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Galbraith Meets Weyl and Fabinger: Countervailing Power and Imperfect Competition in the Retail Market*

ADACHI Takanori**

This note studies how a change in countervailing power on the retailer side (Galbraith 1952) affects the retail and wholesale prices by employing Weyl and Fabinger's (2013) conduct parameter approach in a model of vertical relationships with Nash cooperative bargaining. It is shown that an increase in countervailing power as a result of consoli- dation on the retailer side does not necessarily benefit consumers once the possibility of collusive pricing triggered by consolidation is taken into account.

Keywords: Vertical Relationships; Bargaining; Countervailing Power.

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** Graduate School of Economics, Nagoya University

Ⅰ. Introduction

In this note, I study a tractable model of vertical relationships between N symmetric manu-facturers and M symmetric retailers à la Gaudin (2016) to analyze two sources of Galbraith's (1952) countervailing power by retailers: (i) a decrease in the number of retailers as a result of consolidation, and (ii) an increase in the retailer's bargaining power. I particularly consider the effects on the retail sector's conduct by using the *conduct parameter approach* à la Weyl and Fabinger (2013) to model imperfect competition in the retail sector. Galbraith (1952) points out that the buyer power can counter the upward pricing pressure by upstream firms, and "one of its most important manifestations" can be found in "the relation of the large retailer to the the firms from which it buys" (p. 123). By focusing on symmetric equilibrium retail and wholesale prices, I show that a decrease in the number of retailers as a way of creating countervailing power *does not necessarily lower* the retail price if the effects on the industry's conduct are taken into account. In contrast, the effects of a change in the retailer's bargaining power on the prices depend on whether it raises or reduces the industry's conduct.

Ⅱ. A bargaining model of vertical relationships

Suppose that there are $N \geq 1$ symmetric upstream firms (producers) whose marginal cost of production is assumed to be constant, $c+k^U \geq 0$. Here, N upstream firms are horizontally differentiated. There are also $M \geq 1$ symmetric downstream firms (retailers): each retailer $i \in M \equiv \{1, 2, \cdots, M\}$ transacts with all N upstream firms. Each manufacturer produces one type of product, and for each manufacturer's product, each retailer incurs a constant marginal cost of sales in the final market for consumers, $k^D \geq 0$. The demand for product *if* (brand $j \in N \equiv \{1, 2, \cdots, N\}$ sold by retailer i) is $s_{ij}(\mathbf{P})$, where

$$\mathbf{P} = \begin{pmatrix} p_{11} & p_{12} & \cdots & p_{1N} \\ p_{21} & \ddots & & \vdots \\ \vdots & & \ddots & \vdots \\ p_{M1} & \cdots & \cdots & p_{MN} \end{pmatrix}.$$

Each retailer i pays the unit price w_{ij} to manufacturer j: its total profit is written as $\Pi_i^D \equiv \sum_{i \in \mathcal{N}}(p_{ij}-w_{ij}-k^D)s_{ij}(\mathbf{P})$. Similarly, each retailer j's profit is given by $\pi_j^U \equiv \sum_{i \in \mathcal{M}}(w_{ij}-c-k^U)s_{ij}(\mathbf{P})$.

In the following analysis, I focus on symmetric equilibrium prices p and w, and thus denote by $s(p)$ the per-product market demand corresponding to p: $s(p) \equiv s_{ij}(p, \cdots, p)$, where p is the symmetric price for $M \times N$ products. Note also that the wholesale and final prices are determined *simultaneously* as a pair of $\{w, p\}$: this is a standard assumption in empirical studies of bargaining in vertical relationships such as Draganska, Klapper, and Villas-Boas (2010); Meza and Sudhir (2010); Crawford and Yurukoglu (2012); Grennan (2013, 2014); Gowrisankaran, Nevo, and Town (2015); Ho and Lee (2017); Crawford, Lee, Whinston, and Yurukoglu (2018); De los Santos, O'Brien, and Wildenbeest (2020); and Hayashida (2020).[1] I also employ another simplifying assumption that each bargaining is played one of the M delegates from a manu- facturer and one of the N delegates from a retailer, and each bargaining is unobservable from the other delegates. Additionally, it is also assumed that players hold "passive beliefs" in the sense that even if a player in one bargaining process observes out-of-equilibrium price offer, the player still holds the belief that the equilibrium is played (in the bargaining and the pricing decisions) by the players outside of this bargaining process (McAfee and Schwartz 1994).

1. Nash cooperative bargaining

Under these assumptions, I focus on the bargaining process over w_{ij}. Given the players' belief that the symmetric equilibrium $\{w, p\}$ is played, it is determined by maximizing the Nash product, $[\Delta\Pi_{ij}^D]^\lambda \times [\Delta\pi_{ij}^U]^{1-\lambda}$ with respect to w_{ij}, where $\lambda \in (0, 1]$ is the retailer's *Nash bargaining weight*,

$$\begin{cases} \Delta\Pi_{ij}^D \equiv (p-w_{ij}-k^D)s(p)-(N-1)(p-w-k^D)\Delta s(p) \\ \Delta\pi_{ij}^U \equiv (w_{ij}-c-k^U)s(p)-(N-1)(w-c-k^U)\Delta s(p), \end{cases}$$

and $\Delta s(p) \equiv \tilde{s}(p)-s(p) > 0$ is the market share difference, with $\tilde{s}(p)$ being the market share of product $(ij)' \neq ij$ when product ij is removed in the case of *disagreement*. It is assumed that $\Delta s(p)$ is

continuously differentiable and is strictly increasing in $p(\Delta s' > 0)$: an increase in the market share caused by the product removal is larger when the price is higher. On the other hand, it would be natural to assume that $\Delta s(p)$ is strictly decreasing in M and N for any $p \geq 0$: when the number of involved parties is larger, the share increase by the breakdown will be lower.

Here, λ is interpreted as the *degree of vertical integration*: as λ approaches unity, the vertical structure becomes closer to the complete form of vertical integration (i.e., full integration).[2] In terms of joint surplus, the case where an upstream firm has a full bargaining power $(\lambda = 0)$ is equivalent to the case of $\lambda = 1$. However, it is excluded because the ultimate source of revenues comes from final consumers, and thus the downstream firms which face them should not be left with no gain.

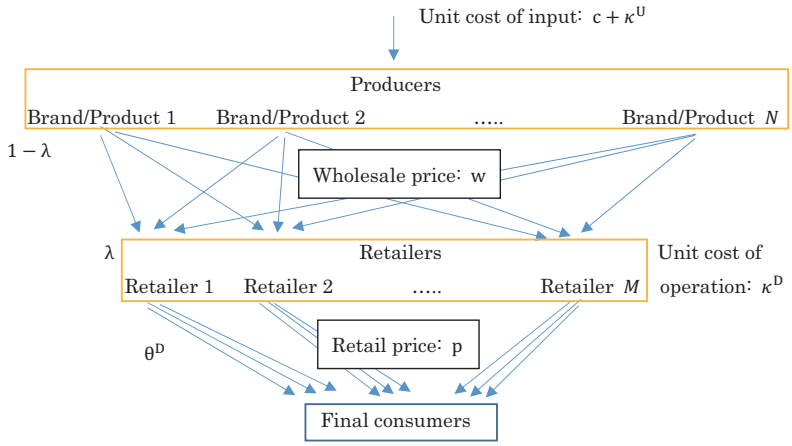
Note here that the retail prices are *not* reoptimized in an event of disagreement—another standard assumption in the literature—and thus consumers still face the same price p for each product (except for the removed product ij). Note also that in symmetric equilibrium, $\Delta\Pi_{ij}^{D}$ is equal to $(p-w-k^{D})[s(p)-(N-1)\Delta s(p)]$: this expression indicates that an additional profit gain for the retailer from inviting one more upstream firm (transacting N firms instead of $(N-1)$ firms) comes from an increase in unit $s(p)$, multiplied by the unit margin $(p-w_j-k^{D})$. However, this addition of an upstream firm reduces the output for each of the other $(N-1)$ firms: this negative effect is captured by the term $(N-1)\Delta s(p)$. The same reasoning also applies to $\Delta\pi_{ij}^{U} = (w-c-k^{U})[s(p)-(M-1)\Delta s(p)]$.[3] Then, the maximization of the Nash product implies $\lambda\Delta\pi_{ij}^{U} = (1-\lambda)\Delta\Pi_{ij}^{D}$.

Now, the *downstream conduct parameter* $\theta^{D} \in [0,1]$ is introduced to measure the intensity of imperfect competition; $\theta^{D} = 0$ indicates that perfect competition prevails, whereas there is only one monopolistic retailer when $\theta^{D} = 0$. I also define *the industry's price elasticity* of demand by $\epsilon(p) \equiv -ps'(p)/s(p) > 0$, where $s'(p) \equiv \frac{\partial s_{ij}}{\partial p_{ij}} + (MN-1)\frac{\partial s_{ij}}{\partial p_{kl}}$ for $k \neq i$ and $l \neq i$. Then, the equilibrium pair of $\{w, p\}$ satisfies:

$$\begin{cases} \theta^{D}p-(p-w-k^{D})\epsilon(p)=0 \\ \lambda(w-c-k^{U})[s(p)-(M-1)\Delta s(p)]-(1-\lambda)(p-w-k^{D}) \\ \qquad\qquad [s(p)-(N-1)\Delta s(p)]=0. \end{cases}$$

Essentially, the simplifying assumptions above make it unnecessary to consider the dependence of p on w. Figure 1 depicts the vertical structure under the symmetry assumption. Here, Holmes' (1989) decomposition indicates that under symmetric pricing, the industry's price elasticity is equal to *the firm's own price elasticity*, subtracted by *the cross price elasticity*:

Figure 1: Vertical structure with N differentiated producers and M differentiated retailers under symmetry.



Note: $\lambda \in [0,1]$ is the retailer's *Nash bargaining weight*, and $\theta^{D} \in [0,1]$ is the *downstream conduct parameter* in the retail market.

$\epsilon(p)=\epsilon_F(p)-\epsilon_C(p)$, where $\epsilon_F(p)\equiv-(p/s(p))\partial s_{ij}(\mathbf{P})/\partial p_{ij}|_{\mathbf{P}=(p,\cdots,p)}$ and $\epsilon_C(p)\equiv(MN-1)(p/s(p))\partial s_{(ij)'}(\mathbf{P})/\partial p_{ij}|_{\mathbf{P}=(p,\cdots,p)}$ for any distinct pair of indices ij and $(ij)'$.

2. Analysis

To further proceed the analysis, it is useful to define the *superelasticity* of demand under symmetry by $\phi(p)\equiv[p/\epsilon(p)]\epsilon'(p)$ (Kimball 1995; Ritz 2019): this amounts to the "elasticity of the elasticity." I assume that ϕ is greater than or equal to unity, which is equivalent to the log-concavity of demand.

Now, let $F(p,\ w)\equiv\theta^D p-(p-w-k^D)\epsilon(p)$ and $G(p,\ w;\lambda,c,M)\equiv\lambda(w-c-k^U)[s(p)-(M-1)\Delta s(p)]-(1-\lambda)(p-w-k^D)[s(p)-(N-1)\Delta s(p)]$. Then, I analyze the equilibrium price changes associated with each of the three parameter changes: (i) cost pass-through (a change in c), and (ii) a decrease in the number of downstream firms, M, as a result of consolidation. More formally, I conduct the analysis based on the following linear approximation:

$$\underbrace{\begin{bmatrix}\frac{\partial F}{\partial p} & \frac{\partial F}{\partial w}\\ \frac{\partial G}{\partial p} & \frac{\partial G}{\partial w}\end{bmatrix}}_{\equiv H}\begin{bmatrix}\frac{\partial p}{\partial k}\\ \frac{\partial w}{\partial k}\end{bmatrix}=-\begin{bmatrix}\frac{\partial F}{\partial k}\\ \frac{\partial G}{\partial k}\end{bmatrix} \tag{1}$$

$$\Longleftrightarrow\begin{bmatrix}\frac{\partial p}{\partial k}\\ \frac{\partial w}{\partial k}\end{bmatrix}=\underbrace{\frac{-1}{\det(H)}}_{>0}\begin{bmatrix}\frac{\partial G}{\partial w} & -\frac{\partial F}{\partial w}\\ -\frac{\partial G}{\partial p} & \frac{\partial F}{\partial p}\end{bmatrix}\begin{bmatrix}\frac{\partial F}{\partial k}\\ \frac{\partial G}{\partial k}\end{bmatrix},$$

where $k\in\{\lambda,c,M\}$ is an exogenous variable of interest, and as discussed in Appendix 1, the determinant, $\det(H)=\left(\frac{\partial F}{\partial p}\right)\left(\frac{\partial G}{\partial w}\right)-\left(\frac{\partial F}{\partial w}\right)\left(\frac{\partial G}{\partial p}\right)$, is plausibly assumed to be negative. In particular, it discusses the condition for $\frac{\partial G}{\partial w}>0$ and $\frac{\partial G}{\partial p}>0$, both of which are used in Proposition 2 below. For a simpler exposition, $\Xi\equiv-[1/\det(H)]>0$ is defined.

(1) Cost pass-through

Then, the following proposition is obtained regarding the cost pass-through elasticity in this framework.

Proposition 1. *The cost pass-through elasticity under the vertical structure with the degree of vertical integration $\lambda\in(0,1]$ is given by*

$$\frac{\partial p}{\partial c}\frac{c}{p}=\Xi\cdot\frac{\lambda\epsilon\cdot[s-(M-1)\Delta s]c}{p}>0.$$

Proof. By incorporating $\frac{\partial F}{\partial c}=0$ and $\frac{\partial G}{\partial c}=-\lambda\cdot[s-(M-1)\Delta s]$ into Equation (1), one obtains the desired result. □

Appendix 2 examines the condition for when the cost pass-through value increases as the degree of vertical integration rises: $\frac{\partial(\partial p/\partial c)}{\partial\lambda}>0$.

(2) Galbraith's (1952) countervailing power

Lastly, the following proposition is a refinement of Galbraith's (1952) argument: how consol-idation in the retail sector affects the final price for consumers. Here, I take into account the possibility that consolidation may relax price competition: it may not only cause a reduction in the downward price pressure but also induce some degree of collusive pricing. In this situation, it is natural to suppose that the conduct parameter θ^D is decreasing in M: $\frac{\partial\theta^D}{\partial M}<0$.

Proposition 2. *The consolidation pass-through and its counterpart for the wholesale price are given by*

$$\frac{\partial p}{\partial M}=\Xi\cdot\{\underbrace{\frac{\partial G}{\partial w}\frac{\partial\theta^D}{\partial M}}_{<0}p+\underbrace{\epsilon\cdot\lambda(w-c-k^U)\Delta s}_{>0}\},$$

and

$$\frac{\partial w}{\partial M}=\Xi\cdot\{-\underbrace{\frac{\partial G}{\partial p}\frac{\partial\theta^D}{\partial M}}_{>0}+\underbrace{[\theta^D(\phi-1)+\epsilon]\lambda[w-c-k^U)\Delta s}_{>0}\}.$$

Proof. By incorporating $\frac{\partial F}{\partial M}=\frac{\partial\theta^D}{\partial M}p$ and $\frac{\partial G}{\partial M}=-\lambda(w-c-k^U)\Delta s$ into Equation (1), one obtains the desired result. □

This result indicates that while the wholesale price decreases as the number of retailers decreases (i.e., $\frac{\partial w}{\partial M}>0$), the retail price may rise, hurting consumer surplus, if $\left|\frac{\partial\theta^D}{\partial M}\right|$ is sufficiently large. In other words, if the retail sector's consolidation induces

collusive pricing to a non-negligible extent, it works as a countervailing effect against the countervailing power, countering Galbraith's (1952) argument. In this way, Weyl and Fabinger's (2013) conduct parameter approach enables one to derive this result under the vertical structure with bargaining in a simple manner.

Ⅲ. Concluding Remarks

In this note, I propose a framework of bargaining to model vertical structure in which Weyl and Fabinger's (2013) conduct parameter approach is utilized. I particularly reconsider Galbraith's (1952) countervailing power hypothesis by showing that the final price may rise as a result of an increase in countervailing power if it also relaxes price competition. As in Adachi (2020), the marginal cost is assumed to be constant throughout in this paper. It would be interesting to consider how the results are affected if the marginal cost is allowed to be non-constant.

Appendix 1: Determining the sign of the determinant of matrix *H*

When $F(p, w) \equiv \theta^D p-(p-w-k^D)\epsilon(p)$ and $G(p, w; \lambda, c, M) \equiv \lambda(w-c-k^U)[s(p)-(M-1)\Delta s(p)] -(1-\lambda)(p-w-k^D)[s(p)-(N-1)\Delta s(p)]$, it is verified that

$$\begin{aligned}\frac{\partial F}{\partial p} &= \theta^D-\epsilon-(p-w-k^D)\epsilon' \\ &= \theta^D-\epsilon-\theta^D\frac{p}{\epsilon}\epsilon' \\ &= -[\theta^D\underbrace{(\phi-1)}_{\geq 0}+\epsilon] < 0,\end{aligned}$$

$$\frac{\partial F}{\partial w} = \epsilon > 0,$$

$$\begin{aligned}\frac{\partial G}{\partial p} &= \lambda(w-c-k^U)[s'-(M-1)\Delta s'] \\ &\quad -(1-\lambda)\{(p-w-c^D)[s'-(N-1)\Delta s'] \\ &\qquad +[s-(N-1)\Delta s]\} \\ &= \lambda(w-c-k^U)[s'-(M-1)\Delta s'] \\ &\quad -(1-\lambda)\frac{p\theta^D}{\epsilon}[s'-(N-1)\Delta s'] \\ &\qquad -\lambda(w-c^U)\frac{\epsilon}{p\theta^D}[s-(N-1)\Delta s] \\ &= \lambda(w-c-k^U) \\ &\quad \underbrace{\left\{\underbrace{[s'-(M-1)\Delta s']}_{<0}-\frac{\epsilon}{p\theta^D}[s-(N-1)\Delta s]\right\}}_{<0} \\ &\quad \underbrace{-(1-\lambda)\frac{p\theta^D}{\epsilon}\underbrace{[s'-(N-1)\Delta s']}_{<0}}_{>0},\end{aligned}$$

and

$$\frac{\partial G}{\partial w} = s-\underbrace{[\lambda M+(1-\lambda)N-1]\Delta s}_{>0}.$$

It would be innocuous to assume $\frac{\partial G}{\partial w} > 0$ because Δs decreases as M or N increases. Then, the signs for the three terms of the determinant for matrix H (see the main text) are determined:

$$\det(H) = \underbrace{\left(\frac{\partial F}{\partial p}\right)}_{<0}\underbrace{\left(\frac{\partial G}{\partial w}\right)}_{>0}-\underbrace{\left(\frac{\partial F}{\partial w}\right)}_{>0}\left(\frac{\partial G}{\partial p}\right).$$

Hence, for $\det(H)$ to be negative, it is sufficient to assume that $\frac{\partial G}{\partial p} > 0$, that is,

$$(1-\lambda)\frac{p\theta^D}{\epsilon}\{-[s'-(N-1)\Delta s']\} > \lambda(w-c^U) \left\{\frac{\epsilon}{p\theta^D}[s-(N-1)\Delta s]-[s'(M-1)\Delta s']\right\}.$$

This assumption should be plausible because otherwise cost pass-through can take a negative value.

Appendix 2: Derivation of $\frac{\partial(\partial p/\partial c)}{\partial \lambda}$

First, the following lemma shows how an increase in the countervailing power of the buyer, aside from consolidation (i.e., a decrease in M), affects the final price.

Lemma. *The Nash bargaining weight pass-through is negative and its expression is given by*

$$\frac{\partial p}{\partial \lambda} = -\Xi\cdot\{\epsilon\cdot(w-c-k^U)[s-(M-1)\Delta s] +\theta^D p\cdot[s-(M-1)\Delta s]\} < 0.$$

Proof. By incorporating $\frac{\partial F}{\partial \lambda} = 0$ and $\frac{\partial G}{\partial \lambda} = (w-c-k^U)[s-(M-1)\Delta s]+(p-w-k^D)[s-(M-1)\Delta s]$ into Equation (10) in the main text, one obtains the desired result. □

Superscript "′" below indicates differential with respect to λ. First, note that

$$\frac{\partial\left(\frac{\partial P}{\partial c}\right)}{\partial\lambda} \equiv \Xi' \times \underbrace{\{\lambda\epsilon\cdot[s-(M-1)\Delta s]\}}_{>0} + \underbrace{\Xi}_{>0} \times \{\lambda\epsilon\cdot[s-(M-1)\Delta s]\}',$$

where

$$\Xi' = \frac{\frac{\partial \det(H)}{\partial\lambda}}{[\det(H)]^2},$$

and

$$\frac{\partial\det(H)}{\partial\lambda} = \left(\frac{\partial F}{\partial p}\right)' \underbrace{\left(\frac{\partial G}{\partial w}\right)}_{>0} + \underbrace{\left(\frac{\partial F}{\partial p}\right)}_{<0}\left(\frac{\partial G}{\partial w}\right)' - \left\{\underbrace{\left(\frac{\partial F}{\partial w}\right)'}_{<0}\underbrace{\left(\frac{\partial G}{\partial p}\right)}_{>0} + \underbrace{\left(\frac{\partial F}{\partial w}\right)}_{>0}\left(\frac{\partial G}{\partial p}\right)'\right\},$$

with

$$\left(\frac{\partial F}{\partial w}\right)' = \underbrace{\epsilon'}_{>0}\cdot\underbrace{\frac{\partial p}{\partial\lambda}}_{<0} < 0$$

because $\epsilon' > \epsilon/p > 0$.

It would be expected that the cost pass-through also rises as the degree of vertical integration rises: $\partial\left(\frac{\partial p}{\partial c}\right)/\partial\lambda > 0$. To examine the condition for this to hold, note first that

$$\left(\frac{\partial F}{\partial p}\right)' = -\left[\theta^D\frac{\partial\phi}{\partial p} + \underbrace{\epsilon'}_{>0}\right]\underbrace{\frac{\partial p}{\partial\lambda}}_{<0}, \tag{A1}$$

$$\left(\frac{\partial G}{\partial w}\right)' = \underbrace{\{s'-[\lambda M+(1-\lambda)N-1]\Delta s'\}}_{<0}\underbrace{\frac{\partial p}{\partial\lambda}}_{<0} - (M-N)\Delta s, \tag{A2}$$

and

$$\left(\frac{\partial G}{\partial p}\right)' = \underbrace{(w-c-k^U)\underbrace{\left\{[s'-(M-1)\Delta s']-\frac{\epsilon}{p\theta^D}(s-(N-1)\Delta s]\right\}}_{<0}}_{<0} + \underbrace{\lambda(w-c-k^U)\left\{\underbrace{[s''-(M-1)\Delta s'']\underbrace{\frac{\partial p}{\partial\lambda}}_{<0}}_{>0}\right.}_{<0}$$

$$\left.-\frac{\epsilon}{p^2\theta^D}\underbrace{\left(\phi-\frac{\partial p}{\partial\lambda}\right)}_{>0}\underbrace{[s-(N-1)\Delta s}_{>0}\underbrace{-\frac{\epsilon}{p\theta^D}\underbrace{[s'-(N-1)\Delta s']}_{<0}\underbrace{\frac{\partial p}{\partial\lambda}}_{<0}}_{<0}\right\}$$

$$+\frac{p\theta^D}{\epsilon}\underbrace{[s'-(N-1)\Delta s']}_{<0}$$

$$-(1-\lambda)\left\{\underbrace{-\frac{\theta^D}{\epsilon}\left[\phi+\frac{\partial p}{\partial\lambda}\right][s'-(N-1)\Delta s']}_{>0}\right.$$

$$\left.+\underbrace{\frac{p\theta^D}{\epsilon}[s''-(N-1)\Delta s'']\frac{\partial p}{\partial\lambda}}_{>0}\right\}. \tag{A3}$$

Here, $(\partial G/\partial w)'$ (Equation A2) is negative if the number of retailers (M) is sufficiently large as compared to the number of producers (N). Similarly, if $\frac{\partial\phi}{\partial p}$ is sufficiently large that $\frac{\partial\phi}{\partial p} > -\epsilon'/\theta^D$, then $(\partial G/\partial p)' > 0$ (Equation A1). In addition, if $[s''-(M-1)\Delta s'']\frac{\partial p}{\partial\lambda} > 0$ is sufficiently small, then $(\partial G/\partial p)' < 0$ (Equation A3). If these conditions are satisfied, $\frac{\partial\det(H)}{\partial\lambda}$ is positive.

Lastly, note that

$$\{\lambda\epsilon\cdot[s-(M-1)\Delta s]\}' = \frac{\epsilon}{p}\cdot\left(p+\lambda\phi\underbrace{\frac{\partial p}{\partial\lambda}}_{<0}\right)\underbrace{[s-(M-1)\Delta s]}_{>0} + \underbrace{\lambda\epsilon\cdot\underbrace{[s'-(N-1)\Delta s']}_{<0}\underbrace{\frac{\partial p}{\partial\lambda}}_{<0}}_{>0}.$$

Thus, if $\left|\frac{\partial p}{\partial\lambda}\right| < \frac{p}{\lambda\phi}$, the sign of $\{\lambda\epsilon\cdot[s-(M-1)\Delta s]\}'$ is positive. Summarizing the arguments so far, it is veried that $\frac{\partial(\partial p/\partial c}{\partial\lambda}$ takes a positive value under the reasonable conditions described above.

Notes

1) Collard-Wexler, Gowrisankaran, and Lee (2019) provide a non-cooperative foundation for Nash's (1950) modeling. This timing assumption would be innocuous when the frequencies of price revisions are similar for wholesale and retail prices. In other cases, retail prices may be revised more frequently: it seems more natural to assume that retail prices are chosen after wholesale prices are determined. Nonetheless, this assumption is utilized in empirical studies to ease computational burden. See Iozzi and Valletti (2014) for a study of richer timing and information structure.
2) Another interpretation is provided by Muthoo (1999, p. 35): λ can be understood as the factor that summarizes "the tactics employed by the bargainers, the procedure through which negotiations are conducted, the information structure, and the player's discount rates."
3) An additional restriction on $\Delta s(p)$ is imposed here: it is assumed that $\Delta s(p) < \min\left\{\frac{\tilde{s}(p)}{M}, \frac{s(p)}{M-1}, \frac{\tilde{s}(p)}{N}, \frac{s(p)}{N-1}\right\}$ for any $p \geq 0$, $M \geq 1$, and $N \geq 1$ to assure that $\Delta \Pi_{ij}^{D}$ and $\Delta \pi_{ij}^{U}$ are always positive.

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