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Endogenizing managerial delegation: a new result under Nash bargaining and network effects

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Abstract
We reconsider the endogenous choice of delegation to a manager by two downstream firms in both a Cournot and a Bertrand vertical market with network effects. An upstream monopolist charges a two-part tariff for a crucial input. By applying the Nash solution in a centralized bargaining, we show that hiring a manager is never an equilibrium under Cournot, regardless of network effects, while it can be the equilibrium choice for firms competing à la Bertrand, depending on the interplay between the network externalities and the degree of product substitutability.

Jel Classification: D43, L14, L21.

Keywords: Nash bargaining, two-part tariff, strategic delegation, network externalities.

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1 Introduction

We aim at identifying the drivers of the choice to hire a manager by two firms competing either à la Cournot or à la Bertrand and offering network goods on a downstream market. They are assumed to be involved in centralized Nash bargaining with an upstream supplier, which defines the equilibrium two-part tariff consisting in a linear wholesale price and an upfront fixed-fee.[1] Decisions on the retail market can be taken directly by stockholders within owner-managed (i.e., entrepreneurial) firms or, rather, can be delegated from stockholders to professional managers. The nature of the firm, entrepreneurial or managerial, is non-cooperatively chosen by stockholders at a pre-play stage of a game. At the following stages, the bargaining process, and then quantity or price competition, occur.

This paper relates to several research streams. It considers the issue of the endogenous choice of delegating control to a manager brought out in literature on managerial incentives (Basu, 1995; Lambertini, 2000; Matsumura and Matsushima, 2012; Delbono et al., 2016),[2] that of bargaining in oligopoly with vertical relationships starting with Correa-López and Naylor (2004) and recently getting renewed attention (Alipranti et al., 2014; Basak and Wang, 2016; Aghadadashli et. al., 2016; Kitamura et al., 2017; Yoshida, 2017),[3] and literature on network externalities (Katz and Shapiro, 1985 and 1994).[4] According to the established literature, hiring a manager at no (or negligible) cost is the symmetric equilibrium choice in both a Cournot and a Bertrand duopoly since it allows firms to strategically commit to a more aggressive market conduct in the former and a less aggressive conduct in the latter. This causes the equilibrium under delegation to be profit detrimental (a prisoner dilemma) under Cournot and profit-enhancing under Bertrand with respect to the equilibrium under no-delegation. While endogenous delegation has been studied under the assumption of independent firms (or perfectly competitive input markets) so far, it is worth being investigated when competing downstream firms trade with an upstream supplier in a vertically related market. In order to do that, we develop a model in which vertical pricing for a key input entails a two-part tariff determined through centralized bargaining.[5] Moreover, we assume that the

[1] See Basak and Wang (2016, f.note 2) and literature therein for a justification of centralized bargaining. See also Ronchi and di Mauro (2017) for an analysis of centralized *vs.* decentralized bargaining across European countries.

[2] Literature on managerial incentives focuses on delegation from firm stockholder to her manager through an observable incentive-compatible contract. The latter acts as a strategic device letting firm exploit the advantage to commit to non-profit maximizing behavior. See Fershtman and Judd (1987) and Sklivas (1987) for analyses under both quantity and price competition.

[3] See the empirical studies by Draganska et al. (2010) and Haucap et al. (2013) which estimate the bargaining power distribution between manufacturers and retailers.

[4] Literature on network externalities (or network effects) captures the ideas that the value users gain from a good increases with the expected size of the network of users and that consumers' expectations are fulfilled at equilibrium. See also Amir and Lazzati (2011) and Suleymanova and Wey (2012) in this regard.

[5] Wage bargaining under exogenous managerial delegation has been first examined by Szy-

downstream firms offer two varieties of a network good, the demand of which exhibits network externalities. In this framework, we assess the role of both centralized bargaining and demand-side characteristics (the intensity of both network effects and product substitutability) in driving the delegation firms' choices. Centralized bargaining is shown to affect the Cournot equilibrium in leading no firm to hire a manager regardless of the demand-side parameters, which contrasts with the equilibrium with symmetric delegation obtained in the case of independent firms. Conversely, both centralized bargaining and the interplay between the demand-side parameters matter in shaping firms' incentive towards delegation under Bertrand, which may lead both firms either to delegate or not to delegate control to managers.

The paper proceeds as follows. Section 2 describes the model and discusses the main results. Section 3 concludes.

2 The model

An upstream monopolist, firm U, supplies two retailers, firm 1 and firm 2, of a critical input. The latter are charged a per-unit price w_i and an upfront fixed-fee F_i $(i = 1, 2)$, which constitute a two-part tariff determined through centralized bargaining. Technology requires one unit of input for one unit of output and implies constant marginal costs normalized to zero for both input and output production. The retailers compete by facing the following inverse demand for a differentiated network good, as in Hoernig (2012):[6]

$$p_i = 1 + n (y_i + \beta y_j) - x_i - \beta x_j \tag{1}$$

$(i,j = 1, 2;\ j \neq i)$, where p_i and x_i denote, respectively, the retail price and output of each variety, y_i is the consumers' expectation about firm i's network size, with $n \in [0, 1)$ measuring the intensity of the network externality and $\beta \in [0, 1)$ the degree of substitutability between the two varieties.

Firm U's and firm i's profits are respectively:

$$\pi_U = \sum_{i=1}^{2} (w_i x_i + F_i) \tag{2}$$

and

$$\pi_i = (p_i - w_i) x_i - F_i \tag{3}$$

manski (1994) who showed how it leads firms to act more like profit-maximizers. Moreover, a more recent strand of literature has introduced bargaining over the terms of the managerial contracts (e.g., van Witteloostuijn et al., 2007).

[6] This demand function derives from maximization of the following quadratic utility function of a representative consumer: $U = (x_i + x_j) - \frac{x_i^2 + x_j^2 + 2\beta x_i x_j}{2} + n\left((y_i + \beta y_j) x_i + (y_j + \beta y_i) x_j - \frac{y_i^2 + 2\beta y_i y_j + y_j^2}{2}\right) + m$, where m denotes consumption of a numeraire good.

Following Fershtman and Judd (1987) and Sklivas (1987), we define firm i's managerial objective function:

$$M_i = \lambda_i \pi_i + (1 - \lambda_i) \, p_i x_i \tag{4}$$

where the weight λ_i attached to revenues identifies an observable incentive-compatible contract, i.e. the degree of discretion assigned by each profit-maximizer owner to her manager. When $\lambda_i < 1$ ($\lambda_i > 1$), the manager is rewarded (penalized) for revenues' maximization and behaves more (less) aggressively on the product market as compared to the profit-maximizing case, which is recovered when $\lambda_i = 1$.[7]

The game runs as follows. At the first stage, each retailer chooses on a profit-maximizing basis to behave as a managerial firm (M) or an entrepreneurial firm (E). At the second stage, the fixed and the linear part of the wholesale price are determined as Nash solutions of centralized bargaining, while delegation (if any) and Cournot or Bertrand competition occur at the last stages. We search backwards for the subgame perfect equilibrium supporting being managerial or entrepreneurial as firm i's equilibrium choice, under the further assumption that, within delegating firms, managerial incentives affect the retailing choices made by managers, while only the profit-maximizing owners are involved in the bargaining process.[8] This requires to work out the equilibrium outcomes under symmetric delegation (MM), unilateral delegation (ME or EM) and symmetric no-delegation (EE), identifying in these settings the solutions with respect to w_i and F_i which derive from maximization of the following Nash product:

$$\left(\sum_{i=1}^{2} (w_i x_i + F_i) \right)^b \left(\sum_{i=1}^{2} ((p_i - w_i) \, x_i - F_i) \right)^{1-b}$$

where $b \in [0, 1]$ measures the bargaining power of the upstream supplier relative to the retailers', $b = 1$ ($b = 0$) implying that the contractual terms are set by the upstream firm (downstream firms).

Nash product's maximization with respect to F_i yields the following solution:[9]

$$F_i = \frac{1}{2} \left(b \left(\sum_{i=1}^{2} (p_i - w_i) \, x_i \right) - (1 - b) \left(\sum_{i=1}^{2} w_i x_i \right) \right) \tag{5}$$

[7] In a standard context with independent retailers (see Fershtman and Judd, 1987), the incentive equilibrium in the quantity and the price game respectively entails $\lambda_i < 1$ and $\lambda_i > 1$.

[8] Indeed, we assume that firm owners are involved in the bargaining process which identifies the wholesale tariff, while price or output decisions are delegated to managers. This assumption is consistent with the strand of strategic delegation literature dealing with long-run decisions kept by owners for themselves, the choice of the input price in our model, and short-run (product market) decisions made by managers. See as further examples Mitrokostas and Petrakis (2014) and Barcena-Ruiz and Casado-Izaga (2005), where R&D investments and firms' locations are respectively conceived as long-run decisions made by owners, while managers choose the market variables.

[9] We assume that F_i can be negative, which implies that the upstream monopolist subsidizes downstream production *via* wholesale pricing, as common in this literature.

while w_i is derived in each setting as a Nash solution after substituting (5) in the Nash product.

2.1 The Cournot game

2.1.1 Symmetric delegation

Both firms delegate output decisions to their managers facing the inverse demand in (1). At the downstream market stage, maximization of M_i in (4) by firm i's manager yields, under the fulfilled expectation condition $y_i = x_i$,[10] the optimal output:

$$x_i = \frac{(1-\lambda_i w_i)(2-n) - \beta(1-n)(1-\lambda_j w_j)}{(2-n-\beta(1-n))(2-n+\beta(1-n))}$$

Profit-maximization by owner i yields the following solution of the delegation stage:

$$\lambda_i = \frac{\beta^2(1-n)\big((1-n)^2\beta^2+(2-n)(1-n)(1-w_j)\beta+(2-n)(3n-2-2w_i(2-n))\big)+(2-n)^2(n(1-w_j)\beta+2(w_i(2-n)-n))}{(1-n)(2(2-n)-(1-n)\beta^2+\beta(2-n))(2(2-n)-(1-n)\beta^2-\beta(2-n))w_i}$$

The Nash solutions of the bargaining process are:

$$_{c|}w_i^{MM} = \frac{\beta((2-n)+\beta(1-n))}{2(1+\beta)(2-n)}$$

$$_{c|}F_i^{MM} = \frac{(b(2-n)(1+\beta)+\beta(n-2-\beta(1-n)))}{4(1-n)(2-n)(1+\beta)^2}$$

At equilibrium we get $_{c|}\lambda_i^{MM} = \frac{(2-n)(\beta(1-n)-n)}{\beta(1-n)(2-n+\beta(1-n))}$, with $_{c|}\lambda_i^{MM} < 1$, as in a context with no vertical relationship, regardless of β and n.
Retailers' profits and the other equilibrium market variables are as follows:

$$_{c|}\pi_i^{MM} = \frac{1-b}{4(1+\beta)(1-n)}$$

$$x_i^* = \frac{1}{2(1+\beta)(1-n)} \quad (6)$$

$$p_i^* = \frac{1}{2} \quad (7)$$

$$\pi_U^* = \frac{b}{2(1+\beta)(1-n)} \quad (8)$$

[10] This condition implies that the consumers' expectations of market size equal the market output at equilibrium.

2.1.2 Unilateral delegation

We assume that firm i is managerial and firm j is entrepreneurial (i,$j = 1, 2$; $j \neq i$). At the last stage, M_i's and π_j's maximization yields the following solutions:

$$\begin{aligned} x_i &= \frac{2-n-\beta(1-n)-\lambda_1 w_1(2-n)+\beta w_2(1-n)}{(2-n-\beta(1-n))(2-n+\beta(1-n))} && (9) \\ x_j &= \frac{2-n-\beta(1-n)-w_2(2-n)+\beta\lambda_1 w_1(1-n)}{(2-n-\beta(1-n))(2-n+\beta(1-n))} && (10) \end{aligned}$$

Firm i's optimal choice at the delegation stage is:

$$\lambda_i = \frac{\beta(1-n)\left((1-n)^2(1-w_2)\beta^2-(2-n)(1-n)(1+w_1)\beta+n(2-n)(1-w_2)\right)-(2-n)^2(n-w_1(2-n))}{2(1-n)(2-n)(2-n-\beta^2(1-n))w_1}$$

The Nash bargaining solutions are as follows, each superscript denoting the role (M or E) played by that firm and by its rival:

$$\begin{aligned} {}_{c|}w_i^{ME} &= \frac{\beta(2-n+\beta(1-n))}{2(1+\beta)(2-n)} \\ {}_{c|}w_j^{EM} &= \frac{\beta(1-n)-n}{2(1+\beta)(1-n)} \\ {}_{c|}F_i^{ME} &= {}_{c|}F_j^{EM} = \frac{2b(1-n)(2-n)(1+\beta)-(1-n)^2\beta^2+(2-n)(n-2(1-n)\beta)}{8(2-n)(1-n)^2(1+\beta)^2}. \end{aligned}$$

The equilibrium incentive parameter is : ${}_{c|}\lambda_i^{ME} = {}_{c|}\ \lambda_i^{MM} = \frac{(2-n)(\beta(1-n)-n)}{\beta(1-n)(2-n+\beta(1-n))}$, whereas the retailers' profits are:

$$\begin{aligned} {}_{c|}\pi_i^{ME} &= \frac{(2-3n)(2-n)-\beta(1-n)(\beta(1-n)-2(2-n))-2(1-n)(2-n)(1+\beta)b}{8(2-n)(1-n)^2(1+\beta)^2} \\ {}_{c|}\pi_j^{EM} &= \frac{(2-n)((2-n)+2(1-n)\beta)+(1-n)^2\beta^2-2(1-n)(2-n)(1+\beta)b}{8(1-n)^2(2-n)(1+\beta)^2} \end{aligned}$$

with the other equilibrium market variables as in (6-8).

2.1.3 Symmetric no-delegation

By assuming that both firms are entrepreneurial, we obtain the solution of the last stage:

$$x_i = \frac{(1-w_i)(2-n)-\beta(1-n)(1-w_j)}{(2-n-\beta(1-n))(2-n+\beta(1-n))}$$

Bargaining yields the following solutions:

$$\begin{aligned} {}_{c|}w_i^{EE} &= \frac{\beta(1-n)-n}{2(1+\beta)(1-n)} \\ {}_{c|}F_i^{EE} &= \frac{n+b(1-n)-\beta(1-b)(1-n)}{4(1-n)^2(1+\beta)^2} \end{aligned}$$

so that the equilibrium retailers' profits are:

$$_{c|}\pi_i^{EE} = \frac{1-b}{4\,(1+\beta)\,(1-n)}$$

while the other equilibrium market variables are as in (6-8).

2.1.4 The endogenous choice of delegation

By moving backwards to the first stage, we search for firm i's optimal choice between (M) and (E). We first compare the equilibrium outcomes across the subgames, introducing the following corollary and proposition.

Corollary 1 *The equilibrium market variables (output, prices and firm U's profits) are the same regardless of* b, β, n *and firm* i*'s structure. The following rankings of the two-part tariff terms apply:*

$$_{c|}w_i^{EE} =_{c|} w_i^{EM} <_{c|} w_i^{ME} =_{c|} w_i^{MM};\ _{c|}F_i^{MM} <_{c|} F_i^{ME} =_{c|} F_i^{EM} <_{c|} F_i^{EE}$$

Proposition 1. *EE is the equilibrium in dominant strategies of the Cournot game, regardless of* b, β and n.

Proof.

The following inequality proves the above proposition:
$_{c|}\pi_i^{MM} -_{c|} \pi_i^{EM} =_{c|} \pi_i^{ME} -_{c|} \pi_i^{EE} = -\frac{n(2-n)+\beta^2(1-n)^2}{8(1-n)^2(2-n)(1+\beta)^2} \leq 0$

2.2 The Bertrand game

By standard procedure, we solve the model when firms compete in prices, facing the following direct demand ($i, j = 1, 2,\ j \neq i$):

$$x_i = \frac{(1-\beta) + ny_i\left(1-\beta^2\right) - p_i + \beta p_j}{1-\beta^2}$$

We compare the equilibrium two-part tariffs and retailers' profits (included in the Appendix), besides the other equilibrium market variables, in Corollary 2 and Proposition 2.

Corollary 2 *Output, prices and firm U's profits are equivalent in Bertrand and Cournot (eqts. 6-8), regardless of* b, β, n *and firm* i*'s structure. The rankings over the two-part tariffs' terms are as follows:*

a) if $f(n,\beta) > 0 \Rightarrow$
$_{b|}w_i^{MM} =_{b|} w_i^{ME} <_{b|} w_i^{EM} =_{b|} w_i^{EE};\ _{b|}F_i^{EE} <_{b|} F_i^{ME} =_{b|} F_i^{EM} <_{b|} F_i^{MM}$

b) if $f(n,\beta) \leq 0 \Rightarrow$
${}_{b|}w_i^{EE} = {}_{b|}\, w_i^{EM} \leq {}_{b|}\, w_i^{ME} = {}_{b|}\, w_i^{MM}$; ${}_{b|}F_i^{MM} \leq {}_{b|}\, F_i^{ME} = {}_{b|}\, F_i^{EM} \leq {}_{b|}\, F_i^{EE}$

where $f(n,\beta) = \beta^2 - n(2-n)$ identifies the curve depicted over the plane (n,β) in Figure 1 and $i = 1, 2$. We also get ${}_{b|}\lambda_i^{MM} = {}_{b|}\, \lambda_i^{ME} = \frac{(\beta-n)\left(\left(2-n-\beta^2\right)\right)}{\beta(1-n)(2-n-\beta)}$, with ${}_{b|}\lambda_i^{MM} = {}_{b|}\, \lambda_i^{ME} > 1$ and ${}_{b|}\lambda_i^{MM} = {}_{b|}\, \lambda_i^{ME} \leq 1$ respectively in case $a)$ and case $b)$.[11]

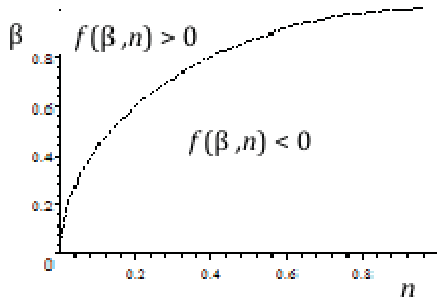

Figure 1

Proposition 2. *Under Bertrand, MM (EE) is the equilibrium in dominant strategies as long as* $f(n,\beta) > 0$ *(*$f(n,\beta) < 0$*). The two equilibria coexist when* $f(n,\beta) = 0$*. This holds regardless of any b.*

*Proof***.**

Consider the profit differentials:

$${}_{b|}\pi_i^{MM} - {}_{b|}\, \pi_i^{EM} = {}_{b|}\, \pi_i^{ME} - {}_{b|}\, \pi_i^{EE} = \frac{(1-\beta)\left(\beta^2 - n(2-n)\right)}{8(1+\beta)(1-n)^2(2-n-\beta^2)}$$

Let $\Delta^* = \frac{(1-\beta)\left(\beta^2-n(2-n)\right)}{8(1+\beta)(1-n)^2(2-n-\beta^2)}$. Clearly, $sign[\Delta^*] = sign[f(n,\beta)]$, so that in the region above (below) the curve in Figure 1, $\Delta^* > 0$ ($\Delta^* < 0$), and MM (EE) is sustained as a unique equilibrium, with MM and EE coexisting along the curve.

[11] Hoernig (2012) first demonstrated that the Fershtman and Judd (1987)'s result that $\lambda_i^* > 1$ under price competition can be reversed due to network effects.

2.3 Discussion

Our model has shown how centralized bargaining over a two-part tariff, by entailing maximization of the entire industry's profits, determines a unit wholesale price which is the higher, the tougher the competitive pressure between retailers. This effect has been shown to interact with the demand-side parameters β and n in delivering the main results. Increasing n, indeed, yields increasing advantages from competing aggressively on the retail market, regardless of the mode of competition.[12] Such effect pushes firms competing à la Cournot, which are induced to behave aggressively under delegation, to further strengthen retail rivalry. The output expansion induced by both delegation and network effects, however, lets w_i increase, which hurts firms' profits and, despite a reduction of F_i, leads owner i not to hire a manager.

In contrast to Cournot, Bertrand delegation can lead firms to soften retail competition, so that the effect of increasing n can go in the opposite direction with respect to that induced by delegation. This occurs when $f(n, \beta) > 0$, case in which owner i hires a manager to gain a market advantage by limiting its aggressiveness and paying a lower w_i with respect to no-delegation. The same forces induce firms not to delegate when $f(n, \beta) < 0$ and delegation translates in greater firm aggressiveness, thus higher w_i, than under no-delegation. Hiring a manager turns out to be the equilibrium for any n, provided that β is sufficiently high, which captures the higher advantages from reducing downstream rivalry through delegation in a highly competitive environment. When n increases over $[0, 1)$, delegation lets firms exploit the increasing advantages from greater rivalry, making firms more aggressive than under no-delegation at progressively higher values of β. This also makes the equilibrium with entrepreneurial firms more likely, due to the higher w_i charged to high-producing firms.[13]

3 Concluding remarks

We have investigated the downstream firms' decision to hire a manager in a vertical structure when consumers' preferences exhibit network externalities. By applying the Nash bargaining solution to determine the equilibrium two-part tariff charged by an upstream supplier, we have shown that the presence of network effects under Cournot does not affect the downstream firms' equilibrium choices, which consist in behaving as entrepreneurial (non-delegating) firms. This is in sharp contrast to earlier research. Conversely, the interplay between the strength of network effects and the degree of product differentiation has been

[12] This is due to the prevailing positive effect on firms' profits of more aggressive conduct caused by consumers' expectations over the negative effect caused by increased firms' rivalry, as pointed out by Pal (2014) in a scenario without delegation.

[13] In a framework without bargaining and linear wholesale pricing, w_i is independent of the demand of inputs from retailers, thus the forces pushing towards hiring a manager are associated only with the downstream advantages of delegation. As in the case with independent firms, MM is the equilibrium strategy under both Cournot and Bertrand, regardless of n and β.

shown to matter in determining the firms' equilibrium choices in the Bertrand game, which can entail both symmetric delegation and symmetric no-delegation, depending on whether firms behave more or less aggressively under delegation than under no-delegation. The role of centralized bargaining in delivering such results is crucial since it determines the conditions under which higher or lower aggressiveness induced by delegation causes per-unit input prices to respectively increase and decrease, thus affecting firms' profits and the equilibrium outcome.

References

[1] Aghadadashli H, Dertwinkel-Kalt M, Wey C (2016) The Nash bargaining solution in vertical relations with linear input prices. Econom Lett 145: 291–294.

[2] Alipranti M, Milliou C, Petrakis E (2014) Price vs. quantity competition in a vertically related market. Econ Lett 24: 122–126.

[3] Amir R , Lazzati N (2011) Network effects, market structure and industry performance. J Econ Theory 146: 2389–2419

[4] Bárcena-Ruiz J, Casado-Izaga F (2005) Should shareholders delegate location decisions? Res Econ 59: 209-222.

[5] Basak D, Wang L (2016) Endogenous choice of price or quantity contract and the implications of two-part tariff in a vertical structure. Econ Lett 138: 53–56.

[6] Basu K (1995) Stackelberg equilibrium in oligopoly: an explanation based on managerial incentives. Econ Lett 49: 459–464.

[7] Correa-López M, Naylor RA (2004) The Cournot-Bertrand profit differential: a reversal result in a differentiated duopoly with wage bargaining. Eur Econ Rev 48: 681–696.

[8] Delbono F, Lambertini L, Marattin L (2016). Strategic delegation under cost asymmetry. Oper Res Lett 44: 443–445.

[9] Draganska M, Klapper D, Villas-Boas S (2010) A larger slice or a larger pie? An empirical investigation of bargaining power in the distribution channel. Mark Sci 29: 57–74.

[10] Fershtman C, Judd K (1987) Equilibrium incentives in oligopoly. Am Econ Rev 77: 927–940.

[11] Haucap J, Heimeshoff U, Klein GJ, Rickert D, Wey C (2013) Bargaining power in manufacturer-retailer relationships. DICE Discussion Paper, No. 107. Available at: http://hdl.handle.net/10419/88908.

[12] Hoernig S (2012) Strategic delegation under price competition and network effects Econ Lett 117: 487–489.

[13] Katz ML, Shapiro C (1985) Network externalities, competition, and compatibility. Am Econ Rev 75: 424–440.

[14] Katz ML, Shapiro C (1994) Systems competition and network effects J Econon Perspect 8: 93–115.

[15] Kitamura H, Matsushima N, Sato M (2017) Exclusive contracts and bargaining power. Econ Lett 151: 1–3.

[16] Lambertini L (2000) Strategic delegation and the shape of market competition. Scot J Polit Econ 47: 550–570.

[17] Matsumura T, Matsushima N (2012) Locating outside a linear city can benefit consumers. J Regional Sci 52: 420–432.

[18] Mitrokostas E, Petrakis E (2014) Organizational structure, strategic delegation and innovation in oligopolistic industries. Econ Innovation New Tech 23: 1–24.

[19] Pal R (2014) Price and quantity competition in network goods duopoly: a reversal result. Econ Bull 34: 1019–1027.

[20] Ronchi M, di Mauro F (2017) Wage bargaining regimes and firms' adjustments to the great recession. ECB Working Paper No. 2051. Available at SSRN: https://ssrn.com/abstract=2968921.

[21] Sklivas S (1987) The strategic choice of managerial incentives. Rand J Econ 18: 452–458.

[22] Suleymanova I, Wey C (2012) On the role of consumer expectations in markets with network effects. J Econ 105: 101–127.

[23] Szymanski S (1994) Strategic delegation with endogenous costs. A duopoly with wage bargaining. Int. J Ind Organiz 12: 105–116.

[24] van Witteloostuijn A, Jansen T, Lier VA (2007) Bargaining over managerial contracts in delegation games: managerial power, contract disclosure and cartel behavior. Manage Decis Econ 28: 897–904.

[25] Yoshida S (2018) Bargaining power and firm profits in asymmetric duopoly: an inverted-U relationship. J Econ DOI 10.1007/s00712-017-0563-3.

Appendix

The equilibrium terms of the two-part tariffs and firms' profits in the Bertrand framework, with $i = 1, 2$, are as follows:

$$\begin{array}{rclcrcl} {}_{b|}w_i^{MM} &=& \frac{\beta(2-n-\beta)}{2(2-n-\beta^2)} & & {}_{b|}w_i^{EE} &=& \frac{\beta-n}{2(1-n)} \\ {}_{b|}F_i^{MM} &=& \frac{\beta(n-2+\beta)-b\left(n-2+\beta^2\right)}{4(1+\beta)(1-n)(2-n-\beta^2)} & & {}_{b|}F_i^{EE} &=& \frac{b(1-n)-\beta+n}{4(1+\beta)(1-n)^2} \\ {}_{b|}\pi_i^{MM} &=& \frac{1-b}{4(1+\beta)(1-n)} & & {}_{b|}\pi_i^{EE} &=& \frac{1-b}{4(1+\beta)(1-n)} \end{array}$$

$${}_{b|}w_i^{ME} = \frac{\beta(2-n-\beta)}{2(2-n-\beta^2)};\ {}_{b|}w_i^{EM} = \frac{\beta-n}{2(1-n)}$$

$${}_{b|}F_i^{ME} = {}_{b|}\ F_i^{EM} = \frac{\left(2\left(2-\beta^2\right)-2n\left(3-n-\beta^2\right)\right)b+\beta^3-(2n-1)\beta^2-(2-n)^2\beta+n(2-n)}{8(1+\beta)(1-n)^2(2-n-\beta^2)}$$

$$\begin{aligned} {}_{b|}\pi_i^{ME} &= \frac{(2-n)(n(\beta-3)+2)-\beta^3+(2n-1)\beta^2-\left(2(1-n)\left(2-n-\beta^2\right)\right)b}{8(1+\beta)(1-n)^2(2-n-\beta^2)} \\ {}_{b|}\pi_i^{EM} &= \frac{\beta^2(\beta-3)+n^2\beta-2\beta n(1-\beta)+(2-n)^2-\left(2(1-n)\left(2-n-\beta^2\right)\right)b}{8(1+\beta)(1-n)^2(2-n-\beta^2)} \end{aligned}$$