



## Organizing the global value chain: A firm-level test

Davide Del Prete<sup>1</sup>, Armando Rungi\*

IMT Lucca, Italy



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### ABSTRACT

In this paper, we study the organization of Global Value Chains on a sample of about 4000 manufacturing parent companies integrating more than 90,000 affiliates in 150 countries. Assuming a technological sequence of production stages, a recent property rights framework (Antràs and Chor, 2013; Alfaro et al., 2015) predicts that vertical integration decisions are crucially based on both the position of a supplier along the chain and on the relative size of demand elasticities faced by the final-good producer and the supplier. In line with this, we find that if final demand is sufficiently elastic (inelastic), *downstream* parents, i.e. final-good producers, integrate production stages that are more proximate to (far from) final demand. However, this result is not valid in the case of *midstream* parents, i.e. producers of intermediate inputs that can integrate either backward or forward along the chain. We document that these companies are at least as common as are *downstream* parents, but the existing theory neglects them. In these cases, we find that demand elasticities do not play a significant role in integration choices. Interestingly, both *midstream* and *downstream* parents tend to integrate affiliates that are more proximate in segments of a supply chain, probably due to technological complementarities in adjacent industries.

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### 1. Introduction

Since the late 80s, technological progress and a decrease in trade barriers have fostered the fragmentation of production on a global scale.<sup>2</sup> Networks of firms have emerged across national borders along virtually international assembly lines. From the product design to the distribution to consumers, all intermediate stages of production could be ordered in technological sequences and dispersed in several countries. Each production stage along a supply chain can be organized in two alternative ways: either keeping the stage within a corporate boundary, in case of vertical integration, or outsourcing it and engaging in arm's length contracts.

The aim of this paper is to test how firms shape the organization of Global Value Chains (GVCs). According to recent property rights frameworks<sup>3</sup> (Antràs and Chor, 2013; Alfaro et al., 2015), an optimal allocation of ownership rights along the supply chain depends crucially on positions of suppliers along the sequence and on the relative size of elasticities of final demand when compared to the elasticity of substitution across production stages. Reasonably, the theory assumes that a downstream stage cannot commence if an upstream stage does not deliver an input; therefore, contractual frictions may be present along supply chains. In fact, all intermediate producers and the final producer have to rely on a partition of the surplus extracted from the sale of the final good. Outsourcing provides suppliers with better incentives to invest in quality, but integration provides the firm with a better bargaining position by virtue of its residual rights of control. In this framework, a relation-specific investment made by any upstream

\* Corresponding author at: Laboratory for the Analysis of Complex Economic Systems, Piazza San Francesco 19, 55100 Lucca, Italy.

E-mail addresses: [davide.delprete@imtlucca.it](mailto:davide.delprete@imtlucca.it) (D. Del Prete), [armando.rungi@imtlucca.it](mailto:armando.rungi@imtlucca.it) (A. Rungi).

<sup>1</sup> Laboratory for the Analysis of Complex Economic Systems, Piazza San Francesco 19 - 55100 Lucca, Italy.

<sup>2</sup> See Baldwin and Lopez-Gonzalez (2014) and, previously, Hummels et al. (2001) for a discussion on the relevance of the phenomenon and on the structural economic changes it entails.

<sup>3</sup> For a review of the successful story of the property rights framework applied to the theory of the firm, see Aghion and Holden (2011). They retrace how Coase (1937) initiated, Williamson (1971, 1975, 1979) followed, and, finally, Grossman and Hart (1986) carved the theory of the firm in economic literature, when using theoretical models of incomplete contracts to understand what determines a firm's boundaries.

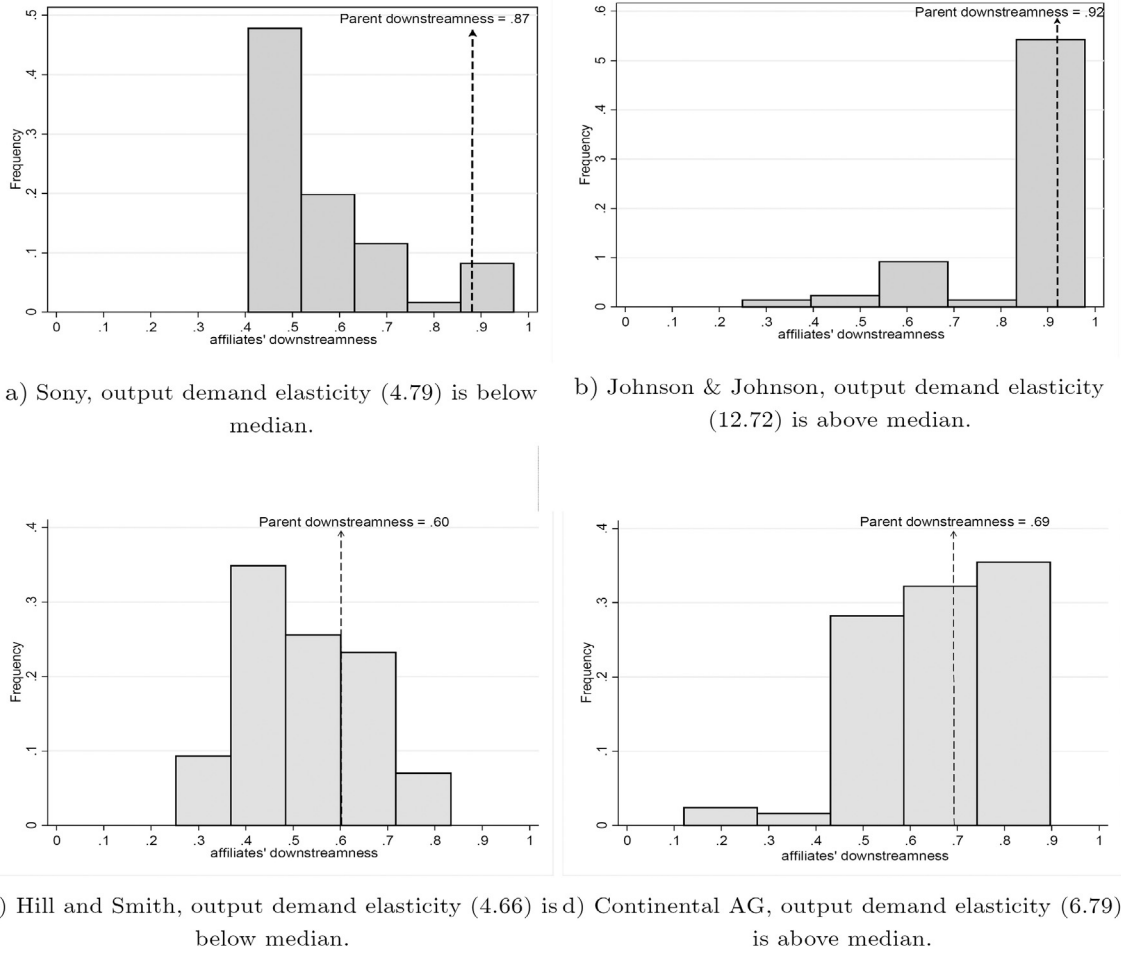


Fig. 1. Cases of downstream and midstream parents: determinants of integration.

supplier can affect incentives to invest by downstream suppliers. Eventually, the main prediction is that a firm integrates the production stages that are more proximate to (far from) the final consumer, if the demand for its product is sufficiently elastic (inelastic).

We find that the theory is valid for producers of final goods (i.e., *downstream parents*), starting integration backward from the bottom of a supply chain. However, we document that *midstream parents* are at least as common as are *downstream parents*. Indeed, we may think of many real-world cases of companies whose main output is an intermediate and not a final product, and can integrate other intermediate producers, both backward and forward. In this case, we find that the role of demand elasticities as a driver of integration is less relevant.

More interestingly, we find that both *downstream* and *midstream parents* systematically prefer to integrate production stages that are proximate along segments of the supply chain. The latter finding is robust across different specifications and several robustness checks. We point to a role for technological determinants that may be as important as are contracting frictions in shaping the organization of GVCs, for which extensions of the theory may be needed. We presume that economies of scope exist when companies coordinate production stages that share technological characteristics in adjacent industries, while sourcing dissimilar stages from arm's length suppliers.

To grasp the essential aspects of our findings, let us consider two case studies of *downstream parents* and two cases of *midstream parents* sourced from our data, in the upper and bottom panels, respectively, of Fig. 1. For each case, we plot the relative positions on the supply

chain of both the parent company and its affiliates, together with the demand elasticity faced by the parent.<sup>4</sup>

Let us start from *downstream parents*. Sony and Johnson & Johnson control 405 and 353 affiliates, respectively. The former is a group that originated in Japan and is primarily focused on electronics manufacturing. The latter is a US multinational corporation producing medical devices and pharmaceutical products. From our data, both exhibit similar positions (a downstreamness of 0.87 and 0.92, respectively) on the supply chain, but they face different demand elasticities. Following the theoretical predictions by Antràs and Chor (2013) and Alfaro et al. (2015), Sony integrates more upstream, having a relatively lower demand elasticity, whereas Johnson & Johnson integrates more downstream, having a relatively higher demand elasticity.

At the bottom of Fig. 1, Hill & Smith Holdings PLC and Continental AG are *midstream parents* that integrate stages in both directions of the technological sequence. The first is a UK-based group active in manufacturing and supplying infrastructure products. The second is a world leading German producer of tyres, brakes, and other components for the automotive industry. They control 127 and 279 affiliates, respectively. Hill & Smith integrates relatively more upstream, whereas Continental seems to integrate relatively more downstream, but the different propensities toward vertical integration are not as remarkable, as is the closeness between parent and average affiliate position. Thus, they seem to be involved in stages that are proximate on the technological sequence.

<sup>4</sup> Downstreamness metrics are sourced from Antràs and Chor (2013) and demand elasticities from Broda and Weinstein (2006). The boundaries of the firms are taken as at the end of 2012. See Section 3 and the Data Appendix for more details on our data.

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