



Do firms benefit equally from trade in inputs?

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As intermediate inputs account for two-thirds of world trade, understanding the mechanisms driving this specific component of global trade and their implications in terms of welfare is crucial. The authors show that micro-data for foreign input spending patterns at the firm-level is key to quantifying the welfare consequence of input trade, as trade in intermediates allows firms to reduce their costs of production thereby benefiting the aggregate economy. In an application of this methodology to the French economy, it appears that the gains from input trade at the firm level are highly skewed: while the median French importer would see its unit costs increase by 11.2% if it lost access to international input markets, the 10% most affected firms would experience unit cost increases larger than 85%. Overall, input trade reduces the prices of manufacturing products by 27% and the aggregate price index by 9%.

Understanding the links between trade, aggregate productivity and eventually welfare is one of the major challenges in international economics. Because intermediate inputs account for about two-thirds of the volume of world trade, understanding the mechanisms underlying firms' import strategies and their implications for the gains from trade is particularly important.

Several articles have shown that improved access to foreign inputs has had a positive impact on firms' productivity in different countries such as Hungary (Halpern et al., 2015) or India (Goldberg et al., 2010). An important second step in this research agenda is to investigate the underlying mechanisms through which imports increase productivity. To evaluate the welfare and redistributive implications of trade policies, we need to understand which firms gain most, through what channels and how the effects depend on the economic environment. In this issue of *Rue de la Banque*, we present the methodology that we have designed in recent research (Blaum et al., 2018a and 2018b) to answer these questions.

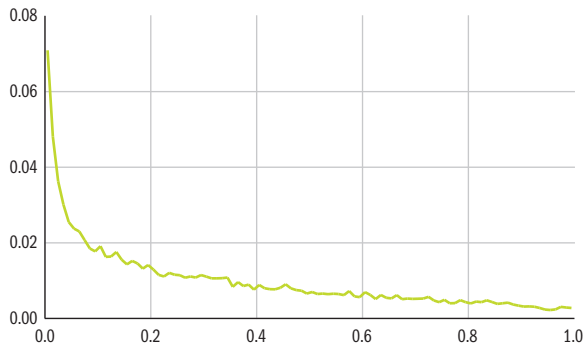
The principal quantitative models of global trade and their limitations

International trade benefits consumers by lowering the prices of the goods they consume. In this respect, an important distinction is that between trade in final goods and trade in intermediate inputs: while the former benefits consumers directly, the latter operates only indirectly. By allowing firms to access novel, cheaper or higher quality inputs from abroad, input trade reduces firms' production costs and thus the prices of locally produced goods.

Most standard models of firm-level trade study the decision of exporters, i.e. of firms selling directly to final consumers (Melitz, 2003). It is not straightforward to adapt these frameworks to analyse firms' import behaviour, because they rely strongly on the fact that firms' unit costs are independent of the number of countries they export to. In contrast, a firm decides to import precisely to lower its (quality adjusted) unit cost of production. As a result, the decision to import from one country affects whether and how much the firm will

C1 Import intensities across French manufacturing firms

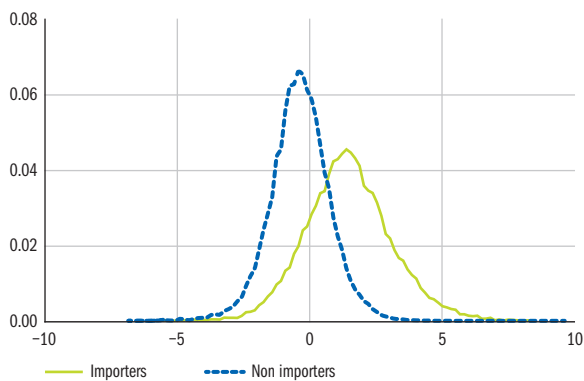
(x-axis: import intensity in %; y-axis: fraction of firms in %)



Source: Blaum et al. (2018a).
 Note: Import intensities correspond to the share of material spending allocated to foreign varieties of an input.

C2 The relative size of French importers vs. non-importers

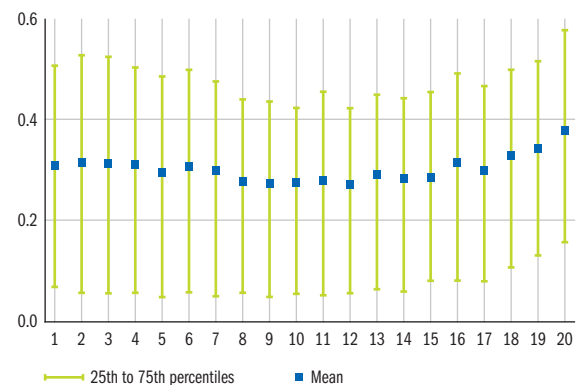
(x-axis: Log value added (% difference vs. sector average); y-axis: fraction of firms)



Source: Blaum et al. (2018a).
 Note: Manufacturing firms only.

C3 French firm size and import intensity: an essentially flat relationship

(x-axis: quantiles of value added (20 categories); y-axis: import intensity in %)



Source: Blaum et al. (2018a).

import from other countries. Foreign sourcing decisions are therefore interdependent across markets, making a model about importing much more complicated to solve theoretically and to estimate empirically (Blaum et al., 2018b and Antràs et al., 2017).

The literature has taken two different approaches to bypass this problem. First, the frameworks used in Eaton, Kortum and Kramarz (2011), Caliendo and Parro (2015) or Costinot and Rodríguez-Clare (2012) share the convenient feature that firms' import intensities are equalised across firms, such that the impact of input trade on consumer prices can be measured easily with just aggregate data.

However, our data, which encompass the entire population of French manufacturing firms between 2001 and 2006,¹ show that import intensities are highly heterogeneous across firms (see Chart 1), which questions the empirical relevance of these quantitative frameworks.

A second set of papers has considered frameworks that generate heterogeneity in import behaviour across firms and which can be solved under particular assumptions that limit the degree of interdependence in sourcing decisions. These frameworks predict a perfect positive correlation between firm size and import intensity (see for example Gopinath and Neiman, 2014 or Ramanarayanan, 2012). They also imply that all importers are larger than firms sourcing only domestic inputs. The data show, however, that many importers are small. The distributions of the sizes (in terms of value added) of importers and non-importers broadly overlap (see Chart 2), and the correlation between firm size and import intensity is slightly positive but far from perfect (see Chart 3).

Bypassing model complexity thanks to detailed micro-data

In our research, we provide a methodology to measure the effect of input trade on consumer prices in environments featuring many dimensions of firm heterogeneity, thus allowing a close fit with the micro-data. In particular, we show that changes in consumer prices can be computed from firm-level data on domestic expenditure shares and value added.

¹ Our dataset thus contains 170,000 firms, of which 38,000 are importers.

By relying on firms' observable domestic shares, we circumvent the need to structurally estimate a particular model. Moreover, our methodology does not require information on the prices and qualities of foreign inputs, nor how firms find their suppliers, e.g. whether importing is limited by fixed costs or a process of network formation. This implies that, perhaps surprisingly, many potentially heterogeneous aspects of firms' import behaviour, such as the number of supplier countries or the distribution of spending across trading partners, are irrelevant for the link between input trade and consumer prices.

Quantifying the gains from input trade in France

The intuition behind this result is simple. By inverting firms' demand system for intermediate inputs, we can link each firm's unit cost to its spending pattern on foreign vs. domestic inputs. When such a demand system is CES (constant elasticity substitution), the unit cost reduction from importing can be recovered from the observable share of expenditure on domestic input varieties: a low domestic share (high import intensity) indicates that the firm benefits substantially from input trade. In this respect, Chart 1 shows that the gains from input trade are heterogeneous at the micro-level. Table 1 documents the distribution of these unit cost reductions for the population of French importers: while the median importer would see its unit costs increase by 11.2% if it lost access to international input markets, the 10% most affected firms would experience unit cost increases larger than 85%.

To correctly aggregate these firm-level gains to the level of the entire French economy, one needs to know each firm's relative importance in the economy. In a multi-sector general equilibrium trade model with inter-sectoral linkages, we show that the aggregate effect of input trade on the consumer price index is akin to a value-added weighted average of the firm-level gains.

T1 Unit cost reductions across French importing firms

(%)

Percentile of distribution	Unit cost reduction
10th	0.6
50th	11.2
70th	33.7
90th	85.7
Mean	24.9

Source: Blaum et al. (2018a).

Note: Manufacturing firms only, observed between 2001 and 2006.

Hence, a key aspect of the data is how firm size and domestic shares correlate; if bigger firms feature lower domestic shares (i.e. higher import intensities), the aggregate effects of input trade will turn out to be large.

The extent to which this is the case in France is depicted in Chart 3. Conditional on importing, the relationship between import intensity and size is essentially flat and there is substantial dispersion in import shares conditional on size. In Blaum et al. (2018b), we further document that this flat relationship between size and import shares is due to two offsetting forces. On the one hand, larger firms tend to source from more countries, which tends to push import shares up. On the other hand, holding the number of markets constant, larger firms tend to source disproportionately more from their top suppliers, including France. This implies that larger firms benefit significantly less than predicted in the standard quantitative models of input trade, and that the aggregate gains at the level of the French economy are also lower.

We find that consumer prices of manufacturing products would be 27% higher if French firms were not allowed to source intermediate inputs from abroad (see Table 2). An analysis based on aggregate data would overestimate this change in consumer prices by about 3 percentage points, i.e. 10% of the correct price effect. Interestingly, our estimate of the impact of input trade on consumer prices in the manufacturing sector exceeds vastly the median firm-level gains in Table 1. There are three reasons to explain this finding. First, the dispersion in firm-level gains (see Table 1) is valued by consumers given their elastic demand (analogously to Broda and Weinstein, 2006). Second, the weak but positive relation between import intensity and firm size, shown in Chart 3, is beneficial because the endogenous productivity gains from importing and firm efficiency are complements. Third, there are important input/output linkages between firms whereby non-importers buy intermediates from importing firms, thus lowering the

T2 Estimated impact of input trade on consumer prices

(price effect in % and bias in percentage points)

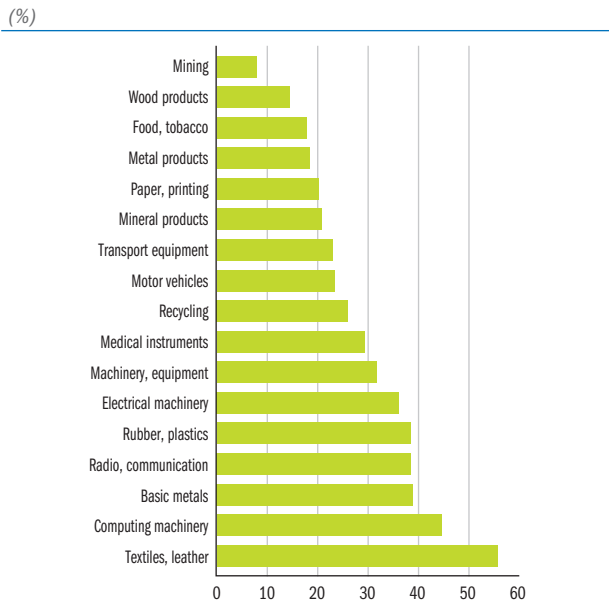
	Manufacturing sector	Overall economy
Gains from input trade	27.5	9.0
Bias when relying on aggregate data only	3.3	0.9

Source: Blaum et al. (2018a).

Note: Price effect in % (and bias in percentage points) estimated on French data for the years 2001 to 2006.

unit cost of production of non-importing firms through general equilibrium effects.

C4 Decline in consumer prices caused by input trade, by industry



Source: *Blaum et al. (2018)*.

The aggregate results in Table 2 also hide substantial industry level heterogeneity, as depicted in Chart 4: the impact of input trade on consumer prices appears to be lowest in the mining industry (7.8%) and highest in the textile industry (55.6%). Our computations also show that the bias of standard aggregate models reaches 80% in the motor vehicles and computing machinery industries while it is negative in the transport equipment industry, where gains from input trade would be under-estimated by 23%.

Trade policy implications

In globalised economies, information about the costs, benefits, and distributional consequences of lowering trade barriers is essential to policymakers trying to decide if a particular agreement should be supported (Jean, Martin and Sapir, 2018). Our work shows how firms’ ability to import inputs allows them to lower their costs and prices, which in turn makes them more competitive, both at home and abroad. As a result, impediments to firms’ imports (be they European or US based) would raise their production costs, making it harder for them to export and raising the overall price index faced by domestic consumers.

References

Antràs (P.), Fort (T.) and Tintelnot (F.) (2017)

“The margins of global sourcing: theory and evidence from US firms”, *American Economic Review*, Vol. 107, No 9, pp. 2514-2564.

Arkolakis (C.), Costinot (C.) and Rodríguez-Clare (A.) (2012)

“New trade models, same old gains?”, *American Economic Review*, Vol. 102, No 1, pp. 94-130.

Blaum (J.), Lelarge (C.) and Peters (M.) (2018a)

“The gains from input trade with heterogeneous importers”, *American Economic Journal: Macroeconomics*, Vol. 10, No 4, pp. 77-127.

Blaum (J.), Lelarge (C.) and Peters (M.) (2018b)

“Firm size and the intensive margin of import demand”, *Journal of International Economics*, forthcoming.

Broda (C.) and Weinstein (D.) (2006)

“Globalization and the gains from variety”, *Quarterly Journal of Economics*, Vol. 121, No 2, pp. 541-585.

Caliendo (L.) and Parro (F.) (2015)

“Estimates of the trade and welfare effects of NAFTA”, *The Review of Economic Studies*, Vol. 82, No 1, pp. 1-44.

Costinot (A.) and Rodríguez-Clare (A.) (2014)

“Trade theory with numbers: quantifying the consequences of globalization”, *Handbook of International Economics*, G. Gopinath, E. Helpman and K. Rogoff (eds.), Vol. 4, pp. 197-261.

Eaton (J.), Kortum (S.) and Kramarz (F.) (2011)

“An anatomy of international trade: evidence from French firms”, *Econometrica*, Vol. 79, No 5, pp. 1453-1498.

Goldberg (P. K.), Khandelwal (A. K.), Pavcnik (N.) and Topalova (P.) (2010)

“Imported intermediate inputs and domestic product growth: evidence from India”, *The Quarterly Journal of Economics*, Vol. 125, No 4, pp. 1727-1767.

Gopinath (G.) and Neiman (B.) (2014)

“Trade adjustment and productivity in large crisis”, *American Economic Review*, Vol. 104, No 3, pp. 793-831.

Halpern (L.), Koren (M.) and Szeidl (A.) (2015)

“Imported inputs and productivity”, *American Economic Review*, Vol. 105, No 12, pp. 3660-3703.

Jean (S.), Martin (P.) and Sapir (A.) (2018)

“Avis de tempête sur le commerce international : quelle stratégie pour l'Europe?”, *Les notes du Conseil d'analyse économique*, No 46.

Melitz (M. J.) (2003)

“The impact of trade on intra-industry reallocations and aggregate industry productivity”, *Econometrica*, Vol. 71, No 6, pp. 1695-1725.

Ramanarayanan (A.) (2012)

“Imported inputs and the gains from trade”, 2012 *Meeting Papers*, No 612, Society for Economic Dynamics.

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