Journal of Economic Behavior & Organization 94 (2013) 330–344

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

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

Incomplete contracts and the boundaries of the multinational firm☆

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ARTICLE INFO

Article history:
Received 4 November 2011
Received in revised form 16 May 2012
Accepted 1 October 2012
Available online 13 October 2012

JEL classification:
F14
F23
L14
L33

Keywords:
Intra-firm trade
Incomplete contracts
Vertical integration
Outsourcing
Fixed-costs

ABSTRACT

Using data on U.S. intra-firm and arm's-length imports for 5705 products imported from 220 countries, we examine the determinants of the share of U.S. imports that are intra-firm. We examine two predictions that arise from Antràs (2003), Antràs and Helpman (2008) and Antràs and Helpman (2004). First, we find that, consistent with the implicit logic of Antràs (2003) and the explicit predictions of Antràs and Helpman (2008), vertical integration is increasing in the importance of *non-contractible* headquarter inputs relative to *non-contractible* supplier inputs. In other words, we show that only non-contractible headquarter inputs affect the firm's make-or-buy decision. Second, we also provide empirical support for the Antràs and Helpman (2004) prediction that intra-firm trade is largest where *non-contractible* headquarter inputs are important *and* productivity is high.

1. Introduction

Recently, a rich research agenda examining the determinants of intra-firm trade has developed. The literature has been able to develop deep insights into the multinational firms' decision regarding the elements of international trade that are done internally to the firm and which are done outside the boundaries of the firm.[1] In this paper, we are interested in a strand of the literature that examines the relationship between a multinational firm and its supplier. Each contributes a customized input that is non-contractible. As a result, there is a classic hold-up problem and the multinational must decide whether to vertically integrate its supplier or outsource to its supplier. One strand of the literature treats the difference between these two organizational forms as the difference between the outside options of the multinational in the event that the hold-up problem cannot be resolved through bargaining. This treatment of the difference between vertical integration and outsourcing originates with Antràs (2003) and appears again in Antràs and Helpman (2004, 2008).

☆ The authors thank Pol Antràs, Jan De Leocker, Rob Feenstra, Elhanan Helpman, Gene Grossman, Wilhelm Kohler, Marc Melitz, Ralph Ossa, Stephen Yeaple and seminar participants at Texas A&M University, a Princeton IES Summer Workshop, and an NBER ITI Working Group Meeting. We are especially grateful to Joel Blit for facilitating construction of the data base.

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[1] Seminal contributions include McLaren (2000), Antràs (2003, 2005), Grossman and Helpman (2002, 2003, 2004, 2005), and Antràs and Helpman (2004).

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http://dx.doi.org/10.1016/j.jebo.2012.10.004

These papers yield two important insights about the determinants of the share of total U.S. imports that are imported by U.S. multinationals from their foreign affiliates (i.e., intra-firm). First, Antràs (2003) argues that when the U.S. headquarters firm provides the bulk of the non-contractible inputs, underinvestment in inputs is reduced by highly incentivizing the headquarter. Vertical integration provides such incentives because it allows the headquarter to control at least some of the supplier's inputs even if bilateral bargaining breaks down. In contrast, when the foreign supplier provides the bulk of the non-contractible inputs, the foreign supplier must be highly incentivized. This is done by outsourcing: outsourcing strips the headquarters firm of any control over the supplier's inputs and thus strengthens the bilateral bargaining position of the supplier. In short, the share of U.S. imports that are intra-firm is increasing in the share of (non-contractible) inputs provided by the U.S. headquarters firm.[2]

While Antràs (2003) examines the simplified case where all inputs are non-contractible, Antràs and Helpman (2008) allow a portion of the inputs to be contractible. (An alternative interpretation is that they allow all inputs to be partially contractible.) Because Antràs (2003) assumes all inputs were non-contractible, in his model what matters is the relative importance of total headquarter-provided inputs relative to supplier inputs. However, as Antràs and Helpman (2008) illustrate, when some investments are contractible it is now only necessary to incentivize the non-contractible investments. Therefore, what matters is the importance of non-contractible headquarter investments relative to non-contractible supplier investments.

The second prediction about the share of total U.S. imports that is intra-firm is developed in Antràs and Helpman (2004). The authors start with the well-known fact that firms display heterogeneous productivities. They then argue that the fixed costs of producing abroad are lower when outsourcing to a foreign supplier than when using foreign direct investment (vertical integration). Since only the most productive firms capture the market share needed to offset the high costs of vertical integration, not all firms identified by Antràs (2003) as candidates for vertical integration will in fact integrate. Only the most productive will. Thus, the share of U.S. imports that are intra-firm will be large when two conditions are simultaneously satisfied: (i) the share of inputs provided by the headquarters firm is large (as in Antràs, 2003) and (ii) firm productivity is high.

Using data on U.S. intra-firm and arm's-length imports for 5705 products imported from 220 countries, we examine these determinants of the share of U.S. imports that are intra-firm. Our conclusions mirror the two predictions listed above. (i) In terms of the Antràs (2003) and Antràs and Helpman (2008) mechanism, we find support for the role of the importance of non-contractible headquarter inputs relative to non-contractible supplier inputs. (ii) We also find strong support for the Antràs and Helpman (2004) prediction that intra-firm trade is largest where headquarter inputs are important *and* productivity is high.

The paper is organized as follows. Section 2 examines the predictions of Antràs (2003) and Antràs and Helpman (2008), and Section 3 examines the predictions from Antràs and Helpman (2004). Section 4 concludes.

2. The boundary of the firm and the role of η (Antràs, 2003; Antràs and Helpman, 2008)

We begin by reviewing the salient features of the Antràs (2003) and Antràs and Helpman (2004, 2008) models from the perspective of the empirical work to follow. Since the models have been presented and summarized elsewhere, we only review its most important features here.[3]

A U.S. firm produces a brand of a differentiated variety j of a product in industry i. Demand is generated by CES preferences. To produce the good, the firm must use two inputs, those produced by the U.S. firm ($h_i(j)$ for *h*eadquarters) and those produced by a foreign supplier ($m_i(j)$ for inter*m*ediates). Output of the final good is given by a Cobb–Douglas production function with two key parameters: a Hicks-neutral productivity parameter $\theta(j)$ that is variety (i.e., match) specific and the cost share of the input provided by the firm η_i, which is an industry-specific parameter. Specifically, production is given by:

$$q_i(j) = \theta(j)\left(\frac{h_i(j)}{\eta_i}\right)^{\eta_i}\left(\frac{m_i(j)}{1-\eta_i}\right)^{1-\eta_i}. \tag{1}$$

In Antràs (2003) and Antràs and Helpman (2004) it is assumed that the two inputs are entirely customized and not contractible. This assumption is relaxed in Antràs and Helpman (2008). Customization raises quality to a threshold which allows the final good to be sold to consumers. Unfortunately, for the U.S. firm and its foreign supplier, the investments in customization are non-contractible and they have no value outside of the relationship. Thus, there is a standard hold-up problem. After the investments in customization have been made there is renegotiation over how the *ex post* quasi-rents from the relationship will be shared.

The timing of the game played by the U.S. firm and its foreign supplier is as follows. After the two parties match, the U.S. firm chooses the organizational form. Then investments in customized inputs are made. Finally, the initial contract is renegotiated and, if there is agreement, the product is sold.

Let β be the generalized Nash share of the *ex post* quasi-rents from the relationship that go to the U.S. firm. The U.S. firm receives this share plus its outside option. The organizational form – vertical integration versus outsourcing – chosen by the

[2] This logic is a specific instance of the larger property rights approach to the firm e.g., Grossman and Hart (1986).
[3] See Helpman (2006) and Nunn and Trefler (2008).