



## Global sourcing and firm selection<sup>☆</sup>



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### HIGHLIGHTS

- We present novel firm-level empirical evidence on global sourcing behavior.
- We identify firms' self-selection into vertical integration and offshoring.
- Firms that are more productive ex ante tend to select vertical integration.
- Firms that are more productive ex ante tend to select offshoring.

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### ABSTRACT

We analyze the sourcing strategies of firms active in the Spanish manufacturing sector. We show that firms that select strategies of vertical integration and of foreign sourcing ex post tend to have been more productive, ex ante, than other firms.

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## 1. Introduction

The sourcing of inputs is of key importance for a firm's success. Firms decide about the location of sourcing (foreign vs. domestic) as well as the ownership structure of sourcing (vertical integration vs. outsourcing). Which firms select which sourcing strategy remains an open question. This letter provides novel empirical evidence on this question by exploring the relationship between *pre-existing* productivity differentials across manufacturing firms in Spain and *subsequent selection* into different sourcing strategies.

We use data from the "Encuesta Sobre Estrategias Empresariales" (ESEE) from 2006 to 2011 to investigate whether firms select their sourcing strategy based on their productivity. We find evidence that firms that select strategies of vertical integration and

of foreign sourcing ex post tend to have been more productive, ex ante, than other firms.

These findings are important because they help discriminate between competing theories of sourcing. They lend support to the influential sourcing model developed by Antràs and Helpman (2004) (AH). The AH model adopts a property rights view of the firm in the global economy, in the tradition of Grossman and Hart (1986) and Hart and Moore (1990); see Antràs (2014) for a survey. In the model, incomplete contracts and relationship-specific inputs give rise to a hold-up problem between a headquarter firm and its input supplier. Firms can minimize the efficiency loss arising from the hold-up problem by deciding about the ownership structure of their sourcing.

Our paper lends empirical support to this idea, because the AH model predicts the pattern of firm selection identified in our data, provided that certain assumptions are met. Critical among these assumptions is that vertical integration demands a higher fixed cost of sourcing than outsourcing (conditional on the sourcing location), and accordingly for foreign sourcing compared to domestic sourcing. Since other models of sourcing (e.g. the incentive system approach proposed by Grossman and Helpman (2004)) have alternative predictions on the precise pattern of firm selection, our results provide indirect support for the AH model, as well as for the configuration of fixed costs assumed in Antràs and Helpman (2004).

The identification of firm selection based on productivity is also interesting in its own right, because it points to aggregate productivity effects. Changes in the costs of operating a strategy of vertical integration or of outsourcing, domestically or abroad, have the potential to change the aggregate productivity of an industry, by analogy to the selection effects of trade and foreign direct investment discussed in Melitz (2003) and Helpman et al. (2004).

The evidence on firm selection into different sourcing strategies is mixed. Using French firm-level data, Defever and Toubal (2013) find that more productive firms are less likely to obtain inputs through intra-firm imports, while the opposite is true for Corcos et al. (2013). Evidence for a productivity premium on vertical integration as well as on offshoring is reported in Federico (2010, 2012) for Italian firms, by Tomiura (2007) for Japanese firms and in Kohler and Smolka (2011, 2012) for Spanish firms. However, none of these studies exploits time series information to address firm selection, thus leaving causality an open issue. Using time series information, Fariñas et al. (2010) and Wagner (2011) find evidence of productivity-based firm selection into foreign sourcing, but they do not address the ownership structure.

## 2. Data and econometric model

ESEE is a longitudinal dataset of Spanish manufacturing firms with 10 or more employees. There are at least three advantages of using ESEE data for this work. The first is its representativeness. The initial selection of firms in 1990 was carried out through a two-way sampling scheme, distinguishing between large firms (more than 200 employees; exhaustive sampling) and small firms (10–200 employees; stratified, proportional, and systematic sampling with a random seed). Subsequent sampling was carried out in a way that preserves representativeness of the sample with respect to the Spanish manufacturing sector with 10 or more employees.<sup>2</sup>

The second advantage of this dataset is its level of detail. The ESEE survey collects a large set of firm characteristics, including firms' main activities, their accounting statements, as well as

information on their customers and suppliers. Information on output and the use of labor as well as capital allow for firms' productivity to be estimated using the Olley and Pakes (1996) estimation algorithm. Details on this estimation are relegated to Appendix A. Of special importance for the present purpose, the survey asks firms:

- Of the total amount of purchases of goods and services that you incorporate (transform) in the production process, indicate – according to the type of supplier – the percentage that these represent in the total amount of purchases of your firm in [year].
  - (a) Spanish suppliers that belong to your group of companies or that participate in your firm's joint capital. [yes/no]/[if yes, then percentage rate]
  - (b) Other suppliers located in Spain. [yes/no]/[if yes, then percentage rate]
- For the year [year], indicate whether you imported goods and services that you incorporate (transform) in the production process, and the percentage that these imports – according to the type of supplier – represent in the total value of your imports. [yes/no]
  - (a) From suppliers that belong to your group of companies and/or from foreign firms that participate in your firm's joint capital. [yes/no]/[if yes, then percentage rate]
  - (b) From other foreign firms. [yes/no]/[if yes, then percentage rate]

We thus distinguish between foreign integration (*FI*), foreign outsourcing (*FO*), domestic integration (*DI*) and domestic outsourcing (*DO*). In 2011, 5.0% of small firms and 34.1% of large firms have relied on *FI*. The corresponding numbers are 40.2% and 70.1% for *FO*, 10.9% and 33.6% for *DI*, and 93.6% and 93.5% for *DO*. Thus, the sourcing strategies are not mutually exclusive, but appear complementary to one another (Kohler and Smolka, 2011).

The third advantage of our data are its panel structure and time horizon. Firms rarely change their sourcing from one year to another. This means that a relatively long time horizon is essential in order to have sufficient variation (“switching” vs. “non-switching” firms) in the data that can be exploited for identification purposes. ESEE data on both dimensions of sourcing (location and ownership structure) has been collected for six consecutive years from 2006 to 2011. The average number of sourcing strategies used in 2006 was 1.37 for small firms and 2.11 for large firms. In 2011, the same numbers were 1.50 and 2.31, respectively. This trend towards a stronger fragmentation of the production process was largely driven by firms adding either *FI* or *FO* to their existing sourcing portfolios.

We use regression analysis to compare the ex ante productivity across firms that select the same sourcing strategy in period  $v - 1$  (the pre-selection period), but select different sourcing strategies in period  $v$  (the selection period). For any given firm, each year from 2006 to 2010 may appear as a pre-selection period  $v - 1$ , and each year from 2007 to 2011 may appear as a selection period  $v$ . This gives five potential realizations of  $\{v - 1, v\}$ -pairs per firm, each corresponding to a pair of consecutive calendar years. We index these pairs by  $t = 1, \dots, 5$ , firms by  $i$  and industries by  $s$ . A generic version of our model then looks as follows:

$$\theta_{i,v-1}(t) = \beta^z \sigma_{i,v}^z(t) + \boldsymbol{\gamma} \cdot \mathbf{X}_{i,v-1}(t) + \delta_s(t) + \varepsilon_{i,v-1}(t),$$

with  $i \in \Omega^z$ , (1)

where  $\theta_{i,v-1}(t)$  is the log of firm  $i$ 's pre-selection productivity at  $t$ ,  $\sigma_{i,v}^z(t)$  is an indicator variable (the selection variable), equal to one if the firm newly selects into the sourcing strategy of interest in the selection period corresponding to  $t$  and equal to zero otherwise,  $\mathbf{X}_{i,v-1}(t)$  is a vector of firm-level control variables (with a corresponding vector of parameters  $\boldsymbol{\gamma}$ ),  $\delta_s(t)$  is a fixed effect specific to industry  $s$  and time  $t$ , and  $\varepsilon_{i,v-1}(t)$  is an error term with zero conditional mean. We assume that observations are

<sup>2</sup> More information on ESEE data and its sampling properties are available at <http://www.fundacionsepi.es/esee/en/epresentacion.asp> (accessed on 25/10/2013).

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