

The Impact of FDI through the Production Network: Evidence from Costa Rica

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This paper uses firm-to-firm transaction data to study the impact of joining the supply chains of multinational firms on domestic firms in Costa Rica. Starting to supply to a multinational brings strong and long-lasting gains not only in firm size, but also in productivity. At the same time, such supplying opportunities are significantly less widespread than previously estimated through Input-Output tables.

Introduction

A long-standing debate has focused on the extent to which attracting foreign capital to a country can not only push the productivity frontier of receiving sectors, but also induce productivity catch-up throughout the economy. As multinational corporations (MNCs) lead in the global productivity race and drive most of today's foreign direct investment (FDI), countries court MNCs hoping for a short-cut to productivity upgrading.

While relationships between MNCs and local suppliers are not the only channel for productivity gains, they are usually seen as the main candidate. Whether countries actually experience widespread productivity gains through this channel, hinges on answers to two questions. First, do local firms see their productivity increase when they start supplying to MNCs? Second, are these supplying opportunities frequent enough to justify hopes of widespread productivity upgrades?

An old important question but with several challenges to be addressed

Continued policy efforts to attract MNCs and connect them to local suppliers rely on the belief that answers to both questions above are likely to be positive. Yet, credible answers to both questions have, so far, proven elusive. Three challenges have stood in the way. First, until now, firm-to-firm relationships have not been observable to researchers. Hence, one had to rely on sector-level Input-Output (I-O) tables to proxy for the likelihood of supplying to MNCs. Little was known, however, about the within-country linkage patterns of MNCs and the extent to which I-O based proxies were able to predict such linkages. A second challenge came from the lack of an empirical strategy that delivered causal estimates of the gains from supplying to MNCs. Finally, whenever productivity is the outcome of interest, one needs to address well-known difficulties in measuring it.

Our study using Costa Rican administrative data

Costa Rica is one of the top recipients of per capita FDI net inflows in Latin America and the Caribbean. Over 20 percent of Fortune 100 companies and many other high-tech enterprises have established operations in Costa Rica in the last 30 years. The attraction of MNCs to the country is considered to be the mainstay of Costa Rica's export and investment promotion strategy. The organizations in charge of attracting FDI to Costa Rica have received international awards for their success.

In addition to Costa Rica being a relevant context to study this question, our project leverages an administrative dataset that allows us to directly overcome previous challenges faced by this literature. Since 2008, this dataset tracks all annual firm-to-firm transactions within the country. As this dataset makes supply chains fully visible, we can isolate the role of linkages to MNCs as potential drivers of productivity gains. Our main contribution is to estimate the causal effects of becoming a supplier to an MNC – i.e., to answer the first question raised above. We achieve this by means of an economy-wide event study analysis, where we define the event as the first time a local firm supplies to any MNC affiliate. In the process, we also shed light on the extent to which MNCs actually source from local firms and how that compares to what is implied by I-O tables. These insights are key inputs in answering the second question above.

What is the causal impact of starting to supply to an MNC?

Methodology: Our empirical strategy consists of a series of event study models, where the “event” (time zero) is defined as the first year a domestic supplier starting selling its products to an MNC. Once we identify the year of the event, we explore what happens to firms in different years relative to the year before the event. For example, if a firm becomes a first-time supplier to an MNC in 2010, then year 0 would be 2010, year +1 would be 2011, and -1 would refer to 2009, etc.

For the estimation of the causal effects of joining MNC supply chains, we use three different samples. Our baseline results exploit the plausible exogeneity of the timing of the event to both firms involved in the transaction. Our first and main sample incorporates the economy-wide set of first-time matches between domestic firms and MNCs in Costa Rica. We include firms that are both eventually matched to an MNC between 2010 and 2015 and firms never observed as supplying to an MNC during our entire firm-to-firm transaction dataset (2008 to 2015).

The second sample uses only firms that are eventually matched. This allows us to check whether our variation comes from this contrast with firms never experiencing an event or from the differential timing of our events. Reassuringly, our results confirm the importance of the timing of the event as the main driver of changes in firms' outcomes.

Last, we also use a sample coming from a government-led matching program between MNCs and local suppliers. This program identifies input needs of MNCs, evaluates candidate firms, and proposes shortlists of the most suitable suppliers for each need. Since all firms in a shortlist are comparable contenders for the same

deal, the program generates quasi-experimental variation in opportunities to sell to MNCs. We exploit this empirical setting using a winners vs. losers design. The small number of deals to which this research design can be applied and concerns of external validity become its main disadvantages with respect to our baseline event studies. Yet, we leverage on the features of this program to strengthen the causal argument of our main empirical strategy and we view its analysis as complementary evidence.

Results

We find that first-time suppliers to MNCs do not exhibit preexisting differential trends with respect to either of the control groups implied by each sample. As all our specifications lack firm-specific trends, this finding suggests that (i) MNCs did not choose suppliers embarked on pre-existing trends of improvement, and (ii) even if firms differ in levels, suppliers-to-be were embarked on trends parallel to those of firms never supplying to an MNC. We also find that firms experience sizable expansions after their first-time supplying to an MNC.

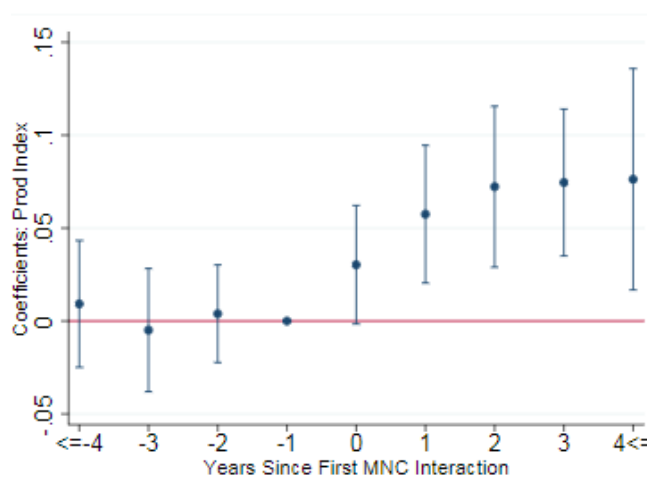


Figure 1: Cost-share Productivity Index

Four year after this event, firms' sales and employment are 25 and 21 percent larger than these values one year before the event. Firms' capital and material inputs increase by around 16 percent as well. More surprisingly, we show that firms also change features of their production process that are not mechanically related to their scale. In particular, we find evidence of significant changes in import behavior: firms boost the value of their imports by 44 percent and increase the share of imports in their input costs by 3 percent.

Despite findings on both firms' expansion and changes in firms' production process, our main outcome of interest is productivity. As common in most settings, we lack contract-specific (or even firm-specific) disaggregated details on quantities, prices, and quality. To make progress on this front, we proceed in steps. We first show significant improvements in raw measures of firm performance, such as profits and value added per worker. We then focus on production function estimation using a Cobb-Douglas productivity index and both Cobb-Douglas and translog production functions. Figure 1 shows the results of using ordinary least squares (OLS) to estimate the impacts of the event on a Cobb-Douglas productivity index. Firms experience a robust 8 percent increase in productivity four years after the event with respect to the year before the event

(year $t-1$, whose coefficient is normalized to 0). Several OLS specifications and classical control function approaches find similar productivity effects in the interval of 7 to 11 percent.

In addition, we also exploit the richness of our production network data to provide indirect evidence on productivity changes. We show that domestic suppliers increase the number of domestic (non-MNC) clients and their sales to them, after the event. This would be inconsistent with increases in prices being the main driver of our findings. Finally, we also find evidence of gains in productivity to domestic clients of suppliers to MNCs.

We then present several pieces of evidence (which are detailed in the paper) to support the causal nature of our findings and their interpretation. In sum, our results do not simply reflect firms' response to demand shocks, price effects, or improvements in tax compliance. Instead, they are suggestive of knowledge transfers by MNCs, that affect suppliers' production technology and organization, input choices, and relationships with their domestic clients.

How widespread are the opportunities to join MNC supply chains?

While aggregating our micro-level estimates of productivity gains from supplying to MNCs is beyond the scope of this paper, we provide insights on moments of the aggregate (upstream) integration of MNCs that are valuable inputs in such an effort.

We construct measures of backward linkages between MNC buyers and domestic suppliers, using firm-to-firm transactions and taking sector-to-sector I-O tables as a benchmark. A backward measure of 0 implies that the domestic supplier does not sell to MNCs. On the other hand, a backward measure of 1 implies that all sales of the domestic supplier are purchased by MNCs. Figure 2 shows striking heterogeneities in actual backward linkages that are not reflected in the use of sector-level I-O tables. Broadly, one could split firms in two categories: the great majority have little to no sales to MNCs, while a minority have MNCs as their main, if not sole clients.

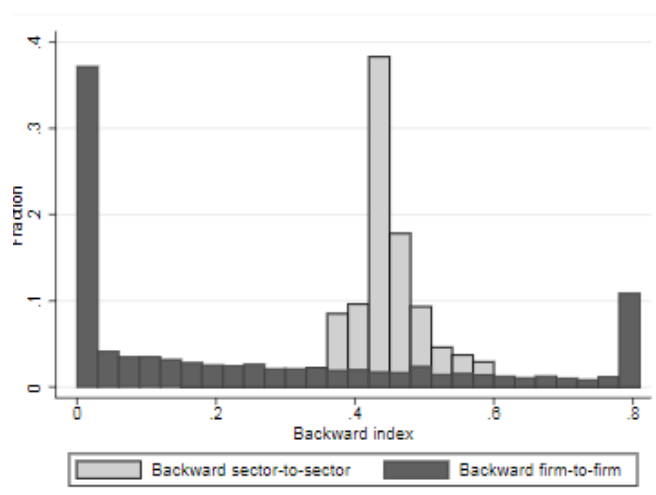


Figure 2: Backward measure for domestic firm

We also show that indirect employment credited to MNCs and predicted from I-O tables is an over-estimation – by 60 percent on average, in 2013 – of the indirect employment measured from the firm-to-firm dataset. This overestimation is particularly important in the top exporter and high-tech sectors, which are commonly the target of subsidies and tax exceptions in many contexts.

In general, MNCs are found to be substantially less integrated in Costa Rica's production network than what I-O tables predict. Even though the precise cost of relying on I-O tables might be country-specific, our evidence suggests that estimates of measures of MNC integration relying on I-O tables may paint too optimistic a picture of their actual integration.

Policy impact

Our work provides valuable insights on the merits and perils of policies attracting MNCs. On the one hand, we find strong and persistent effects in productivity after firms start supplying MNCs. On the other hand, the findings of little integration of MNCs suggest that these productivity gains might not spread through domestic economies as much as previously thought. This evidence informs policy makers on the need to foster better integration of MNCs in host countries if they want the benefits of attracting MNCs to spill over the entire the economy. We believe that the findings of our project will benefit not only Costa Rica, but all countries finding themselves in the situation of either already offering generous incentives to attract MNCs or contemplating to do so in the future.

Moving forward

A natural next step to our project is to aggregate our micro-level estimates of the sizable and long-lasting productivity gains from joining MNC supply chains in a framework that allows for general equilibrium effects. A key ingredient in such an exercise is a credible estimate of how frequent these supplying relationships are. We show that I-O tables greatly overestimate the extent to which local firms participate in MNC supply chains, as I-O tables are oblivious to the peculiar patterns of MNCs' sourcing that we uncover in our firm-to-firm transaction data. These insights inform future research on the aggregate implications of MNC supply chains.

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