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Konstantinos Eleftheriou

University of Piraeus, Greece

Nickolas J. Michelacakis

University of Piraeus, Greece

Vassilios G. Papavassiliou

University College Dublin, Ireland

The Rimini Centre for Economic Analysis, Italy

A COMMENT ON 'CROSS-BORDER MERGER, VERTICAL STRUCTURE, AND SPATIAL COMPETITION'

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A comment on ‘Cross-border merger, vertical structure, and spatial competition’

Konstantinos Eleftheriou*, Nickolas J. Michelacakis* and Vassilios G. Papavassiliou^{†, ‡}

Abstract

The aim of this paper is to revise and correct the results obtained in Beladi et al. [Beladi, H., Chakrabarti, A., Marjit, S., 2010. Cross-border merger, vertical structure, and spatial competition. *Economics Letters* 109, 112-114]. Specifically, we prove that the Nash equilibrium locations of the downstream firms are the same in the pre-merger free-trade case as they are following a cross-border upstream merger.

JEL classification: L13, L42, D43, R32, F10, F12

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1 Introduction

In their paper Beladi et al. (2010) attempt to extend the work of Braid (2008) to demonstrate the effect of a cross-border merger between upstream firms on the equilibrium locations of downstream firms selling different varieties of a product. They claim that the pre-merger autarkic Nash equilibrium locations of two downstream retailers coincide with the Nash equilibrium locations of the same firms in the post-merger free trade case. Additionally, they argue that this equilibrium is different than the corresponding Nash equilibrium in the pre-merger free trade situation. The accuracy of the above results has been compromised by both technical and conceptual flaws. Specifically, Beladi et al. (2010) fail to appropriately account for the wholesale price effects.

*Department of Economics, University of Piraeus, 80 Karaoli & Dimitriou Street, Piraeus 185 34, Greece. E-mail: kostasel@otenet.gr (Eleftheriou); njm@unipi.gr (Michelacakis).

[†]Corresponding author. University College Dublin, UCD Michael Smurfit Graduate Business School, Carysfort Avenue, Blackrock, Co Dublin, Ireland. E-mail: vassilios.papavassiliou@ucd.ie; Tel: +353 1 7168095.

[‡]Rimini Centre for Economic Analysis (RCEA), Via Patara, 3 - 47900 Rimini (RN) - Italy.

We show that:

- (i) the pre-merger autarkic equilibrium does not necessarily coincide with the post-merger one under free trade,
- (ii) under free trade, the pre and post-merger Nash equilibrium locations of the downstream competitors are identical.

2 Model and Results

We consider a vertically related industry. To the end of facilitating the presentation we make use of the exact same notation as in Beladi et al. (2010), with M and M^* the two upstream monopolists in the home and foreign country, respectively, and R (home country) and R^* (foreign country) the two downstream competing firms. The two downstream firms transform (on a one-to-one basis) the intermediate good into the differentiated final goods they sell to consumers distributed uniformly with unit density on a uni-dimensional (linear) market interval with support $[0, 1]$. The two downstream firms R and R^* are located at x and y , respectively, with $x < y$ in $[0, 1]$. Three varieties of a differentiated product are offered to consumers: U and W from firm R and V and W from firm R^* . Let the fraction of consumers buying only good U equal the fraction of consumers buying good V , both set equal to c . Product W is bought by a fraction b of consumers. The above assumptions imply that the two downstream firms have monopoly power over the goods (or varieties) U and V while they compete for market share regarding the good (or variety) W . Transportation costs are td , where t is a positive constant and d is the distance shipped. Let k denote the maximum reservation price a consumer is willing to pay for any product. This price is sufficiently large and becomes relevant only for product varieties where there is no competition between the two firms.

The complete information game according to Beladi et al. (2010) is played in three stages. In the first stage, M and M^* make a take-it-or-leave-it two-part tariff offer to R and R^* respectively and, at the same time, R and R^* simultaneously choose their locations in the market. M and M^* charge R and R^* two-part tariff (w, F) and (w^*, F^*) , respectively, where w^0 is the marginal wholesale price and F^0 is the fixed fee extracted by the upstream

supplier in each country. In stage two of the game, the downstream competitors, R and R^* , simultaneously decide whether to accept or decline the two-part tariff contract offered by the upstream monopolists. Once an offer is accepted by the downstream firms, the fixed fee is collected by the monopolist at this stage. In the third stage, R and R^* engage in spatial price discrimination and consumers make their purchasing choices to clear the market.

The game is solved by backward induction and a comparison is being made amongst three distinct cases: the pre-merger equilibrium with autarky, and the pre-merger and post-merger equilibria with free trade (all of them with downstream spatial price discrimination). Beladi et al. (2010) do not really define autarky, but they implicitly assume that each upstream firm is allowed to sell the intermediate good only to the downstream firm in its own country (but both downstream firms are allowed to sell their goods to all consumers).

In the pre-merger case under autarky, the profit functions of R and R^* are respectively given by

$$\begin{aligned} \Pi(x, y) = & \left(c(k - w) - \frac{ct}{2} [x^2 + (1 - x)^2] \right) \\ & + \left(\int_0^x b[t(y - x) + w^* - w]dz \right. \\ & \left. + \int_x^{\left(\frac{x+y}{2} + \frac{w^*-w}{2t}\right)} b[t(x + y - 2z) + w^* - w]dz \right) - F \end{aligned} \quad (1)$$

$$\begin{aligned} \Pi^*(x, y) = & \left(c(k - w^*) - \frac{ct}{2} [y^2 + (1 - y)^2] \right) \\ & + \left(\int_{\left(\frac{x+y}{2} + \frac{w^*-w}{2t}\right)}^y b[t(2z - x - y) + w - w^*]dz \right. \\ & \left. + \int_y^1 b[t(y - x) + w - w^*]dz \right) - F^* \end{aligned} \quad (2)$$

with $\frac{w^*-w}{2t} \leq \frac{y-x}{2}$.¹ The location s of the indifferent consumer for good W is determined by equating the two delivered costs in regard to the common good W : $t(y - s) + w^* = t(s - x) + w \implies s = \frac{x+y}{2} + \frac{w^*-w}{2t}$. These equations serve to correct equations (1) and (2)

¹If $\frac{w^*-w}{2t} > \frac{y-x}{2}$, both firms are reduced to spatial-price discriminating monopolists where the common good W is now provided only by firm R . We consider this case trivial and focus only on the case where $\frac{w^*-w}{2t} \leq \frac{y-x}{2}$.

respectively in Beladi et al. (2010). Beladi et al. (2010) (incorrectly) do not account for the fact that the delivered cost for good W of the firm that is located further away, which is equal to the price charged to consumers by its rival, is equal to the sum of its transportation and marginal cost (see Braid, 2008, p. 345). Since the marginal cost of R^* is equal to the wholesale price, w^* , the profits of R realizing a sale of good W to a customer located at place z , will be equal to $w^* + t(y - z) - t|z - x| - w = t(y - z) - t|z - x| + w^* - w$. The corresponding profits for R^* can be defined in a similar way. Having evaluated the integrals, (1) and (2) become

$$\begin{aligned} \Pi(x, y) = & c(k - w) - \frac{ct}{2} [x^2 + (1 - x)^2] \\ & + bx [t(y - x) + w^* - w] + \frac{b}{4t} [t(y - x) + w^* - w]^2 - F \end{aligned} \quad (1b)$$

$$\begin{aligned} \Pi^*(x, y) = & c(k - w^*) - \frac{ct}{2} [y^2 + (1 - y)^2] \\ & + b(1 - y) [t(y - x) + w - w^*] + \frac{b}{4t} [t(y - x) + w - w^*]^2 - F^* \end{aligned} \quad (2b)$$

Solving the first order condition for profit maximization we obtain:

$$(x, y) = \left(\frac{1}{2} - r + g, \frac{1}{2} + r + g \right) \quad (3)$$

where $r = \frac{b}{4(b+c)}$ and $g = \frac{b(w^*-w)}{2t(b+2c)}$. We observe that if $w = w^*$, then the corresponding Nash equilibrium is

$$(x, y) = \left(\frac{1}{2} - r, \frac{1}{2} + r \right) \quad (3b)$$

In the pre-merger case, under free trade, Beladi et al. (2010) assume (implicitly) that each upstream firm can sell to either downstream firm, so that $w = w^* = 0 = F = F^*$. It follows from their analysis, which is correct for this case, that the Nash equilibrium locations are given by (3b).

Proposition 1 *In the pre-merger autarkic case, the Nash equilibrium locations of the two downstream firms in a vertically related industry are $(\frac{1}{2} - r + g, \frac{1}{2} + r + g)$. In the pre-merger free-trade case, the Nash equilibrium locations of the two downstream firms in a vertically related industry are $(\frac{1}{2} - r, \frac{1}{2} + r)$.*

The results in Proposition 1 are different than (and serve to correct) the results in Beladi et al. (2010).

If M and M^* merge, under free trade, the merged upstream firm $\tilde{M}$ will charge a uniform wholesale price $\tilde{w}$ and a fixed fee $\tilde{F}$. The corresponding profits of the two downstream retailers, R and R^* from selling varieties U , V and W are²

$$\begin{aligned} \Pi(x, y) = & \left(c(k - \tilde{w}) - \frac{ct}{2} [x^2 + (1 - x)^2] \right) \\ & + \left(\int_0^x b[t(y - x)] dz + \int_x^{\frac{x+y}{2}} b[t(x + y - 2z)] dz \right) - \tilde{F} \end{aligned} \quad (4)$$

$$\begin{aligned} \Pi^*(x, y) = & \left(c(k - \tilde{w}) - \frac{ct}{2} [y^2 + (1 - y)^2] \right) \\ & + \left(\int_{\frac{x+y}{2}}^y b[t(2z - x - y)] dz + \int_y^1 b[t(y - x)] dz \right) - \tilde{F} \end{aligned} \quad (5)$$

Equations (4) and (5) can be derived from (1) and (2) simply by changing both w and w^* in (1) and (2) to the $\tilde{w}$ variable used here.

After evaluating the integrals we are led to

$$\begin{aligned} \Pi(x, y) = & c(k - \tilde{w}) - \frac{ct}{2} [x^2 + (1 - x)^2] \\ & + bx[t(y - x)] + \frac{b}{4t} [t(y - x)]^2 - \tilde{F} \end{aligned} \quad (4b)$$

²See Eleftheriou and Michelacakis (2016).

$$\begin{aligned}\Pi^*(x, y) = & c(k - \tilde{w}) - \frac{ct}{2} [y^2 + (1 - y)^2] \\ & + b(1 - y)[t(y - x)] + \frac{b}{4t} [t(y - x)]^2 - \tilde{F}\end{aligned}\tag{5b}$$

Profit maximization proves that the Nash equilibrium is

$$(x, y) = \left(\frac{1}{2} - r, \frac{1}{2} + r \right)\tag{6}$$

Proposition 2 *Following a cross-border merger upstream, the Nash equilibrium locations of the two downstream firms, in a vertically related industry, are $(\frac{1}{2} - r, \frac{1}{2} + r)$.*

It should be noted that the result in Proposition 2 is independent of $\tilde{w}$.³ When $\tilde{w} = 0$, this result is consistent with that in Braid (2008) who implicitly assumed $(\tilde{w}, \tilde{F}) = (0, 0)$ by not modeling an upstream firm $\tilde{M}$. Our result corrects Proposition 2 in Beladi et al. (2010) for the post-merger case. One deduces from Propositions 1 and 2 that the Nash equilibrium locations of the downstream firms are identical in the pre-merger free trade and post-merger cases.

3 Conclusion

We have shown that: (i) the pre-merger autarkic and post-merger free-trade equilibria in Beladi et al. (2010) are incorrect, and they need not be the same (although they will be if $g = 0$), and (ii) in contrast to Beladi et al. (2010), the pre-merger and post-merger free-trade Nash equilibrium locations of the downstream firms are identical.

References

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³This is equivalent with the pre-merger case in Eleftheriou and Michelacakis (2016).

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