the profit of the wholesalers is always nonnegative.

take α as independent of the bargaining regime.¹¹

Furthermore, we suppose that the switching costs to the publisher of setting up his own distribution channel are sufficiently large, so that it is not worthwhile incurring them during the short period of negotiation with the incumbent wholesalers.¹² The publisher will only expend these costs if he decides to replace his wholesaler(s) permanently, so that opting for self-delivery ends the current business relationship for good.

The wholesalers are able to make a final offer to the publisher before he leaves the negotiation table to take up his outside option; this is a reasonable assumption in face-to-face bargaining situations (see Shaked 1994). Shaked and Sutton (1984) and Binmore (1985) have demonstrated that the existence of such outside options does not affect the bargaining outcome provided that the publisher prefers this outcome to supplying the relevant market(s) on his own account: the threat of having recourse to self-delivery is empty under these circumstances. If, on the other hand, the publisher would be better off taking up his outside option than accepting the original bargaining result, the wholesaler(s) can “keep him sweet” by making a final offer exactly matching the publisher’s costs of self-delivery (but no lower). The intuition behind this “outside option principle” as applied to the case in question is that, since the outside option is not available to the publisher as long as bargaining continues, its value does not enter as a short-run opportunity cost into the gain from reaching an agreement (i.e. it does not shift the “disagreement point”), but merely serves as a boundary on the range of possible bargaining outcomes.

Following a standard procedure advocated by Sutton (1986) and Binmore, Rubinstein, and Wolinsky (1986) (see Muthoo 1999 for a textbook exposition), we approximate the result of the bargaining process by the static Nash bargaining solution with disagreement points of zero for all parties and the publisher’s costs of self-delivery setting an upper limit on the wholesalers’ “share of the pie”.¹³

¹¹If we think of the α as some broader measure of bargaining power, it might be reasonable to assume that the bargaining power of wholesalers is larger under centralized bargaining. But this would only reinforce our results.

¹²See section 6 for an analysis of what happens if this assumption is relaxed.

¹³In Section 6 we discuss how our results change when we employ a different bargaining setup where the outside option principle is not satisfied.

3.1 Centralized bargaining

Under centralized bargaining, the newspaper and the wholesalers bargain over a margin m , a fixed percentage of the cover price, paid to the wholesaler. The wholesalers are represented by a representative whose incentive is to maximize the wholesalers' aggregate profit

$$\sum_i (m R_i(p) - f_i).$$

The newspaper's profit is

$$\sum_i (1 - m) R_i(p).$$

As discussed above, the wholesalers' bargaining power is α . If negotiations fail, the newspaper can take recourse to the outside option of delivering both regions itself at a cost $\underline{f}$ per region, yielding a profit of $\sum_i (R_i(p) - \underline{f})$.

The margin m maximizes the Nash product subject to the outside option constraint. That is, m solves

$$\max_m \left(\sum_i (m R_i(p) - f_i) \right)^\alpha \left(\sum_i (1 - m) R_i(p) \right)^{1-\alpha}$$

subject to

$$\sum_i (1 - m) R_i(p) \geq \sum_i (R_i(p) - \underline{f}).$$

Solving this problem is straightforward. If

$$2\underline{f} > \alpha \sum_i R_i(p) + (1 - \alpha) \sum_i f_i \quad (2)$$

the outside option constraint is not binding and the bargaining solution equals

$$m = \alpha + (1 - \alpha) \frac{\sum_i f_i}{\sum_i R_i(p)}.$$

The newspaper's profit is $(1 - \alpha) \sum_i (R_i(p) - f_i)$, and the wholesalers' aggregate profit is $\alpha \sum_i (R_i(p) - f_i)$. Let

$$s_i(p) = \frac{R_i(p)}{\sum_k R_k(p)}$$

denote the market share of wholesaler i , which is equivalent to the fraction of readers in market i . The profit of wholesaler i is¹⁴

$$\begin{aligned} & \left(\alpha + (1 - \alpha) \frac{\sum_k f_k}{\sum_k R_k(p)} \right) R_i(p) - f_i \\ = & \alpha R_i(p) + (1 - \alpha) s_i(p) \sum_k f_k - f_i. \end{aligned} \quad (3)$$

This equation will be useful for analyzing investment incentives below. Intuitively, wholesaler i 's revenue per unit sold can be expressed as

$$\frac{\sum_k f_k}{\sum_k n_k(p)} + \alpha \left(p - \frac{\sum_k f_k}{\sum_k n_k(p)} \right),$$

which is the average industry delivery costs plus a fraction of the average industry transaction rent.

If inequality (2) does not hold, the outside option constraint is binding and bargaining yields $m = \frac{2f}{\sum_i R_i(p)}$; the newspaper's profit is $\sum_i (R_i(p) - \underline{f})$, and wholesalers' aggregate profit is $\sum_i (\underline{f} - f_i)$.

As argued above, the empirically most relevant scenario seems to be that, in the case of centralized bargaining, the publisher's outside option constraint is never binding. To focus on this scenario, some of our results below assume that

$$2\underline{f} > \alpha \sum_i R_i(p_0) + (1 - \alpha) 2f \quad (4)$$

where p_0 is the price that maximizes total revenues $\sum_i R_i(p)$. The price p_0 will also turn out to be the equilibrium price under centralized bargaining. Assumption (4) states that, even if wholesalers do not engage in any cost reducing efforts, the newspaper's outside option constraint is not binding when bargaining takes place on the centralized level; it implies that inequality (2) holds for all prices p and investments e_1, e_2 .

3.2 Local bargaining

Under local bargaining, the newspaper negotiates with the two wholesalers separately. Denote the margin agreed on with wholesaler i by m_i . Accordingly,

¹⁴As stated above, we assume that a wholesaler's profit is always nonnegative. Since $0 < f_i \leq f$, $s_i > 0$, and $R_2(p) < R_1(p)$, a sufficient condition is that $\alpha R_2(p) > f$ for all relevant prices p (which will be considered below).

wholesaler i 's profit is $m_i R_i(p) - f_i$, while the newspaper obtains a profit $(1 - m_i) R_i(p)$ from market i . If negotiations between the newspaper and wholesaler i fail, the newspaper opts for self-delivery in the respective region at a profit $R_i(p) - \underline{f}$.

Note that we are dealing with two separate bargaining problems that do not interact because wholesalers are local monopolists. As stated above, we assume that the wholesalers' bargaining power α is the same as in the centralized bargaining case. The margin m_i thus solves

$$\max_{m_i} (m_i R_i(p) - f_i)^\alpha ((1 - m_i) R_i(p))^{1-\alpha}$$

subject to the local outside option constraint

$$(1 - m_i) R_i(p) \geq R_i(p) - \underline{f}.$$

Again, the problem is straightforward to solve. If

$$\underline{f} > \alpha R_i(p) + (1 - \alpha) f_i$$

the outside option constraint is not binding in region i , so that the margin equals

$$m_i = \alpha + (1 - \alpha) \frac{f_i}{R_i(p)},$$

the newspaper's profit from region i is $(1 - \alpha) (R_i(p) - f_i)$, and the profit of wholesaler i is $\alpha (R_i(p) - f_i)$.

Otherwise, the outside option constraint is binding in region i , its contribution to the newspaper's total profit is $R_i(p) - \underline{f}$, and the profit of wholesaler i is $\underline{f} - f_i$. The total profit of the newspaper is the sum of its profits in the two regions.

3.3 Comparison: bargaining outcomes

To compare the two alternative bargaining regimes, it is useful to consider industry profit as the sum of the newspaper's profit and the wholesalers' aggregate profits. Irrespective of the bargaining regime, industry profit is given by

$$\sum_i (R_i(p) - f_i).$$

Thus, given the cover price p and the delivery costs f_1 and f_2 , the bargaining regime does not affect industry profit, but only determines its distribution among the parties involved. We are now in a position to state our first main result.

Proposition 1 *Consider stage 3 where the price p and costs f_1 and f_2 are given. (i) If*

$$\max_{i=1,2} \{\alpha R_i(p) + (1 - \alpha) f_i\} > \underline{f} > \min_{i=1,2} \{\alpha R_i(p) + (1 - \alpha) f_i\}, \quad (5)$$

the newspaper strictly prefers local bargaining, while the wholesalers' aggregate profits are strictly lower under local bargaining. (ii) Otherwise, the newspaper is indifferent, and aggregate profits of the wholesalers are identical under centralized and local bargaining.

Proof. For notational convenience and without loss of generality, let

$$\alpha R_k(p) + (1 - \alpha) f_k \geq \alpha R_l(p) + (1 - \alpha) f_l. \quad (6)$$

(i) Suppose that (5) holds. Under local bargaining, the newspaper's outside option constraint is binding in market k , but not in market l . Thus the newspaper's profit is

$$R_k(p) - \underline{f} + (1 - \alpha) (R_l(p) - f_l).$$

Under centralized bargaining, there are two possibilities. First, if inequality (2) holds, the outside option constraint is not binding, the newspaper's profit is

$$(1 - \alpha) \sum_i (R_i(p) - f_i),$$

By (5) and (6),

$$(1 - \alpha) (R_k(p) - f_k) < R_k(p) - \underline{f}.$$

Therefore, the newspaper's profit is strictly higher under local bargaining. Moreover, the wholesaler's aggregate profit (i.e. the sum of the profits of the two wholesalers) must be strictly lower, since the bargaining regime does not change industry profit.

Second, suppose that inequality (2) does not hold. Then under centralized bargaining, the newspaper's outside option constraint is binding, and its profit is equal to

$$\sum_i (R_i(p) - \underline{f}).$$

By (5) and (6),

$$(1 - \alpha) (R_l(p) - f_l) > R_l(p) - \underline{f}.$$

Therefore, again, the newspaper's profit is strictly higher under local bargaining, while the wholesalers' aggregate profit is strictly lower.

(ii) Suppose inequality (5) does not hold. There are two subcases. First, if

$$\alpha R_l(p) + (1 - \alpha) f_l \geq \underline{f},$$

the outside option constraints are always binding: in both bargaining regimes, and in both regions with local bargaining. The newspaper is indifferent under these conditions because its profit is $\sum_i (R_i(p) - \underline{f})$, irrespective of the bargaining regime. Moreover, wholesalers' aggregate profits are the same under local as under centralized bargaining.

Second, if

$$\underline{f} \geq \alpha R_k(p) + (1 - \alpha) f_k,$$

the outside option constraints are irrelevant. As above, the newspaper is indifferent, and wholesalers' aggregate profits are the same under local as under centralized bargaining. ■

Proposition 1 sheds some light on the recent developments in Germany. It provides a rationale for why the Bundesverband Pressegrasso prefers to keep up centralized bargaining, while the Bauer Media Group pushes for a regime change: with local bargaining, the publisher can use its outside option in some regions but rely on the wholesalers in other regions.¹⁵ In fact, this is what happened to the wholesale company Grade, who was operating in a region close to Hamburg. The Bauer Media Group terminated its contractual relationship with Grade and set up its own delivery system in the respective region; the Bundesgerichtshof later ruled that the termination of the contract by Bauer was legal (BGH, Az. KZR 7/10, Oct. 24, 2011).

The choice of the bargaining regime has intra-group distributional consequences. We now briefly consider the distribution of the wholesalers' aggregate profits. To illustrate the inherent conflict, suppose that the outside option constraint is not binding. Wholesaler i will prefer centralized over individual bargaining if centralized bargaining gives him a higher margin,

¹⁵Other publishers, most notably Axel Springer AG, support the centralized bargaining regime. This may be due to different outside options, a different readership accross regions, or a different time horizon: we show in Section 5 that the long-run profit of the newspaper may well be lower under local bargaining.

which is the case if

$$\frac{f_i}{R_i(p)} < \frac{f_j}{R_j(p)}.$$

This means that companies operating with lower average costs receive higher margins if the centralized bargaining regime is adopted, whereas companies with less favourable cost structures prefer bargaining to be carried out at the local level. While the regional court of Cologne argued in 2012 (LG Köln, Az. 88 O [Kart] 17/11) that local bargaining serves to “discipline” unthrifty wholesalers, we find, to the contrary, that under centralized bargaining the relatively cost-intensive companies are put under pressure.¹⁶ We will study investments in economizing on distribution costs in detail in Section 5 below.

4 The newspaper’s pricing decision

We now turn to stage 2 of the game, where the newspaper sets its cover price.

4.1 Centralized bargaining

As argued above, under centralized bargaining, the newspaper’s profit is equal to

$$\begin{cases} (1 - \alpha) \sum_i (R_i(p) - f_i), & \text{if } \alpha \sum_i R_i(p) + (1 - \alpha) \sum_i f_i \leq 2\underline{f}, \\ \sum_i R_i(p) - 2\underline{f}, & \text{otherwise.} \end{cases}$$

Note that the newspaper’s profit is a continuous function of the price p .¹⁷ Whether the second case applies because the outside option constraint is

¹⁶In the labor market context, a related finding has been termed the “productivity whip”-effect of unionized wages (see Calmfors, Booth, Burda, Checchi, Naylor, and Visser 2001, p. 68).

¹⁷This follows from the continuity of the demand functions n_1 and n_2 together with the fact that, if

$$\alpha \sum_i R_i(p) + (1 - \alpha) \sum_i f_i = 2\underline{f}$$

then

$$\begin{aligned} (1 - \alpha) \sum_i (R_i(p) - f_i) &= \sum_i R_i(p) - \left(\alpha \sum_i R_i(p) + (1 - \alpha) \sum_i f_i \right) \\ &= \sum_i R_i(p) - 2\underline{f}. \end{aligned}$$

binding at stage 3 depends, in general, on the price p chosen at stage 2. But irrespective of the collective bargaining outcome, the profit maximizing price just maximizes total revenue $\sum_i R_i(p)$. To summarize this observation:

Remark 1 *Under centralized bargaining, the newspaper sets the price $p = p_0$, defined by*

$$p_0 := \arg \max_p \sum_i R_i(p).$$

4.2 Local bargaining

The analysis of price setting in the local bargaining regime is more involved. In general, the newspaper's pricing decision may affect in which region the outside option influences the bargaining outcome. In contrast to centralized bargaining, "asymmetric" cases can occur, in which the outside option constraint is binding in exactly one of the two regions, say in region i , so that the newspaper's profit equals

$$R_i(p) - \underline{f} + (1 - \alpha)(R_j(p) - f_j). \quad (7)$$

Note that this consists of a weighted sum of the revenues in both regions and additional terms independent of the newspaper price. The weight on region i , where the outside option constraint is binding, is higher. Intuitively, the newspaper can fully appropriate any change in revenue accruing from market i , whereas, in region j , the local wholesaler receives a share α . Expression (7) is maximized by p_i defined by

$$p_i := \arg \max_p \{R_i(p) + (1 - \alpha)R_j(p)\}, \quad (i, j = 1, 2, j \neq i).$$

Since by assumption (1) marginal revenue is higher in region 1, we have $p_1 > p_0 > p_2$. Our next lemma shows that the newspaper will choose one of these three prices in equilibrium.

Lemma 1 *Under local bargaining, the profit maximizing price is either p_0 , p_1 , or p_2 .*

Proof. See Appendix A.1. ■

The proof of Lemma 1 has to take into account that the newspaper's pricing decision may affect which outside option constraint is binding. In

particular, we need to rule out that there is a “corner” solution where the price is such that a small price change alters the set of binding constraints. While conceptually straightforward, this requires some lengthy considerations since the set of prices such that no outside option constraint is binding is, in general, not convex.

Using Lemma 1, it is straightforward to find the profit maximizing price: One only has to compute the profits from these three prices and determine which is highest.

4.3 Comparison: newspaper price

The price is different under local bargaining as compared with centralized bargaining if and only if exactly one outside option constraint is binding. It is higher (lower) if this is the outside option constraint of the bigger (smaller) market.

Which of these cases is relevant depends on the size of the markets and the costs f_i , which are determined by the wholesalers’ investments at stage 1. For example, if delivery costs are identical ($f_1 = f_2$), then if only one outside option constraint is binding, it must be the outside option constraint of the bigger market 1. In bargaining, the newspaper shares its revenues with the wholesaler; and since revenues are higher in market 1, the outside option here is relatively more attractive. This result is enforced if f_1 is bigger than f_2 . But even in cases where f_1 is smaller than f_2 , the outside option constraint is more likely to be binding in the bigger market, unless the cost difference outweighs the revenue sharing consideration. In fact, under assumption (4), the outside option constraint is never binding in the smaller market.

Lemma 2 *Suppose inequality (4) holds. Under local bargaining, the outside option constraint is not binding in region 2, and the newspaper’s choice of cover price is either p_0 or p_1 .*

Proof. From (4),

$$\begin{aligned}
2\underline{f} &> \alpha \sum_i R_i(p_0) + (1 - \alpha) 2f \\
&\geq \alpha \sum_i R_i(p) + (1 - \alpha) 2f \\
&> \alpha 2R_2(p) + (1 - \alpha) 2f
\end{aligned}$$

where the second line holds for any p since p_0 maximizes the sum of revenues, and the third line follows since market 2 is the smaller market. Thus

$$\underline{f} > \alpha R_2(p) + (1 - \alpha)(f - e_2)$$

for any p and e_2 , so that the outside option constraint of region 2 cannot be binding. ■

Lemma 2 shows that, if under local bargaining exactly one outside option constraint is binding, then it must be the outside option constraint of the bigger market 1. It follows that the newspaper will either set the price p_0 as under centralized bargaining, or the price p_1 , which gives more weight to the revenue from the bigger market 1 and is therefore strictly higher than p_0 . Which of these prices is optimal depends, in general, on how much effort wholesaler 1 has put into cutting delivery costs:

Lemma 3 *Suppose inequality (4) holds. Under local bargaining, the newspaper will set price p_1 if $e_1 < \hat{e}$, and price p_0 if $e_1 > \hat{e}$, where*

$$\hat{e} := f + \frac{\alpha R_1(p_1) - f}{1 - \alpha} + \sum_i (R_i(p_1) - R_i(p_0)).$$

Proof. See Appendix A.2. ■

Thus, if the investment of wholesaler 1 is low and, consequently, his delivery cost f_1 are high, the outside option constraint will be binding in market 1 and the newspaper will set the price p_1 . On the other hand, if wholesaler 1 invests a lot and operates at low costs, the outside option constraint will not be binding and the newspaper will set the price p_0 . Note that, under some parameter constellations, the critical investment level $\hat{e}$ will be zero, i.e. the outside option constraint in market 1 will never be binding, independent of the investment level of wholesaler 1. Similarly, the critical investment level $\hat{e}$ can be so high that the outside option constraint is always binding in market 1. If $e_1 = \hat{e}$, the newspaper is indifferent; it turns out to be convenient for the analysis of the investment stage to assume it chooses p_1 in this case.

The following Proposition summarizes the economic implications.

Proposition 2 *Consider stage 2 where the costs f_1 and f_2 are fixed, and suppose (4) holds. The newspaper's cover price is weakly higher¹⁸ under local*

¹⁸That is, the price is always at least as high under local bargaining, and under some parameter constellations strictly higher. All the comparisons in Proposition 2 are to be understood in this way.

than under centralized bargaining. Consumer surplus, industry profit, and welfare are weakly lower under local bargaining.

Proof. The pricing result has been derived above, and the statement on consumer surplus is an immediate implication. Industry profit is equal to $\sum_i (R_i(p) - f_i)$, which is at its maximum when $p = p_0$, and lower at any other price. ■

Proposition 2 shows that the readers may be adversely affected by local bargaining. Interestingly, this is exactly the case if local bargaining enables the publisher to lower his payments to the wholesalers. The publisher will not pass on this cost saving to the ultimate consumers. If “asymmetric” cases occur, where the outside option constraint is binding in only some markets, these will be the bigger markets by Lemma 2. The wholesalers in these regions will “keep the publisher sweet” by making offers that exactly match his outside option profit. Consequently, marginal revenues from these regions entirely accrue to the newspaper, while they have to be shared with wholesalers in smaller regions. Therefore, the high demand regions will have a higher weight in the newspaper’s pricing calculus. The newspaper will charge a higher price, adversely affecting consumer surplus and industry profits.

5 The wholesalers’ investments in cost reduction

Now we turn towards the wholesalers’ efforts at cost reduction. As a benchmark, consider the first-best investments that minimize total cost, which consist of the cost of delivery $f - e_i$ and the cost of improving delivery $C(e_i)$. First-best investments are characterized by $C'(e_i^{FB}) = 1$. Equilibrium investments, however, will typically fall short of this benchmark due to the hold-up problem: a wholesaler takes into account that higher investments on his part will lead to a lower margin. While bearing the full costs of investment, he can appropriate only part of the benefits.

5.1 Centralized bargaining

Under centralized bargaining, the price always equals p_0 , and the ex ante profit of wholesaler i is (compare equation (3))

$$\alpha R_i(p_0) + (1 - \alpha) s_i(p_0) (f_i + f_j) - f_i - C(e_i).$$

Using $f_i = f - e_i$, the profit of wholesaler i can be written as

$$(1 - s_i(p_0) + \alpha s_i(p_0)) e_i - C(e_i) + (\text{terms independent of } e_i)$$

The profit maximizing investment is therefore given by

$$C'(e_i) = 1 - s_i(p_0) + \alpha s_i(p_0). \quad (8)$$

Hence, investment is such that the marginal costs are equal to a weighted average of the cost reduction 1 and the bargaining power α . The weights are given by the market shares. Note that, for both firms, the investment is smaller than the first-best efficient level. Additionally, condition (8) implies that the wholesaler serving the smaller market invests more. The hold-up problem is less stringent for this firm since its investment has a smaller impact on the centrally negotiated margins.

5.2 Local bargaining

By Lemma 2, the outside option constraint is never binding in the smaller market 2. This implies that the price the newspaper sets at stage 2 does not depend on the investment of firm 2. The ex ante profit of wholesaler 2 is

$$\alpha (R_2(p) - f + e_2) - C(e_2),$$

where p is either p_0 or p_1 , depending on fundamentals and the investment of firm 1. Thus, wholesaler 2 will invest such that

$$C'(e_2) = \alpha \quad (9)$$

Comparing (8) with (9) gives the following:

Remark 2 *Wholesaler 2 invests strictly less under local than under centralized bargaining.*

Now consider wholesaler 1. By Lemma 3, if wholesaler 1 it invests less than $\hat{e}$, the outside option constraint will be binding in market 1, and the newspaper sets the price p_1 . Otherwise, the outside option constraint is irrelevant, and the newspaper sets the price p_0 . The ex ante profit of wholesaler 1 is

$$\begin{cases} \underline{f} - f + e_1 - C(e_1), & \text{if } e_1 \leq \hat{e}, \\ \alpha (R_1(p_0) - f + e_1) - C(e_1), & \text{otherwise.} \end{cases}$$

This function has a downward jump discontinuity at $\hat{e}$.¹⁹ Moreover, the slope is $1 - C'(e_1)$ for $e_1 < \hat{e}$ and $\alpha - C'(e_1)$ otherwise, thus at $\hat{e}$ the profit function also “kinks” downward.

To determine the investment of wholesaler 1, consider first the case in which the first-best efficient investment is below $\hat{e}$. Then wholesaler 1 will invest efficiently. This is due to the fact that as long as the outside option constraint is binding, the margin does not depend on the costs of wholesaler 1, who therefore receives the entire marginal return to investment. Otherwise, if the first-best efficient investment is above $\hat{e}$, the investment of firm 1 will either be characterized by $C'(e_1) = \alpha$, or it will be at the corner $e_1 = \hat{e}$.²⁰ In the latter case, we may even have $e_1 = \hat{e} < C'^{-1}(\alpha)$, which means that, in some constellations, wholesaler 1 invests less than wholesaler 2 under local bargaining.

Remark 3 *The investment of firm 1 is never higher than the first-best efficient investment level. It can be higher or lower under local than under centralized bargaining.*

Proof. Whenever $C'(e_1) > 1$, firm 1 can decrease e_1 to its efficient level, thereby strictly improving its profit. As argued above, the investment of firm 1 can be efficient under local bargaining, while it is always less than efficient under centralized bargaining, which shows that it can be higher under local bargaining. Finally, if the investment of firm 1 is at the hold-up level under

¹⁹To see this, note that

$$\begin{aligned} \underline{f} - f + \hat{e} &= \underline{f} + \frac{\alpha R_1(p_1) - \underline{f}}{1 - \alpha} + \sum_i (R_i(p_1) - R_i(p_0)) \\ \alpha(R_1(p_0) - f + \hat{e}) &= \alpha \left(R_1(p_0) + \frac{\alpha R_1(p_1) - \underline{f}}{1 - \alpha} + \sum_i (R_i(p_1) - R_i(p_0)) \right) \end{aligned}$$

The difference is

$$\begin{aligned} &\alpha(R_1(p_1) - R_1(p_0)) + (1 - \alpha) \sum_i (R_i(p_1) - R_i(p_0)) \\ &= R_1(p_1) - R_1(p_0) + (1 - \alpha)(R_2(p_1) - R_2(p_0)) \\ &= R_1(p_1) + (1 - \alpha)R_2(p_1) - (R_1(p_0) + (1 - \alpha)R_2(p_0)) \end{aligned}$$

which is strictly positive by definition of p_1 .

²⁰The possibility of this corner solution is the reason why we impose the tie-breaking rule that the newspaper sets price p_1 whenever it is indifferent, i.e. if $e_1 = \hat{e}$.

local bargaining $C'(e_1) = \alpha$ (or even below at $e_1 = \hat{e}$), it is strictly smaller than under centralized bargaining. ■

5.3 Comparison: aggregate costs

We now study which bargaining regime leads to lower aggregate costs defined by $\sum_i (f - e_i + C(e_i))$.

Proposition 3 *Assume (4). Aggregate cost can be higher or lower under centralized bargaining. A sufficient condition for aggregate costs to be strictly lower under centralized bargaining is that, for all e ,*

$$C'''(e) \geq 0. \quad (10)$$

Proof. See Appendix A.3. ■

The result concerning aggregate cost is ambiguous since there can be two countervailing effects. On the one hand, wholesaler 2 invests more under centralized than under local bargaining, which improves efficiency. On the other hand, wholesaler 1 may choose the first-best efficient investment level under local bargaining. The net effect depends on the relative strength of these two effects. If the cost function C satisfies assumption (10), then the sum of investments $(e_1 + e_2)$ is at least as large under centralized as under local bargaining. Moreover, whenever the sum of investments is identical under the two bargaining regimes, they are more unevenly distributed across wholesalers under local bargaining, which, by convexity of C , implies that total costs are lower under collective bargaining even in this case.

We conclude this section by laying out the implications of our observations for profits and consumer surplus.

Proposition 4 *The newspaper's ex ante profit can be higher or lower with centralized bargaining.*

Proof. The newspaper's ex ante profit is higher with centralized bargaining if the outside option is never relevant, which is the case when $\bar{f}$ is sufficiently high. In this case, the newspaper's profit is $(1 - \alpha) (\sum_i (R_i(\bar{p}_0) - \bar{f} + e_i))$, and since both wholesalers invest more under centralized bargaining, the newspaper prefers this regime from an ex ante point of view.

The newspaper's ex ante profit can also be lower under collective bargaining due to the result in Proposition 1. To see this, suppose there is basically

no possibility of cost reduction through investment (i.e. e^{FB} is close to zero), the demand functions are such that the prices p_0 and p_1 differ only marginally, and at the third stage inequality (5) holds, so that the newspaper has a strictly higher profit under local bargaining even from an ex ante point of view. ■

While Proposition 1 has illustrated that, in the short term, the newspaper is better off under local bargaining, in the long term, the wholesalers' incentives to invest in cost reduction need to be considered as well. Since centralized bargaining mitigates the hold-up problem and thus improves investment incentives, the newspaper may be better off in the long term under centralized bargaining, as Proposition 4 shows. In fact, the newspaper may face a time consistency problem where, from an ex ante point of view, it prefers centralized bargaining, but has an incentive to switch to local bargaining once the wholesalers' investments are made.

While the comparison can go either way with respect to the newspaper's profit, results on industry profits and consumer surplus are unambiguous:

Proposition 5 *Assume (4) and (10). Under centralized bargaining, consumer surplus is weakly higher²¹, industry profits are strictly higher, and welfare is strictly higher than under local bargaining.*

Proof. Consumer surplus is higher under centralized bargaining for the same reason as in Proposition 2: the newspaper price may be higher under local bargaining. Consider industry profits. First, aggregate costs are strictly lower under centralized bargaining by Proposition 3. Second, under centralized bargaining the price will be p_0 which maximizes total revenues, while it may be p_1 under local bargaining; thus total revenues are higher under centralized bargaining. ■

In view of Proposition 5, centralized bargaining in press wholesale should not be viewed as a cartel agreement in violation of competition law, but rather as an institutional arrangement to provide local natural monopolies, contractually protected from the threat of entry in order to avoid wasteful cost duplication, with appropriate investment incentives.

²¹As in Proposition 2, consumer surplus is always at least as high with collective bargaining, but under some parameter constellations strictly higher.

6 An alternative specification of the bargaining process

Although we believe the outside option principle is the appropriate way to model the bargaining process between wholesalers and publishers, our main conclusion does not hinge on it. To show this, we consider in this section a different bargaining set-up, where the profit the newspaper can realize by setting up its own delivery system serves as the disagreement point in an axiomatic Nash bargaining solution. This specification is appropriate when bargaining takes the form of an alternative offers game with an exogenous risk of breakdown, or when switching costs are negligible, so that self-delivery is possible during the bargaining process (see Binmore, Rubinstein, and Wolinsky 1986). Our main result – namely that centralized bargaining in press wholesale is welfare enhancing – is only reinforced in this alternative framing of the bargaining problem.

Under centralized bargaining, the agreed upon margin solves

$$\max_m \left(\sum_i (m R_i(p) - f_i) \right)^\alpha \left(\sum_i ((1-m) R_i(p) - (R_i(p) - \underline{f})) \right)^{1-\alpha}$$

Thus

$$m = \frac{\alpha 2 \underline{f} + (1-\alpha) \sum_i f_i}{\sum_i R_i(p)}$$

and the newspaper's profit equals

$$\sum_i R_i(p) - \left(\alpha 2 \underline{f} + (1-\alpha) \sum_i f_i \right).$$

Similarly, the local bargaining solution solves

$$\max_{m_i} (m_i R_i(p) - f_i)^\alpha ((1-m_i) R_i(p) - (R_i(p) - \underline{f}))^{1-\alpha},$$

which yields

$$m_i = \frac{\alpha \underline{f} + (1-\alpha) f_i}{R_i(p)}.$$

The newspaper's profit equals

$$\sum_i (R_i(p) - (\alpha \underline{f} + (1-\alpha) f_i))$$

and is the same as under centralized bargaining. In this setup, there is no reason for the publisher to favor local negotiations. Similarly, the wholesalers aggregate profits are identical under the two bargaining regimes.

The analysis of the pricing stage is also straightforward: the newspaper will always set the price p_0 . Accordingly, neither the newspaper price nor the distribution of profits between publisher and wholesalers depend on the bargaining regime.

Concerning the wholesaler's investment incentives, however, our results from above get even stronger in the alternative bargaining set-up considered here. Under centralized bargaining, wholesaler i receives an ex ante profit of

$$\frac{\alpha \underline{f} + (1 - \alpha)(f_j + f - e_i)}{\sum_k R_k(p_0)} R_i(p_0) - (f - e_i) - C(e_i)$$

and rationally invests such that

$$s_i(p_0) + (1 - s_i(p_0))\alpha = C'(e_i).$$

Under local bargaining, wholesaler i receives

$$\alpha \underline{f} + (1 - \alpha)(f - e_i) - (f - e_i) - C(e_i)$$

and chooses an investment level defined by $\alpha = C'(e_i)$. Thus, *both* wholesalers invest strictly less under local than under centralized bargaining. Note that no assumption on C''' is needed here for this conclusion. Consequently, aggregate costs are strictly higher, and industry profits and welfare are strictly lower under local bargaining.

7 Conclusion

In this paper, we argued that centralizing negotiations in newspaper and periodical wholesale has an economic efficiency advantage over local negotiations. By mitigating the hold-up problem, centralized bargaining improves wholesalers' investment incentives and leads to lower aggregate cost of delivery. Moreover, we identify a reason why the newspaper's cover price is likely to be lower under centralized bargaining, which is why consumers also benefit if bargaining is carried out on the industry level; circulation and readership

increase. Insofar as newspaper readership has positive externalities due to increased knowledge and participation in democratic decision processes²², there will be additional social benefits of a centralized bargaining system over and above the narrow economic benefits we focussed on in the main part of the paper. In future work, we wish to extend this approach to multiple publishers, thus touching on the issue of entry opportunities for minority press items.

Our results suggest that centralized bargaining can be viewed as an attractive institutional device for regulating local natural monopolies. Currently, the German government prepares for a change of German competition law (8. GWB-Novelle). The amendment, which at the time of writing has already passed the Bundestag but still awaits the approval of the Bundesrat, includes a new paragraph (§30) explicitly declaring centralized negotiations in press wholesale (under some conditions) as permitted and not in conflict with German or EU competition law. In the light of our results, this seems to be a step in the right direction. More generally, our results may help understand why the German press distribution system is characterized by a relatively dense network of points of sale and is judged, by some observers, to be working relatively well by comparison with other European countries (see Haller 2012).

A Appendix

A.1 Proof of Lemma 1

Let

$$P_{12} := \{p \in \mathbb{R}_+ \mid \alpha R_i(p) + (1 - \alpha) f_i \geq \underline{f}, i = 1, 2\}$$

denote the set of prices such that the outside options are binding in both markets. Similarly, let

$$P_i := \{p \in \mathbb{R}_+ \mid \alpha R_i(p) + (1 - \alpha) f_i \geq \underline{f}, \alpha R_j(p) + (1 - \alpha) f_j < \underline{f}\}$$

²²There is considerable evidence, both from field studies and experimental research, that this is in fact the case. See, for example, Besley and Burgess (2002), Gentzkow, Shapiro, and Sinkinson (2011), Gerber, Karlan, and Bergan (2009), and Snyder and Strömberg (2010). Recent survey are provided by Della Vigna and Gentzkow (2010), Prat and Strömberg (2011), and Sobbrío (2013).

denote the set of all prices such that the outside option constraint is binding only in a single market $i = 1, 2$, and let

$$P_0 := \{p \in \mathbb{R}_+ \mid \alpha R_i(p) + (1 - \alpha) f_i < \underline{f}, i = 1, 2\}.$$

denote the set of all prices such that the outside options are irrelevant. These sets cover all possible cases, i.e. $P_0 \cup P_1 \cup P_2 \cup P_{12} = \mathbb{R}_+$. Since R_i is concave, the set P_0 is in general not convex.

Moreover, let

$$\begin{aligned} \pi_{12} &: = \sum_i (R_i(p) - \underline{f}), \\ \pi_i &: = (R_i(p) - \underline{f}) + (1 - \alpha) (R_j(p) - f_j), i, j = 1, 2, i \neq j, \\ \pi_0 &: = (1 - \alpha) \sum_i (R_i(p) - f_i). \end{aligned}$$

This notation allows us to express the profit of the newspaper succinctly as

$$\pi(p) := \pi_k(p) \text{ if } p \in P_k, \text{ where } k = 0, 1, 2, 12.$$

We now argue that π is a continuous function of p . Clearly π is continuous at any prize in the interior of the four sets P_0, P_1, P_2, P_{12} . For $i \in \{1, 2\}$, any p which is a boundary point of the set P_{12} , and, at the same time, a boundary point of the set P_i satisfies

$$\alpha R_j(p) + (1 - \alpha) f_j = \underline{f}$$

and thus

$$\begin{aligned} \pi_{12}(p) &= \sum_k (R_k(p) - \underline{f}) \\ &= R_i(p) - \underline{f} + R_j(p) - \alpha R_j(p) - (1 - \alpha) f_j \\ &= R_i(p) - \underline{f} + (1 - \alpha) (R_j(p) - f_j) \\ &= \pi_i(p). \end{aligned}$$

Thus, π is continuous at p . A similar argument establishes that π is continuous at any p which is a boundary point of any two of the sets four sets P_0, P_1, P_2, P_{12} .

Next, we point out that

$$\pi(p) = \max \{\pi_{12}(p), \pi_1(p), \pi_2(p), \pi_0(p)\}. \quad (11)$$

To see this, note that

$$\alpha R_i(p) + (1 - \alpha) f_i \geq \underline{f} \Leftrightarrow R_i(p) - \underline{f} \geq (1 - \alpha) (R_i(p) - f_i),$$

and hence for $i, j = 0, 1, 2, 12$, $i \neq j$, if $p \in P_i$, then $\pi_i(p) \geq \pi_j(p)$.

Recall the definition of p_i from the main text, restated here for convenience:

$$p_i := \arg \max_p R_i(p) + (1 - \alpha) R_j(p).$$

Note that p_i is the unique price that maximizes π_i , for $i = 1, 2$. Recall that p_0 maximizes total revenue, therefore it also maximizes π_0 and π_{12} . If the profit maximizing price is in the interior of P_0 (of P_1 , of P_2 , of P_{12}), then it must maximize π_0 (π_1 , π_2 , π_{12}) and thus it must be equal to p_0 (p_1 , p_2 , p_0).

To prove Lemma 1, it remains to rule out that the profit maximizing price is some $\hat{p} \notin \{p_0, p_1, p_2\}$ due to a corner solution between the sets defined above. Toward a contradiction, suppose that the profit is maximized at a price $\hat{p} \notin \{p_0, p_1, p_2\}$. Then $\hat{p}$ must be at a common boundary point of two of the sets P_0 , P_{12} , P_1 and P_2 . Suppose $\hat{p}$ is a boundary point between P_i and P_j , $i \neq j$, $i, j \in \{0, 1, 2, 12\}$. Without loss of generality let $p' \in P_i$ for all $p' < \hat{p}$ in some environment of $\hat{p}$, and $p' \in P_j$ for all $p' > \hat{p}$ in some environment of $\hat{p}$. That is, a small increase (decrease) of the price starting from $\hat{p}$ leads to a price in the set P_j (P_i). Then at $\hat{p}$ it must be the case that $\pi'_i(\hat{p}) > 0$, for if $\pi'_i(\hat{p}) < 0$ lowering the price increases profits, and if $\pi'_i(\hat{p}) = 0$, then $\hat{p} = p_i$ in contradiction to our assumption. But since $\pi_i(\hat{p}) = \pi_j(\hat{p})$ (by continuity of π and the fact that $\hat{p}$ is at a boundary point of P_i and P_j), and $\pi_j(p) \geq \pi_i(p)$ for all $p \in P_j$, we must have $\pi'_j(\hat{p}) > 0$ and thus increasing the price above $\hat{p}$ raises profits. This concludes the proof of Lemma 1.

A.2 Proof of Lemma 3

1. By Lemma 2, the profit maximizing price is either p_0 or p_1 .
2. At the price p_1 , the outside option constraint is binding in market 1 if and only if

$$\alpha R_1(p_1) + (1 - \alpha)(f - e_1) \geq \underline{f}$$

or, equivalently,

$$e_1 \leq \bar{e} := f + \frac{\alpha R_1(p_1) - f}{1 - \alpha}.$$

3. If $e_1 > \bar{e}$, the outside option constraint is not binding in market 1 if the newspaper sets the price p_1 . In terms of the notation of the Proof of Lemma 1, $p_1 \in P_0$. Thus the price p_0 maximizes the newspaper's profit.
4. At the price p_0 the outside option constraints are irrelevant if and only if

$$\alpha R_1(p_0) + (1 - \alpha)(f - e_1) < \underline{f}$$

or, equivalently,

$$e_1 > \underline{e} := f + \frac{\alpha R_1(p_0) - \underline{f}}{1 - \alpha}.$$

5. If $e_1 \leq \underline{e}$, the outside option constraint is binding in market 1 at p_0 . In terms of the notation of the Proof of Lemma 1, $p_0 \in P_1$. Therefore, the price p_1 maximizes the newspaper's profit.
6. From the definitions of p_0 and p_1 it follows that $\bar{e} > \underline{e}$.
7. It remains to consider the case where $\underline{e} < e_1 \leq \bar{e}$. Here, the outside option constraint in market 1 is binding at the price p_1 , but not binding at p_0 . The newspaper will set the price p_1 if

$$\begin{aligned} & R_1(p_1) - \underline{f} + (1 - \alpha)(R_2(p_1) - f_2) \\ & > (1 - \alpha)(R_1(p_0) - f + e_1 + R_2(p_0) - f_2) \end{aligned}$$

which is equivalent to $e_1 < \hat{e}$ where the definition of $\hat{e}$ is restated here for convenience:

$$\hat{e} := f + \frac{\alpha R_1(p_1) - \underline{f}}{1 - \alpha} + \sum_i (R_i(p_1) - R_i(p_0)).$$

8. $\underline{e} < \hat{e} < \bar{e}$. To see this, let

$$g(x_0, x_1) := f + \frac{\alpha R_1(x_1) - \underline{f}}{1 - \alpha} + \sum_i (R_i(x_1) - R_i(x_0))$$

and note that

$$\begin{aligned} g(p_0, p_0) &= \underline{e} \\ g(p_0, p_1) &= \hat{e} \\ g(p_1, p_1) &= \bar{e} \end{aligned}$$

Since

$$\frac{\partial}{\partial x_0} g(x_0, x_1) = - \sum_i R'_i(x_0) > 0$$

for all $x_0 > p_0$, we have $\hat{e} < \bar{e}$. Furthermore,

$$\frac{\partial}{\partial x_1} g(x_0, x_1) = \frac{1}{1-\alpha} (R'_1(x_1) + (1-\alpha) R'_2(x_1)) > 0$$

for all $x_1 < p_1$. This implies $\underline{e} < \hat{e}$.

A.3 Proof of Proposition 3

Denote the investment levels under centralized bargaining by e_i^{CB} ; these are given by

$$e_i^{CB} = C'^{-1}(1 - (1-\alpha)s_i).$$

Denote the investment levels under local bargaining by e_i^{LB} . We have $e_2^{LB} = C'^{-1}(\alpha)$ and $e_1^{LB} \leq e^{FB}$. Thus

$$\sum_i (f - e_i^{LB} + C(e_i^{LB})) \geq 2f - e^{FB} + C(e^{FB}) - C'^{-1}(\alpha) + C(C'^{-1}(\alpha)). \quad (12)$$

We show that $C'''(e) \geq 0$ implies

$$2f - e^{FB} + C(e^{FB}) - C'^{-1}(\alpha) + C(C'^{-1}(\alpha)) > \sum_i (f - e_i^{CB} + C(e_i^{CB})) \quad (13)$$

Use $s_1 = 1 - s_2$ to substitute out s_1 :

$$\begin{aligned} \sum_i (-e_i^{CB} + C(e_i^{CB})) &= -C'^{-1}(1 - (1-\alpha)s_2) \\ &\quad - C'^{-1}(1 - (1-\alpha)(1-s_2)) \\ &\quad + C(C'^{-1}(1 - (1-\alpha)s_2)) \\ &\quad + C(C'^{-1}(1 - (1-\alpha)(1-s_2))) \end{aligned}$$

Note that as $s_2 \rightarrow 0$, we have $e_2^{CB} \rightarrow e^{FB}$ and $e_1^{CB} \rightarrow C'^{-1}(\alpha)$, thus in the limit case $s_2 = 0$ the two sides of (13) are equal. Take the derivative with respect to s_2 to get

$$\begin{aligned} \frac{\partial}{\partial s_2} \sum_i (-e_i^{CB} + C(e_i^{CB})) &= \frac{1-\alpha}{C''(e_2^{CB})} (1 - C'(e_2^{CB})) \\ &\quad - \frac{1-\alpha}{C''(e_1^{CB})} (1 - C'(e_1^{CB})). \end{aligned}$$

This is strictly negative iff

$$\frac{1 - C'(e_1^{CB})}{C''(e_1^{CB})} > \frac{1 - C'(e_2^{CB})}{C''(e_2^{CB})}$$

which is true since $e_1^{CB} < e_2^{CB}$ (as shown in the main text) and, under assumption (10),

$$\frac{\partial}{\partial e} \left(\frac{1 - C'(e)}{C''(e)} \right) = - \frac{(C''(e))^2 + (1 - C'(e)) C'''(e)}{(C''(e))^2} < 0.$$

It follows that, for any $s_2 > 0$, inequality (13) holds. Together with (12), this implies aggregate costs are lower under centralized bargaining.

It remains to show that aggregate costs can be higher under centralized bargaining when (10) is violated. This can be shown by example of cost functions parametrized by $C(e) = e^\gamma/\gamma$ with $1 < \gamma < 2$. Details are available upon request.

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