



# Static and dynamic gains from costly importing of intermediate inputs: Evidence from Colombia



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## ABSTRACT

This paper investigates the long-term effect of importing intermediate inputs on firm revenue and productivity, by estimating a dynamic model of firms' endogenous importing decisions with random sunk and fixed costs of importing. Based on counterfactual analysis, the model decomposes the gains from importing into a static revenue effect, resulting from improved quality and variety of available inputs, and a dynamic productivity effect, resulting from improved productivity. Empirical results from a Colombian plant-level dataset show that both the static and dynamic effects are important sources of gains from importing. It is also shown that the two types of trade liberalization, either by reducing the import tariff or by reducing sunk and fixed costs of import, both have a substantial impact on firm value.

## 1. Introduction

This paper examines the long-term effect of importing intermediate inputs on firm performance and quantitatively evaluate the relative importance of its effect through immediately increased revenue and dynamically increased productivity, by estimating a dynamic model of endogenous importing decisions at the firm level with random sunk and fixed costs of importing. The idea of this paper is motivated by two basic facts observed in a plant-level panel data from Colombia. First, firms that are importing intermediate inputs have much higher labor productivity than those not. Second, firms' labor productivity jumps up when they start importing and jumps down when they stop importing. Both of these two facts suggest labor productivity is positively correlated with importing behavior. This is consistent with existing literatures in international trade, which document a strong and positive correlation between productivity and importing. For example, using cross-country macro data, it is shown that countries more actively participating in importing have higher productivity levels and productivity growth rates (Coe and Helpman, 1995; Coe et al., 1997; Eaton and Kortum, 2002; Acharya and Keller, 2009).<sup>1</sup> Keller (2004) has a review of the literature before 2004. Using recently available firm- or plant-level data it is shown that firm-level productivity are positively related to firms' importing behavior (Halpern et al., 2011; Bernard et al., 2009; Blalock and Veloso, 2007; Amity and Konings, 2007; Kasahara and Rodrigue, 2008; Vogel and Wagner, 2010; Khandelwal and Topalova, 2011).

In general, there are three possible explanations to this observed positive correlation between importing and productivity. First, the productivity difference between importers and non-importers may be due to *self selection* of firms to import intermediate inputs. That is, more productive firms are more likely to import, as documented in Vogel and Wagner (2010). Second, importing may increase firm revenue immediately through increased quality and variety of available inputs, which improves firm performance, as documented in Kasahara and Rodrigue (2008), Goldberg et al. (2009), Goldberg et al. (2010), and Halpern et al. (2011). This revenue effect can increase the measured total factor productivity (TFP) of importing firms and it can happen even when the firm

<sup>1</sup> Earlier studies such as Ethier (1982), Romer (1990), and Grossman and Helpman (1991) also find such a positive correlation.

productivity/technology is not changed. We refer to this static revenue effect of importing as *static effect* throughout this paper. This static quality and variety effect is directly associated with the usage of imported inputs. Once a firm stops importing, it cannot benefit from it anymore. Third, importing experience may also have an impact on firms' productivity, which in turn influences firms' future importing decisions and productivity. I will call the effect from this productivity-importing interaction *dynamic effect* in this paper. This effect can arise from several different channels. For example, importing firms have more exposure to foreign knowledge and technology, which directly increase firms' knowhow about production. This change of knowledge can directly change firms' productivity in the future (e.g. to reduce shutdown of production line). Importing firms also usually receive some technical supports from their foreign suppliers, which directly changes their knowledge about production and will have a long-term impact in the future. Moreover, importing can also incur firms to invest more in R&D possibly due to the newly available inputs and newly available knowledge from abroad which help the firm to reduce the cost of innovation and/or increase its chances of a successful R&D. This increased R&D investment due to importing can also increase firm productivity in the future. The term dynamic effect will contain all these productivity-importing interaction results, including the direct effect of importing on future productivity and the indirect effect of importing on future productivity through induced R&D investment and other forms of investments.<sup>2</sup> In either of the three cases, we would observe a positive correlation between importing and productivity. A key implication is that we need to estimate firms' endogenous importing decisions and account for both static revenue effect and dynamic productivity effect of importing simultaneously, in order to consistently evaluate the long-term and short-term effects of a change of importing policy, such as a reduction of importing barrier.

This paper estimates a dynamic structural model of firms' endogenous decisions on whether to import intermediate inputs or to rely exclusively on domestically supplied inputs, and quantifies its static effect and dynamic effect on firm value separately. In the model, firm productivity evolves endogenously. The productivity, along with random fixed and sunk costs of importing and other factors, determines firms' importing decisions. The importing decisions, in turn, have a dynamic effect on the future productivity of the importing firms. The model provides an approach to estimating the short-term impact of importing on profit directly and simulating the long-term impact of import expansion on firm performance. Based on this dynamic structural model, as one contribution of this paper, we can use counterfactual analysis to separately quantify the static effect and dynamic effect of importing in terms of increased firm value, which is defined as the accumulated future profit. As specified in the model, the static effect, which results from improved quality and variety of intermediate inputs due to importing, increases current profit immediately. The dynamic effect, resulting from improved productivity due to importing, enhances future profitability. As part of the model I also estimate the dynamic policy function of plants' optimal importing decisions, which depends on expected future profits and current fixed or sunk costs of importing.

The import decisions, as mentioned above and also discussed in [Andersson et al. \(2008\)](#) and [Kasahara and Rodrigue \(2008\)](#), are usually associated with sunk and fixed costs, besides the usual transaction price. First-time importers need to learn customs procedures, search for potential foreign suppliers, testing whether the good matches current production line, negotiation, contract formulation etc. These cost could be high, especially considering the long distance and potential differences in language, business culture, legal system etc. Continuing importing is also associated with fixed costs due to custom documents, administration fees for custom clearance, business relationship maintenance, quality inspection etc. In the presence of import restriction such as during the data period in Colombia, importers also need to pay additional costs to get the import license and overcome the trade friction. All of these will be reflected as sunk and fixed costs of importing and they may have a substantial impact on individual firm's import decisions. One second purpose of this paper is to evaluate how trade policies influence the import participation, productivity, and long-term payoff to individual firms by reducing/increasing the sunk and fixed costs of importing.

I estimate the dynamic model structurally using a plant-level data set from Colombia. It is shown that importing increases both the within-plant current period revenue and future productivity substantially, lending evidence to the existence of both static and dynamic effects of importing. Among all four industries investigated in this paper, being an importing firm increases its current-year revenue positively by a lowest 22.47% in the other metal products industry and a highest 29.98% in the printing and publishing industry, indicating clear evidence of a static effect of importing based on quality and variety effect. At the same time, being an importer increases within-firm productivity in the next period positively from a lowest 0.54% in the printing and publishing industry to a highest 5.80% in the structural metal products industry. This positive productivity effect, on one hand, will be (partly) carried over to future periods through the Markov productivity evolution process. On the other hand, the increased productivity will also affect the firm's importing decisions for the future, which further have an impact on future productivity. Both of these two channels suggest a dynamic productivity effect of importing. The estimation result also shows more productive firms tend to participate in importing of intermediate inputs.

In the first counterfactual exercise, I evaluate the total gains to firms from importing and the relative contribution through the static revenue effect and dynamic productivity effect. I simulate the within-firm total gains from importing, defined as the difference between the firm value in the data and that in a conjectured autarky economy when firms are not allowed to import, for each of the four industries. Results suggest the total gains from importing are substantial and both static and dynamic effects are important sources of gains from importing intermediate inputs. It is shown that importing access in the data increases firm value significantly, by 11.92–23.79% in the four industries. It arises from immediately increased revenue and dynamically increased productivity,

<sup>2</sup> It will be great if we can evaluate the relative importance of these different channels of dynamic productivity effect. Unfortunately, without detailed information on technical supports received by individual importing firms and firm-level R&D in the Colombia data, which is used in the empirical study, we are unable to distinguish the relative importance of these channels. This could be an interesting topic for future research. In this paper, the dynamic productivity effect thus contains the total productivity effect of importing from all these channels.

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