Economics Letters 122 (2014) 79–83

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Domestic and international research joint ventures: The effect of collusion

Ricardo Flores-Fillol *, Guiomar Ibañez-Zarate [1], Bernd Theilen [2]

Departament d'Economia and CREIP, Universitat Rovira i Virgili, Avinguda de la Universitat 1, 43204 Reus, Spain

HIGHLIGHTS

- We analyze the effect of research joint ventures (RJVs) on consumer welfare.
- We consider an international context when collusion can occur.
- The recent literature shows that RJVs with collusion harm consumers.
- However, international RJVs with collusion might be beneficial for consumers.
- Antitrust authorities should be more benevolent with international RJVs.

ARTICLE INFO

Article history:
Received 3 May 2013
Received in revised form
28 October 2013
Accepted 4 November 2013
Available online 12 November 2013

JEL classification:
K21
L24
L44
O32

Keywords:
Collusion
Domestic research joint venture
International research joint venture

ABSTRACT

We analyze the effect of research joint ventures (RJVs) on consumer welfare in an international context when collusion can occur. Our results suggest that antitrust authorities should distinguish between domestic and international RJVs and be more benevolent with international RJVs.

1. Introduction

Cooperative R&D among enterprises is common practice in all sectors of the economy, particularly in the high-tech sector. These cooperation agreements in the form of research joint ventures (RJVs) enable firms to exploit synergies, share individual risks, internalize R&D spillovers, increase efficiencies, and promote innovation. As a consequence, new products become available and the existing products are produced at lower prices, which benefits consumers and raises social welfare. For this reason and regardless of the characteristics of each RJV, regulatory agencies have mainly ruled in favor of these agreements. RJVs are typically exempted from restrictive antitrust rules, in both the United States (US) and the European Union (EU) (Carree et al., 2010; White, 2010). However, there are two reasons that call into question the common practice when assessing the effects of RJVs. First, there is increasing evidence that cooperation in R&D is used to facilitate collusion in the product market (Duso et al., forthcoming; Goeree and Helland, 2010; Oxley et al., 2009; Martin, 1995). Second, with the globalization of the economy, an increasing number of RJVs bring together firms located in different countries (Uphoff and Gilman, 2010). Such international RJVs have different effects than domestic RJVs.

The objective of this paper is to analyze the effect of RJVs on consumer welfare in an international context. We consider the threat of collusive agreements in the product market, acknowledging that the effect of collusion may differ between domestic and international agreements. Our analysis is based on a model that extends the study of D'Aspremont and Jacquemin (1988) to a context with

* Corresponding author. Tel.: +34 977759851; fax: +34 977759810.
E-mail addresses: ricardo.flores@urv.cat (R. Flores-Fillol), guiomar.ibanez@urv.cat (G. Ibañez-Zarate), bernd.theilen@urv.cat (B. Theilen).
[1] Tel.: +34 977759884; fax: +34 977759810.
[2] Tel.: +34 977759813; fax: +34 977759810.

0165-1765/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.econlet.2013.11.005

international trade. There are two countries with four firms—two in each country. We assume the technological spillovers between domestic and foreign firms to be different. Strategic decision making by firms is modeled as a two-stage game. In stage one, firms decide whether or not to form a RJV with another firm, either domestic or foreign. In stage two, firms choose the quantity to produce. Once a RJV has been formed, it is possible to distinguish two scenarios. Either firms decide on production levels non-cooperatively, or they use the RJV to collude in the production stage. We limit our attention to symmetric outcomes where either two domestic or two international RJVs are formed, along with the base case in which no RJV is formed. In addition to the base case, we thus have four different scenarios: (i) domestic and (ii) international RJVs with no collusion in the production stage; and (iii) domestic and (iv) international RJVs with collusion in the production stage.

Our main findings can be summarized as follows. In the absence of collusion, both domestic and international RJVs are consumer welfare-enhancing when the spillovers are sufficiently large. The relative magnitude of each spillover effect (domestic and international) determines which of the two types of RJV is more beneficial. In the presence of collusion, domestic RJVs are unambiguously welfare-reducing whereas international RJVs can be welfare-enhancing. While collusion in domestic RJVs yields a *competition-reduction effect*, under international RJVs there is an additional *efficiency-gains effect* since the specialization in domestic markets allows partner firms to save internationalization costs. International RJVs therefore increase the consumer welfare when the latter positive effect of collusion predominates over the former negative effect. Naturally, when internationalization costs are low, collusion typically reduces consumer welfare (for both domestic and international RJVs).

In general, RJVs with collusion harm consumers. However, our results introduce a qualification to this statement: international RJVs with collusion might be beneficial for consumers when internationalization costs are high. The EU and US competition policy advises against RJVs that facilitate collusion on the grounds of their expected negative effects. Our results suggest that antitrust authorities should distinguish between domestic and international RJVs and, in certain cases, be more benevolent with international RJVs.

2. The model

Consider an industry with four firms located in two countries that produce a homogeneous good. Two firms are located in country A and two firms are located in country B. Each firm i decides on the quantity to produce for the domestic market (h_{ij}) and for the foreign market (e_{ij}), with $i = 1, 2$ and $j = A, B$. Thus, the total quantity traded in country j consists of domestic production and imports, i.e.,

$$q_j = h_j + e_l = h_{1j} + h_{2j} + e_{1l} + e_{2l}, \tag{1}$$

where $j, l = A, B$ and $j \neq l$. Firms face a linear inverse demand function $p_j = a - q_j$ and compete in quantities (à la Cournot).

Production costs are assumed to be linear in the firm's total output. Firms can reduce their marginal production costs by undertaking R&D activities, x_{ij}, at cost $\gamma x_{ij}^2/2$ with $\gamma \geq \underline{\gamma} \equiv 9.6$.[3] R&D efforts exerted by an individual firm produce a positive spillover that benefits other firms. These spillovers may have an asymmetric impact on the domestic and the foreign markets. Let us denote by β and $\lambda\beta$ the intensity of spillovers at the domestic and international levels, respectively. Thus, total cost for firm i in country j is given by

$$CT_{ij} = \left[c - x_{ij} - \beta x_{kj} - \lambda\beta \sum_{i=1,2} x_{il}\right]\left(h_{ij} + e_{ij}\right) + \gamma x_{ij}^2/2, \tag{2}$$

where $i, k = 1, 2$ with $i \neq k$ and $a > c > 0$. At this point, it seems sensible to assume $0 \leqslant \lambda \leqslant \overline{\lambda} \equiv (1-\beta)/2\beta$ so that the own marginal return to R&D effort is larger than the absorbed one. This cost structure builds on the one proposed in D'Aspremont and Jacquemin (1988), adapting it to a framework with international trade.[4]

In addition, selling abroad makes firms incur an additional *internationalization cost*, te_{ij}. This term accounts for learning costs on how to adapt the product to a foreign market, the costs for complying with different legal requirements, higher transportation costs, or the payment of tariffs levied by the foreign country.[5] Thus, the profits of a firm i located in country j are given by

$$\pi_{ij} = p_j h_{ij} + p_l e_{ij} - CT_{ij} - te_{ij}. \tag{3}$$

Now, consider the base case in which firms behave non-cooperatively in both stages of the game, i.e., firms neither engage in RJVs nor collude in production. In stage 2, firms choose quantities h_{ij} and e_{ij} to maximize profits in Eq. (3). The Cournot–Nash equilibrium values of this stage game (conditional on R&D decisions) are

$$h_{ij}^{02} = \frac{1}{5}\left[a - c + 2t - (1 + \beta - 3\lambda\beta)\sum_{i=1,2,j=A,B} x_{ij}\right] + (1 - \beta\lambda)\, x_{ij} + (1 - \lambda)\,\beta x_{kj} \tag{4}$$

and

$$e_{ij}^{02} = \frac{1}{5}\left[a - c - 3t - (1 + \beta - 3\lambda\beta)\sum_{i=1,2,j=A,B} x_{ij}\right] + (1 - \beta\lambda)\, x_{ij} + (1 - \lambda)\,\beta x_{kj}, \tag{5}$$

where the superscript 02 denotes the stage-2 equilibrium values in the base case. The sole difference between home and foreign production quantities is found in the effect of the internationalization cost, which benefits the domestic production. By looking at these expressions along with Eq. (1), we can verify that the existence of internationalization costs reduces the total production in both countries. We can also confirm that both h_{ij}^{02} and e_{ij}^{02} increase with x_{ij}, which constitutes a natural firm reaction to a lower marginal production cost.

Plugging these values into Eq. (3), we obtain the stage-1 profit function that firms maximize through their choices of R&D

$$\pi_{ij} = \left(h_{ij}^{02}\right)^2 + \left(e_{ij}^{02}\right)^2 - \gamma x_{ij}^2/2. \tag{6}$$

[3] This threshold ensures compliance with second-order and stability conditions. These conditions are thoroughly analyzed in a Complementary Appendix, which is available from the authors on request (see Appendix C).

[4] Kamien and Zang (2000) extend the (D'Aspremont and Jacquemin, 1988) model to allow for absorptive capacity. In their model, the extent to which a firm can benefit from R&D carried on by other firms depends on its own R&D investment. As compared to the case with costless spillovers, they find that absorptive capacity yields larger R&D spending. Introducing absorptive capacity in our analysis would not change the results qualitatively while complicating the model substantially.

[5] In this paper we assume internationalization costs to be entirely exogenous. Though, as pointed out by an anonymous referee, some of these costs could be endogenous such as some tariffs and other artificial trade barriers.