



Determinants of vertical integration in export processing: Theory and evidence from China[☆]

Ana P. Fernandes^a, Heiwai Tang^{b,c,d,*}

^a University of Exeter, United Kingdom

^b Tufts University, United States

^c MIT Sloan, United States

^d LdA, Italy

ARTICLE INFO

Article history:

Received 9 February 2011

Received in revised form 25 January 2012

Accepted 25 May 2012

JEL classification:

F14

F23

L14

Keywords:

Intra-firm trade

Vertical integration

Export processing

Outsourcing

ABSTRACT

This paper examines the determinants of vertical integration versus outsourcing in export processing, by exploiting the coexistence of two export processing regimes in China, which designate by law who owns and controls the imported components. Based on a variant of the Antràs-Helpman (2004) model, we show theoretically that control over imported components for assembly can affect firm integration decisions. Our empirical results show that when Chinese plants control the use of components, the export share of foreign-owned plants is positively correlated with the intensity of inputs provided by the headquarter (capital, skill, and R&D). These results are consistent with the property-rights theory of intra-firm trade. However, when foreign firms own and control the components, there is no evidence of a positive relationship between the intensity of headquarters' inputs and the prevalence of vertical integration. The results are consistent with our model that considers control over imported components as an alternative to asset ownership to alleviate hold-up by export-processing plants.

© 2012 Elsevier B.V. All rights reserved.

1. Introduction

Export processing, in which a final-good producer offshores the final stage of production to an assembly plant in a foreign country, has been an important part of developing nations' economies. It employed over 63 million people in the developing world,¹ and accounted for over half of total exports in countries such as China and Mexico in recent

years (Bergin et al., 2009). Recent studies have shown how export processing and offshoring in general have important macroeconomic impacts on the host countries.² In export processing, final-good producers are often confronted with the decisions of whether to outsource to or integrate with the foreign assembly plant, which in turn affect the macroeconomic effects of offshoring. This paper studies the prevalence of vertical integration versus outsourcing in export processing using detailed product-level trade data from China's Customs.

We exploit the special regulatory regimes governing processing trade in China. These legal arrangements designate by law which party of a global production relationship has control rights over the imported materials, which are critical for export processing. Specifically, export processing in China has been governed under two regimes since the early 1980s, which are referred to as pure-assembly and import-assembly.³ The main difference between the two regimes lies in the allocation of control rights of the imported inputs. In the

[☆] We are grateful to Eric Verhoogen (the co-editor), two anonymous referees, Pol Antràs, Alejandro Cuñat, Fabrice Defever, Giovanni Facchini, Robert Feenstra, Giordano Mion, Emanuel Ornelas, Larry Qiu, Stephen Redding, Shang-Jin Wei, Alan Winters, Stephen Yeaple and seminar participants at Clark, Colby, HKUST, Louvain, LSE, Nottingham, Sussex, Trinity College Dublin and the World Bank, as well as conference participants at the CEPR First Meeting of Globalization, Investment and Services Trade in Milan, the 2009 SAET Conference in Ischia, the 2009 ETSG Conference in Rome, the 2010 Econometric Society World Congress in Shanghai and the 2010 APTS conference in Osaka for insightful discussions and comments. We thank Randy Becker, Joseph Fan, Nathan Nunn and Peter Schott for kindly sharing with us their data. We also thank the Nuffield Foundation and the Hong Kong Research Grants Council for financial support. Fernandes thanks the CEP at the London School of Economics where part of this research was conducted. Tang thanks the HKIMR where part of this research was conducted.

* Corresponding author.

E-mail addresses: a.p.o.fernandes@exeter.ac.uk (A.P. Fernandes),

heiwai.tang@tufts.edu (H. Tang).

¹ See International Labour Organization (2007).

² For instance, Bergin et al. (2009, 2011) link offshoring activities to higher employment volatility in Mexico; and Sheng and Yang (2011) study how exporting processing activities contribute to increasing returns to skills in China after its accession to the WTO.

³ See Feenstra and Hanson (2005) for a detailed description of these two trade regimes in China.

pure-assembly regime, a foreign firm supplies components to a Chinese assembly plant and retains ownership and control over the imported inputs throughout the production process. In the import-assembly regime, a Chinese assembly plant imports components of its own accord and retains control over their use. Based on a variant of the [Antràs-Helpman \(2004\)](#) model that incorporates component-purchase investments, we provide empirical evidence on how control over imported inputs may serve as an alternative to asset ownership to mitigate hold-up by foreign suppliers, which in turn shape the organizational choices of multinational production.⁴

While there is an extensive theoretical literature on the pattern of intra-firm trade, empirical evidence is relatively scant and exclusively focuses on the developed world.⁵ This paper thus complements the existing literature by providing evidence on the make-or-buy decisions in processing trade in a developing country. In particular, our results empirically examine existing theory on the relationship between industry characteristics and the relative prevalence of vertical integration versus outsourcing ([Antràs, 2003](#); [Antràs and Helpman, 2004, 2008](#)). Since this literature so far abstracted from the discussion of control rights of imported components, which are particularly important for processing trade in developing countries, we extend the [Antràs-Helpman \(2004\)](#) model to capture the policy features in China. In the model, the final-good producer in the North invests in headquarter services (e.g. marketing), while the assembly plant in the South invests in assembly activities. Who invests in global component purchase depends on the trade regime. In particular, the final-good producer invests in component purchases under pure-assembly, whereas the assembly plant invests in component purchases under import-assembly.

Our model, which features firm heterogeneity, predicts that vertical integration and outsourcing in both import-assembly and pure-assembly regimes can coexist in sectors where headquarter investments are important. In particular, our model predicts that the most productive final-good producers in the North choose to integrate with the assembly plant and own the imported materials when offshoring assembly tasks to the South, whereas the least productive final-good producers allocate both the ownership of the plant's asset and the control rights over imported materials to the assembly plant. Based on this ranking of production modes, the model yields a positive correlation between the export share of integrated firms that operate under import-assembly and headquarter intensity across sectors, consistent with the main prediction by [Antràs \(2003\)](#). The cross-sector relationship between headquarter intensity and the prevalence of integration under pure-assembly is ambiguous. The reason for the ambiguity is that in a headquarter-intensive sector where safeguarding the headquarter's investment incentives is important, a foreign client can choose to either own and control imported inputs or own the plant's assets to alleviate hold-up. The export volume from integrated plants increases for both import-assembly and pure-assembly when the headquarter intensity of the sector rises. If the incremental gain from integration is sufficiently smaller with input control than without, the export volume can

increase more for the former than the latter, resulting in a lower share of integrated plants under pure-assembly in total processing trade.

We investigate empirically the implications of introducing controls over input purchases on the prevalence of different global production modes in processing trade. To this end, we use detailed firm- and product-level trade data collected by the Customs General Administration of China for 2005. We find a positive and significant relationship between the share of integrated plants' exports from the import-assembly regime and various measures of the intensity of headquarter inputs (i.e., skill, R&D, and physical capital intensities). The results are robust when we restrict the sample to include only Chinese exports to the US and to different country groups based on income levels, as well as when country fixed effects are controlled for. In sum, we find evidence supporting our predictions and the property-rights theory of intra-firm trade.

However, we find no evidence of a positive relationship between the degree of headquarter intensity and integrated plants' exports from the pure-assembly regime, where the foreign firm retains ownership and control rights over the imported inputs. These results provide indirect support to our theoretical prediction that control over the use of imported components serves as an alternative to asset ownership to mitigate hold-up by foreign assembly plants. It is worth noting that this result should not be taken as a rejection of the existing theory on intra-firm trade, but rather as a confirmation of its predictions in a more complex setting.

Our paper relates to several strands of studies. First, our work is most related to and to a large extent inspired by [Feenstra and Hanson \(2005\)](#), who are the first to exploit the special regulatory arrangements for processing trade in China to examine empirically the prevalence of integration in processing trade. Similar to their work, we also adopt the property-rights theory of the firm to rationalize the determinants of integration. Different from theirs, we adopt the general-equilibrium framework of [Antràs \(2003\)](#) and [Antràs and Helpman \(2004, 2008\)](#) that pins down the relationship between industry characteristics, productivity heterogeneity, and the prevalence of vertical integration. By solving for the export share of each production mode in Chinese export processing, our theoretical predictions are largely consistent with their partial-equilibrium insights. [Feenstra and Hanson](#) estimate their model structurally, by exploring the variation in market thickness and court efficiency across Chinese regions.⁶ We instead focus on the sectoral determinants of the prevalence of integration based on a more reduced-form but more general empirical model.

Using data from assembly trade in a developing country, our paper adds to the existing empirical literature on the determinants of arm's-length trade versus vertical integration in developed countries. [Antràs \(2003\)](#), [Yeaple \(2006\)](#), [Bernard et al. \(2008\)](#), and [Nunn and Trefler \(2011\)](#) are important precursors in this literature. They examine the effects of headquarters inputs, productivity dispersion and contractibility of inputs on intra-firm imports as a share of total imports in the U.S. [Bernard et al. \(2008\)](#) use a new measure of product contractibility based on the importance of intermediaries in international trade. [Nunn and Trefler \(2011\)](#) explore the varying degree of relationship specificity of different kinds of physical capital, and use new data to take into account U.S. intra-firm imports that are shipped from foreign parents of U.S. subsidiaries. Recent studies use firm-level data to examine empirically the theory of intra-firm trade. [Defever and Toubal \(2007\)](#) and [Corcos et al. \(2008\)](#) provide evidence from France, while [Kohler and Smolka \(2009\)](#) provide evidence from Spain. These studies

⁴ We take the property-rights approach to study the determinants of vertical integration. The determinants of multinational firm boundaries can be analyzed by other theories of the firm. Existing research has applied the incentive-systems approach of [Holmstrom and Milgrom \(1994\)](#), and the authority-delegation approach of [Aghion and Tirole \(1997\)](#) to study the general equilibrium patterns of foreign integration and outsourcing. For the incentive-systems approach, see [Grossman and Helpman \(2004\)](#), among others. For the authority-delegation approach, see [Marin and Verdier \(2008, 2009\)](#) and [Puga and Trefler \(2003\)](#), among others.

⁵ Seminal work includes [McLaren \(2000\)](#), [Antràs \(2003, 2005\)](#), [Grossman and Helpman \(2002, 2003, 2004, 2005\)](#), [Antràs and Helpman \(2004, 2008\)](#). See [Helpman \(2006\)](#) for a summary of the theoretical literature, and [Hummels et al. \(2001\)](#) for the evidence of the tremendous growth of trade in intermediate inputs. More recent studies include [Conconi et al. \(2008\)](#) and [Ornelas and Turner \(2009\)](#), among others. See [Antràs \(2011\)](#) for a survey of the literature.

⁶ There is also a literature that studies the spatial determinants of FDI, such as supplier and market access. See, among others, [Head and Mayer \(2004\)](#) for evidence from Europe and [Amiti and Smarzynska Javorcik \(2008\)](#) for evidence from China. Our analysis abstracts away from these spatial determinants.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات