



The asymmetric effects of tariffs on intra-firm trade and offshoring decisions^{☆,☆☆}



Federico J. Díez

Federal Reserve Bank of Boston, United States

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ABSTRACT

This paper studies the effects of tariffs on intra-firm trade. Building on the Antràs and Helpman (2004) North–South theoretical framework, I show that higher Northern tariffs reduce the incentives for outsourcing and offshoring, while higher Southern tariffs have the opposite effects. I also show that increased offshoring and outsourcing imply a decrease in the ratio of Northern intra-firm imports to total imports, an empirically testable prediction. Using a highly disaggregated dataset of U.S. (the North) imports and relevant U.S. and foreign tariffs, I find robust evidence to support the model's predictions.

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1. Introduction

International trade and foreign direct investment are among the fastest growing economic activities (Helpman, 2006). At the heart of these phenomena is offshoring—the movement of production activities overseas.¹ Offshoring always involves international trade, but these trade flows can take two forms: if an offshoring firm is vertically integrated it engages in intra-firm trade, while if the offshoring firm decides to outsource (to work with an independent supplier) it engages in arm's-length trade. It is very important to have a good understanding of this because almost half of U.S. imports take place within the

boundaries of multinational firms. Indeed, during the period from 2000 to 2009, intra-firm imports accounted, on average, for 47.1% of total imports. In this paper, I explore two novel features about U.S. intra-firm imports.

First, U.S. intra-firm imports depend positively on U.S. tariffs; that is, U.S. industries with low tariffs show relatively less intra-firm imports than industries with higher tariffs. Fig. 1 provides some graphical evidence for this fact. Industries were clustered in bins according to the tariff values, using U.S. data averaged over the period 2000–2009. As the figure confirms, there is a positive relationship between U.S. tariffs and the share of U.S. intra-firm imports.

Second, U.S. intra-firm imports depend negatively on foreign tariffs. In other words, U.S. imports originating from countries that impose relatively high tariffs include a smaller fraction of intra-firm imports than those coming from countries with lower tariffs. Fig. 2 provides some informal evidence of this fact, using data averaged over 2000–2009. U.S. trading partners were sorted into quintiles according to the average tariff imposed on U.S. products. The figure shows that there is a clear negative relationship between foreign tariffs and the share of U.S. intra-firm imports.

In this paper I develop a theoretical framework to rationalize these facts and I empirically test its implications.² In particular, I extend the

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E-mail address: federico.diez@bos.frb.org.

¹ Feenstra and Hanson, (1996) report evidence in favor of increased offshoring for the United States.

² At this point, one might be concerned about an omitted variable bias driving these facts. As explained below, I tackle these issues in the empirical section.

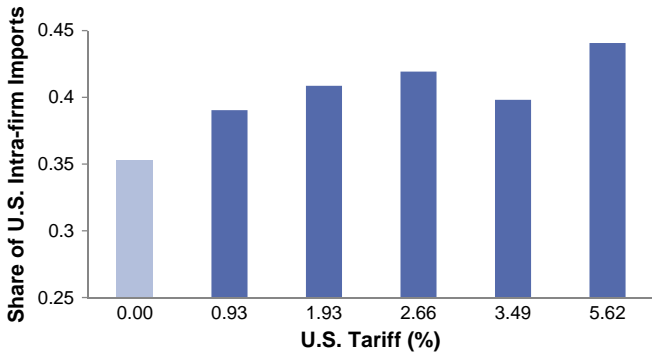


Fig. 1. Share of U.S. Intra-Firm Imports and U.S. Tariffs. Notes: “Share of U.S. Intra-Firm Imports” is the average ratio of intra-firm imports to total U.S. imports of the respective bin. HS6 industries were assigned to bins according to the U.S. tariff. The light column contains all industries with a tariff equal to zero. The rest of the sample was divided in quintiles; each column plots the median share of intra-firm imports for the corresponding bin. The average tariff value for each quintile is reported at the bottom of the horizontal axis. The industries considered are those with high HQ intensity used for the baseline estimation in Section 3. All data are averaged over the period 2000–2009.

Antràs and Helpman (2004) North–South model of international trade with incomplete contracts.

As in Antràs and Helpman (2004), the production of a good requires the joint work of two individuals, an entrepreneur and a manager. Entrepreneurs (all located in the North) choose whether to contact an agent in the North or in the South—that is, to produce domestically or to offshore. Regardless of this geographical decision, entrepreneurs also decide if the agent is going to be part of the firm (an employee) or an independent supplier—that is, to vertically integrate or to outsource. For each decision there is a trade-off: (i) the North has lower fixed costs but the South has lower variable costs; (ii) outsourcing requires lower fixed costs than vertical integration but the entrepreneur’s *ex-post* share of the surplus is lower. Given the corresponding fixed costs for each organizational form, firms optimally sort based on their own productivity and on the headquarter (HQ) intensity of the industry (meaning, the relative importance of activities like design, research and development, and so on, in the firm’s production function). For HQ-intensive industries, the main focus of this paper, four kinds of organizational choices may exist in equilibrium. High-productivity firms offshore production while low-productivity firms assemble domestically—additionally, within each group, low-productivity firms outsource and high-productivity firms integrate.

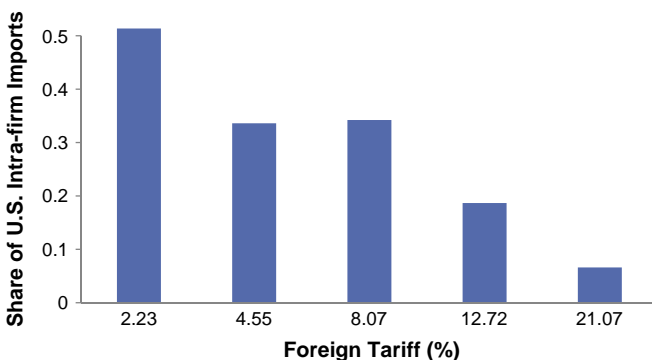


Fig. 2. Share of U.S. Intra-Firm Imports and Foreign Tariffs. Notes: “Foreign Tariff” is the tariff imposed on U.S. exports by each trading partner country, averaged across industries. Countries were sorted into quintiles according to their tariff value. The average (across countries) tariff value for each quintile is reported at the bottom of the horizontal axis. “Share of U.S. Intra-Firm Imports” is the ratio of intra-firm imports to total U.S. imports from each of these countries. Each column plots the median share of intra-firm imports for the corresponding bin. The industries considered are those with high HQ intensity used for the baseline estimation in Section 3. All data are averaged over the period 2000–2009.

There are two major differences between my model and the Antràs and Helpman (2004) framework. First, I explicitly incorporate tariffs into the model. Second, I model offshoring as the foreign sourcing of *assembly services*, whereas in the Antràs and Helpman model offshoring corresponds to the foreign sourcing of inputs.³ More specifically, I assume that each entrepreneur possesses a critical input, such as a blueprint. The entrepreneur then contacts a manager to process the input into a final good. It follows that hiring a Southern manager (i.e., offshoring) implies that the production of final goods will move from North to South.⁴ Hence, in contrast to Antràs and Helpman, in my model final goods can be produced in either country.

The following points summarize the main theoretical findings. First, a tariff imposed by the North on final goods (i) decreases the market share of offshoring firms, and (ii) decreases the relative market share of outsourcing firms versus vertically integrated firms in *both* countries. Intuitively, the tariff protects firms that assemble in the North and, critically, the tariff’s impact is particularly important among firms that are marginally indifferent between vertically integrating in the North and outsourcing in the South. When firms choose the latter option, it is because the variable costs are sufficiently lower in the South to justify the higher fixed costs and lower surplus shares. The tariff, however, acts precisely as an increase in the variable costs—thereby causing more firms to lean towards integration in the North instead of outsourcing in the South. In contrast, conditional on conducting assembly in a given country, the tariff has no direct effect along the outsourcing–vertical integration margin. These facts combined imply that the Northern tariff increases (decreases) assembly in the North (South), and these changes are particularly important among vertically integrated (outsourcing) firms, leading to decreased outsourcing in both countries. Second, a tariff on final goods imposed by the Southern government has exactly the opposite effects: it increases the market shares of offshoring and of outsourcing firms in both countries. The Southern tariff works in the opposite direction to the Northern one—it protects those firms assembling in the South, especially those that are marginally indifferent between integrating in the North and outsourcing in the South.

I derive two testable implications from the theory. If offshoring increases (meaning, if there are more Northern firms producing in the South), Northern imports will increase. Similarly, if there is relatively more vertical integration than outsourcing, the composition of imports will change; there will be relatively more intra-firm trade and less arm’s-length trade. Consequently, the above theoretical predictions can be mapped to empirical predictions about the ratio of intra-firm imports to total imports. In particular, Northern (Southern) tariffs cause the ratio of Northern intra-firm imports to total imports to increase (decrease)—Fig. 1 (Fig. 2) precisely reflects this idea. Intuitively, Northern (Southern) tariffs decrease (increase) total offshoring but, as explained above, imports due to offshore-vertical-integration decrease (increase) relatively less than imports due to offshore-outsourcing. I test these predictions using highly disaggregated data for the United States (the North) during the 2000–2009 period.

The empirical findings provide support for these implications of my theory. In particular, I find that: (i) higher U.S. tariffs increase the ratio of American intra-firm imports to total American imports; and (ii) higher foreign tariffs decrease this ratio. In the relevant subsample of the data, the mean of the ratio is 30%. Using this subsample, I find that a 1-percentage point increase in the American tariff is associated with a 0.25 percentage point increase in the ratio, while a 1-percentage point increase in the foreign tariff implies a 0.12 percentage point decrease in the ratio.

³ I use this alternative definition of offshoring because offshoring the assembly of final goods is less stringent in terms of data requirements when studying the effects of U.S. and foreign tariffs. Specifically, it suffices to observe final-good trade flows between countries at the industry-level; in contrast, offshoring of inputs requires matching intermediate goods imports to final goods exports using firm-level data.

⁴ One can think of this as the overseas assembly activities reported by Swenson (2005) or the export-processing activities in China reported by Feenstra and Hanson (2005).

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