

The Margins of Global Sourcing: Theory and Evidence from U.S. Firms

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Abstract:

This paper begins by unveiling a series of systematic patterns in the intensive and extensive margins of U.S. imports that suggests that selection into importing is potentially as important in explaining aggregate imports as selection into exporting is in explaining aggregate exports. Our empirical analysis makes use of firm-level import and production data from the U.S. Census Bureau for the year 2007. More specifically, we match detailed information on firm-level imports by country of origin with production and sales data for these firms. We first replicate standard results showing that U.S. firms that record a positive volume of imports appear to be more productive than U.S. firms that source inputs only domestically. We next follow the approach in Bernard et al. (2007, 2009) and decompose aggregate U.S. imports by country of origin into an extensive and intensive margin component, and explore the relative importance of these two margins in explaining the cross-section of U.S. import volumes. We also provide an ‘anatomy’ of U.S. imports along the lines of Eaton et al. (2011). Overall, the results we find very much resonate with those obtained by other authors when studying the intensive and extensive margins of exports. These stylized facts motivate the development of a model in which relatively productive firms self-select into importing from particular markets based on their profitability and country-specific variables that do not affect firms differentially.

Our theoretical framework is a quantifiable multi-country sourcing model in the spirit of Antràs and Helpman (2004). In order to tractably handle multiple sourcing countries for a firm’s importing

decisions, we follow Tintelnot (2013) and embed the stochastic specification of technology of Eaton and Kortum (2002) inside each individual firm. In the model, an industry is populated by a continuum of heterogeneous firms each producing a differentiated final-good variety. Production requires combining intermediate inputs, which can be bought from any country in the world. Nevertheless, adding a country to the set of countries a firm is able to import from requires incurring a market-specific sunk cost. As a result, relatively unproductive firms naturally opt out of importing from certain countries that are not particularly attractive sources of inputs. Once a firm has determined the set of countries from which it has secured the ability to source inputs – which we refer to as its global sourcing strategy – it then learns the various firm-specific efficiency levels with which each input can be produced in each of these ‘active’ countries. These efficiency levels are assumed to be drawn from an extreme-value Fréchet distribution, as in Eaton and Kortum (2002). The model delivers a simple closed-form solution for the profits of the firm as a function of its sourcing potential, which in turn is a function of the set of countries from which a firm has invested in being able to import as well as of the characteristics (wages, trade costs, and average technology) of these countries. The sourcing potential of a firm is an increasing function of the number of countries from which it has gained the ability to source. Intuitively, by enlarging that set, the firm benefits from greater competition among suppliers, and thereby lowers the effective cost of its intermediate input bundle. The choice of a sourcing strategy therefore trades off lower variable cost of production against the greater fixed costs associated with a more complex global sourcing strategy.

A key characteristic of the derived profit function is that the marginal gain in profits associated with adding a country to set of potential sources of inputs generally depends on the number and characteristics of the other countries in this set. This contrasts with standard models of selection into exporting featuring constant marginal costs, in which the decision to service a given market is independent of that same decision in other markets. Whether the decisions to source from different countries are complements or substitutes crucially depends on a parametric restriction involving the elasticity of demand faced by the final-good producer and the Fréchet parameter governing the variance in the distribution of firm-specific input efficiencies across locations. Selection into importing features complementarity across markets, whenever demand is relatively elastic (so profits are particularly responsive to variable cost reductions) and whenever input efficiency levels are relatively heterogeneous across markets (so that the reduction in expected costs achieved by adding an extra country in the set of active locations is relatively high).

Conversely, when demand is inelastic or input efficiency draws are fairly homogeneous, the addition of country to a firm's global sourcing strategy instead reduces the marginal gain from adding other locations. In such a situation, the problem of the firm optimally choosing its sourcing strategy is extremely hard to characterize, both analytically as well as quantitatively, since it boils down to solving a combinatorial problem with 2^J elements with little guidance from the model.

The case with complementary sourcing decisions turns out to be much more tractable and delivers sharp results reminiscent of the broad patterns discussed above. In particular, in that case, we can use standard tools from the monotone comparative statics literature to show that the sourcing strategies of firms follow a strict hierarchical structure in which the number of countries in a firm's sourcing strategy is (weakly) increasing in the firm's core productivity level. Furthermore, we can show that the number of firms sourcing from a particular country is (weakly) increasing in the cost attractiveness of that location, with that attractiveness being shaped by the wages, technology, transport costs and fixed costs of offshoring associated with that sourcing location.

We are currently in the process of structurally estimating the model and performing counterfactual exercises.