# The Effects of Joining Multinational Supply Chains: New Evidence from Firm-to-Firm Linkages[*]

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This paper investigates the effects of becoming a supplier to multinational corporations (MNCs) using administrative data tracking all firm-to-firm transactions in Costa Rica. Event-study estimates reveal that after starting to supply to MNCs, domestic firms experience strong and persistent improvements in performance, including the expansion of their workforce by 26% and gains in standard measures of total factor productivity (TFP) of 6-9% four years after. Moreover, the sales of domestic firms to buyers other than the first MNC buyer grow by 20%, both through a larger number of buyers and larger sales per buyer. We propose a simple model by which TFP and reputation affect the number of buyers, but TFP alone affects sales conditional on buying. We find a model-based increase in TFP of 3% four years after. Finally, we collect survey data from managers in both domestic firms and MNCs for further insights on mechanisms. Our surveys suggest that becoming suppliers to MNCs is transformative for domestic firms, with changes ranging from new managerial practices to better reputation.

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# 1 Introduction

Governments around the world compete to attract foreign direct investment – typically in the form of affiliates of multinational corporations (MNCs) – through costly public programs such as tax holidays or subsidized industrial infrastructure.[1] The expectation of these governments is that MNCs are not only high-performers themselves, but that they also help improve the performance of domestic firms. This latter prospect is particularly appealing for developing countries, where most firms are small and low-performing.[2] While there are other channels by which MNCs may affect domestic firms, both scholars and policy-makers view direct supply chain linkages as one of the most promising channels for performance gains.[3]

In this paper, we ask what are the effects of becoming a supplier to MNCs on domestic firms. A complete answer to this question has so far proven elusive for three related reasons. First, it has been exceedingly difficult to observe direct business linkages between domestic suppliers and MNCs in conventional data, especially for the entire economy. Past research has thus relied on sector (or sector-by-region) level variation in the degree of foreign ownership in downstream sectors. Second, firm supply linkages may be endogenous. Without observing actual linkages, it is difficult to tease out the direction of causality between supplying to MNCs and changes in firm performance. Third, the same inability to directly observe suppliers has limited previous research from painting a complete picture of the effects of becoming a supplier to MNCs.

To make progress on these three challenges, we bring together a rich collection of microdata from Costa Rica that includes the universe of firm-to-firm transactions in the country. This makes it possible to observe the actual linkages between MNCs and their domestic suppliers.[4] Second, we adopt an event-study strategy to estimate the effects of starting to supply to MNCs. Third, we provide a detailed account of the changes faced by first-time suppliers to MNCs. We begin with standard measures of firm performance using typical balance sheet data, such as firm size or total factor productivity (TFP) from production function estimations. We then leverage the firm-to-firm transaction data and a simple model to infer changes in TFP from changes in sales to buyers other than the first MNC buyer. Finally, we conduct a new survey of managers in a representative sample of 164 domestic firms and MNCs. These surveys reveal key mechanisms by which first-time suppliers to MNCs improve firm performance.

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[1]The competition in investment incentives (fiscal, financial, and other) for MNCs is so high that governments are adopting ever more sophisticated approaches such as special tax incentives focused on intangible assets (UNCTAD, 2018a). Moreover, the number of Special Economic Zones – the mainstay of investment promotion and facilitation policies – rose from 76 in 1986 (spread across 47 countries) to over 4,500 in 2018 (spread widely across the world) (UNCTAD, 2018b).

[2]See Tybout (2000); Bloom, Mahajan, McKenzie, and Roberts (2010); Hsieh and Klenow (2014).

[3]See the reviews of Harrison and Rodríguez-Clare (2010); Havránek and Iršová (2011); Alfaro (2017). For instance, Alfaro (2017) concludes that "FDI can play an important role in economic growth, most likely via suppliers." The World Bank 2020 World Development Report on "Global Value Chains: Trading for Development" announces that it will assess the typical tools used by policy-makers to "form [...] linkages and networks in GVCs": incentive packages offered to foreign investors, and other policies meant to encourage investors to create "backward in-country linkages" post-investment.

[4]The data cover the universe of all firm-to-firm relationships whose transactions in a year amount to more than 4,200 U.S. dollars. See Section 2 for additional details.

The analysis proceeds in four steps. In the first step, we introduce the new database that we assemble for this research and the empirical context. Most of our progress relies on the firm-to-firm transaction data collected by the Ministry of Finance since 2008. We match this data with corporate income tax data and foreign ownership data. We can then identify MNCs and domestic firms in buyer-supplier relationships and characterize these firms and relationships. Our event of interest is the first time a domestic firm sells to an MNC in Costa Rica. We focus on events occurring between 2010 and 2015, for which we observe the transition of domestic firms into their new role as suppliers of MNCs. During this period, there are 3,697 domestic firms who start supplying to one of 444 MNCs. These relationships constitute a significant fraction of each domestic firm's output, where the average (median) amount first sold to an MNC is 62,400 (18,590) U.S. dollars and represents 19% (6%) of all sales that year.

In addition to this rich data environment, Costa Rica offers a number of additional advantages to study the effects of MNCs. Ever since the entry of Intel in 1997, the country has attracted a large and diverse set of MNCs.[5] This feature of our setting allows us to characterize the linkages that most benefit domestic suppliers. Second, a Costa Rican public agency (Procomer) implements "Productive Linkages," a program aimed at mediating linkages between MNCs and domestic suppliers.[6] We use the variation granted by the rules of this program for a robustness check to our main event-study results.

In the second step, we describe and implement our main event-study design to estimate the effects of starting to supply to MNCs. Our baseline results use the sample that includes both domestic firms who supply for the first time to an MNC in Costa Rica sometime between 2010 and 2015, and domestic firms who never supply to an MNC between 2008 and 2017. Credible estimates hinge on the assumption that firms yet to supply to MNCs form a credible counterfactual for first-time suppliers to MNCs, after accounting for time-invariant differences between firms (through firm fixed effects) and common shocks (through fixed effects at the four-digit sector by province by calendar year level). As we can estimate event-study coefficients for the four years before a first supplying experience, this method allows us to transparently show that first-time suppliers do not exhibit pre-trends in observables.

The main concern for identification is that firms experience unobservable firm-specific shocks that affect both the timing of their first supplying transaction with an MNC and their subsequent performance. We provide several pieces of evidence to alleviate this concern, including evidence against the effects being driven by a change in managers just before the event. Moreover, we conduct a battery of additional robustness checks that demonstrate that our results are robust to only keeping the first-time suppliers in the analysis, varying the set of fixed effects, and balancing the sample of first-time suppliers around the event year.

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[5]In 2017, the Costa Rican foreign direct investment (FDI) stock per capita was the second largest in Latin America.
[6]Programs similar to "Productive Linkages" have become increasingly popular among governments looking to improve the local integration of (multinational or large) corporations (see the American Supplier Initiative in the U.S. or the Local Content Unit in Rwanda, Steenbergen and Sutton, 2017). Typically, the aim of these programs is not to replace unmediated market-based linkages between MNCs and domestic suppliers with linkages mediated by the program, but to create additional opportunities for linkages (e.g., by lowering informational barriers on the capabilities of domestic suppliers). Only about 1% of the number (value) of linkages between MNCs and domestic suppliers occurring economy-wide in Costa Rica are mediated by the "Productive Linkages" program.

Our baseline results show that first-time suppliers experience large and long-lasting improvements in firm size. Four years after their first sale to an MNC buyer, firms have 33% higher sales, 26% more employees, 22% more net assets, and 23% higher total input costs. We find no evidence of selection into supplying to MNCs based on past firm growth. As these firms were provided with a positive demand shock, one natural concern is that this expansion is purely mechanical. We exploit the firm-to-firm transaction data to show that four years after starting to supply to MNCs, sales to buyers other than the first MNC buyer increase by 20%, sales to other corporate buyers grow by 45%, the number of corporate buyers rises by 36%, and the average sales to other corporate buyers increase by 14%.[7]

We then examine standard measures of TFP, ranging from the residual of ordinary least squares (OLS) estimates of a Cobb-Douglas production function to those from standard methods that account for the potential endogeneity of firm-level input choices. We continue to find no evidence of selection into supplying to MNCs, this time based on past TFP growth. In contrast, after their first MNC sale, domestic firms experience sizable and lasting gains in TFP, such that their TFP is between 6 and 9% higher than in the year before the event. While we do not observe prices directly, we provide evidence that mark-up effects are unlikely to explain this observed TFP growth. Under certain assumptions, such as that no output or input price variation is correlated with the event, these results capture the behavior of true TFP.

We also implement an alternative event-study design that leverages the rules of the "Productive Linkages" program. The program evaluates the ability of domestic firms to supply to MNCs and assigns them scores. Scores assess a firm's readiness to supply to MNCs on aspects unobserved in conventional administrative data (such as whether the firm is ISO 9001 certified or not). Based on these scores, Procomer proposes shortlists to MNCs. A small subset of deals lends itself to the implementation of a "winner vs. losers" research design in the spirit of Greenstone, Hornbeck, and Moretti (2010). We find that winners and losers are not statistically different before the event, both in scores and other observables. Also, by their very participation in the program, all contenders are interested in supplying to MNCs and deem themselves ready to do so. This design yields results that are qualitatively similar to those from the main event-study design. While the main economy-wide design and this design have different advantages and disadvantages, they paint a very consistent picture.

In the third step, we propose alternative measures of firm performance that leverage our findings from firm-to-firm transaction data. Specifically, we develop a simple framework that allows us to interpret the behavior of sales to buyers other than the first MNC buyer (hereafter, *sales to others*). Under fairly general demand and total cost curves, changes in sales to others are informative regarding changes in supply-side parameters (here, TFP and reputation). These sales can grow both through sales conditional on buying (the intensive margin) and the number of buyers (the extensive margin). We assume that TFP affects both margins: higher-TFP firms sell more because they have a cost advantage and are better at finding buyers. We use the term *reputation* as an umbrella term over a set of firm-level features other than TFP that

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[7]The *corporate buyers* of a firm are those whose purchases in a year amount to more than $4,200 U.S. dollars (the reporting threshold of the form behind the firm-to-firm transaction data).

only affect the number of buyers. Some of these features are not about reputation *per se* but refer instead to the marketing technology or search costs, among others.

In our model, increases in a measure we call *adjusted sales to others* reflect increases in *composite TFP* (TFP, reputation, and the interaction between the two). The adjustment is done via a parameter $\delta$ that controls for both potential returns to scale and the effects of the MNC demand shock on prices. To estimate the increase in TFP alone, our model leads us to a measure of *average* adjusted sales to others. We bring our theoretical results to the data in two steps. First, we estimate $\delta$ using an instrumental variable strategy based on government demand shocks. Second, we use the main event-study design to estimate the effect of becoming a supplier to MNCs on (average) adjusted sales to others. We conclude that four years after, composite TFP increases by 6%, while TFP alone increases by 3%. This highlights the potential of the extensive margin to magnify differences in TFP. We obtain similar results across reasonable ranges of the main parameters of the model ($\delta$ and the elasticity of demand, $\sigma$).

In the fourth and final step, we document additional evidence on the mechanisms behind performance gains to suppliers to MNCs. First, we explore treatment effect heterogeneity using our administrative data. For instance, we find that suppliers in manufacturing see their performance improve twice as much as suppliers in retail and services. Conversely, MNCs in manufacturing and MNCs in high-tech sectors trigger the highest performance gains for their suppliers. We conjecture that MNCs are likely to devote more attention to relationships where the supplied input has a direct bearing on their core activity. Also, suppliers might receive more support from MNCs whose product is of high quality (or complex), as imperfections in inputs can be particularly costly.

We then rely on surveys conducted on a representative sample of MNCs and domestic suppliers. Both MNCs and domestic firms recognize how consequential it is for a domestic firm to start supplying to MNCs. After becoming suppliers to MNCs, most firms undergo a series of interrelated changes, which include expansions in product scope with higher-quality products, better managerial and organizational practices, and improved reputation. These changes arise from interactions during which MNCs communicate expectations and advice, and from the significant efforts exerted by new suppliers to deliver on their contracts.

Our work is related to several literatures. At its core, this article contributes to an extensive literature studying interventions aimed at improving firm performance in developing countries. In a recent review, Woodruff (2018) notes that most of this literature focuses on interventions that alleviate supply-side constraints (e.g., programs granting access to credit or training). Despite the popularity of supply-side interventions, literature reviews suggest that the evidence is mixed as to whether they can actually alter the long-term growth of firms.[8]

While notably scarcer, there is increasing evidence that demand is an important determinant of (small) firm dynamics. In particular, improving access to foreign buyers – through

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[8]For examples of papers in this strand of the literature, see De Mel, McKenzie, and Woodruff (2008); Bloom, Eifert, Mahajan, McKenzie, and Roberts (2013); Fafchamps, McKenzie, Quinn, and Woodruff (2014); Banerjee, Duflo, Goldberg, Karlan, Osei, Parienté, Shapiro, Thuysbaert, and Udry (2015). For reviews, see Banerjee (2013); McKenzie and Woodruff (2013).

trade[9] or foreign direct investment (FDI) – is believed to hold great promise for firms in developing countries.[10] The expectation is that foreign buyers do not only provide demand shocks but also provide valuable learning opportunities.

By studying the effects of supplying to foreign buyers, this paper relates to a voluminous literature on learning-from-exporting.[11] There are three key differences between exporting and supplying to MNCs locally. First, exporting is only possible for firms selling tradable goods and services, and even further, only possible for firms competitive enough to overcome trade costs.[12] Second, the proximity between buyers and suppliers is likely to facilitate learning. Finally, MNCs are exceptional firms - globally and even more so in a developing country.[13] Hence, MNCs are likely to be more sophisticated buyers than the usual importer.[14]

By studying the effects of supplying to MNCs in one's country, this paper is also closely related to a vast literature on the effects of FDI on firm performance. Papers on this topic generally combine firm-level panel data with sector-level input-output (I-O) tables and find that an increase in FDI at the sector (or sector-by-region) level is associated with increases in standard measures of TFP of (nearby) domestic firms in upstream sectors (commonly referred to as spillovers from backward linkages).[15] Moving from variation in sector-level proxies of exposure to FDI to variation in the actual linkage status of a firm presents new opportunities for precision and insight on the process of joining MNC supply chains.[16]

Finally, this paper also relates to empirical work made possible by the recent availability

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[9]There is a long literature linking the exposure to trade to the performance of firms (see review in De Loecker and Goldberg, 2014). On developing countries in particular, see Clerides, Lach, and Tybout (1998); Pavcnik (2002); Verhoogen (2008); Goldberg, Khandelwal, Pavcnik, and Topalova (2010); Topalova and Khandelwal (2011); Bustos (2011); Atkin and Donaldson (2018); Atkin, Faber, and Gonzalez-Navarro (2018); Fieler, Eslava, and Xu (2018).

[10]Other ways in which governments can improve demand conditions include building infrastructure (see Faber, 2014; Ghani, Goswami, and Kerr, 2016; Asher and Novosad, 2018; Donaldson, 2018) and expanding public procurement (see Ferraz, Finan, and Szerman, 2016; Lee, 2017; Carrillo, Donaldson, Pomeranz, and Singhal, 2018).

[11]Recent papers find strong positive causal effects of exporting on firm performance (De Loecker, 2007, 2013; Atkin, Khandelwal, and Osman, 2017).

[12]Only 7% of the domestic firms studied here have ever exported before starting to supply to MNCs in Costa Rica. Our surveys suggest that supplying to MNCs locally is seen as a stepping stone to exporting in the future.

[13]MNCs disproportionately populate the right tail of the TFP distribution in Costa Rica (see Figure A1, Online Appendix A). For papers on the exceptional nature and practices of MNCs, see Helpman, Melitz, and Yeaple (2004); Harrison and Scorse (2010); Ramondo and Rodríguez-Clare (2013); Antràs and Yeaple (2014). On global value chains, see Gereffi, Humphrey, and Sturgeon (2005); Alfaro, Antràs, Chor, and Conconi (2015); Taglioni and Winkler (2016); Antràs and de Gortari (2017).

[14]In addition – while not a difference *per se* between exporting and supplying to MNCs – our data also allows us to explore treatment effect heterogeneity based on buyer characteristics (other than its country and purchases, the typical information present in customs data).

[15]For classic papers in the FDI literature, see Haddad and Harrison (1993); Aitken and Harrison (1999); Blomström and Sjöholm (1999); Djankov and Hoekman (2000); Javorcik (2004); Alfaro, Chanda, Kalemli-Özcan, and Sayek (2004); Haskel, Pereira, and Slaughter (2007); Blalock and Gertler (2009); Keller and Yeaple (2009). In their meta-analysis of the literature, Havránek and Iršová (2011) find robust evidence for increases in the performance of domestic firms in supplier sectors (backward spillovers), small increases for firms in customer sectors (forward spillovers), and no effect for firms in the same sector (horizontal spillovers).

[16]Using our firm-to-firm transaction data, we find that sector-level backward linkages predict less than 1% of the actual firm-level linkages (see Figure A2, Online Appendix A). This may explain why estimates of spillovers from backward linkages vary broadly across studies, from strongly positive to negative (Havránek and Iršová, 2011).

of domestic firm-to-firm transaction data.[17] This paper studies in detail the effects of establishing a specific type of firm-to-firm linkage: the one with the first MNC buyer. After this new linkage, domestic firms improve their performance in two equally important ways: through the number of buyers (the extensive margin) and the sales per buyer (the intensive margin).[18]

This paper proceeds as follows. Section 2 describes the data and context. Section 3 introduces our event-study strategy and Section 4 presents its results. Section 5 introduces a theoretical framework that allows us to interpret our event-study findings, in particular those on sales to buyers other than the first MNC buyer. Section 6 draws on heterogeneity analyses and surveys for more insights on mechanisms. Section 7 concludes.

# 2   Data and Description of Supplying Linkages

## 2.1   Data

*Economy-wide administrative data.* The main dataset tracks the universe of firm-to-firm relationships in Costa Rica between 2008 and 2017. This information is collected by the Ministry of Finance of Costa Rica through the D-151 tax form. Firms must report the tax identifier (ID) of all their suppliers and buyers with whom they generate at least 2.5 million Costa Rican colones (around 4,200 U.S. dollars) in transactions that year, in addition to the total amount transacted. Given the third-party reporting nature of the D-151, it is used by the Ministry of Finance to enforce corporate income tax compliance.[19] We keep for our analysis approximately 92% of all transactions and 88% of the value of all transactions, which were either filled in correctly or with minor mistakes that could be fixed (e.g., misreporting of decimal points).

We merge this dataset with two other administrative datasets that track the universe of formal firms in Costa Rica over the same time period. The first of these is built from yearly corporate income tax returns and contains typical balance sheet variables. The second dataset comes from the Social Security Fund and includes firms' wage bill and number of workers.

Additionally, we construct a comprehensive dataset on the foreign ownership of firms. In Costa Rica there is no source which provides centralized and exhaustive reporting of the country of origin of firms' capital. To overcome this data limitation, we combine information from five different sources. The first three are annual surveys conducted by BCCR and inquir-

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[17]Alfaro-Ureña, Fuentes, Manelici, and Vasquez (2018) show that the main stylized facts established for the production networks of Belgium and Japan (the countries most studied thus far) also hold for the Costa Rican network. Dhyne, Kikkawa, Mogstad, and Tintelnot (2018b) and Dhyne, Kikkawa, and Magerman (2018a) are examples of papers studying the production network of Belgium. For Japan, see for example Bernard, Moxnes, and Saito (2019); Furusawa, Inui, Ito, and Tang (2017); Miyauchi (2018). Contemporaneous papers studying the production networks of Ecuador, Chile, and Turkey are Carrillo, Donaldson, Pomeranz, and Singhal (2018); Huneeus (2018); Demir, Javorcik, Michalski, and Örs (2018).

[18]Our findings on the importance of the extensive margin of sales in firm growth are in line with the findings of Bernard, Dhyne, Magerman, Manova, and Moxnes (2018). The authors use firm-to-firm transaction data from Belgium to show that firms can be large due to their higher productivity (or product quality) or their selling to more and/or larger buyers (among other factors). Cross-sectionally, 81% of the variation in firm sales within narrowly-defined sectors is explained by firms' ability to attract many and/or large buyers.

[19]In the D-151 one can identify firms who reduce their taxes by over-reporting purchases or under-reporting sales.

ing on the foreign ownership of firms. These surveys tend to oversample large firms. The fourth source is the organization responsible for drawing FDI to Costa Rica (CINDE), which provides information on the foreign ownership of firms they attracted. Finally, we bring in Orbis data, which has a high coverage of firms in Costa Rica and allows us to identify firms in the country that are affiliates of MNCs.

A last challenge in building the final administrative dataset is to assign tax IDs to firm groups and properly turn tax ID-level information into group-level information.[20] In Online Appendix F.1 we discuss how we overcome this challenge, in addition to providing more details on data construction and summary statistics.

*"Productive Linkages" program data.* Since 2001, Costa Rica's trade promotion agency (Procomer) has implemented a matchmaking program called "Productive Linkages." Its main objective has been to insert local firms into export supply chains, where the exporter is usually an MNC affiliate in Costa Rica. Procomer has built a comprehensive database of local firms that are suitable and willing to supply to MNCs. Procomer staff visit firms and evaluate them on criteria that are typically unobservable in tax records but are nonetheless relevant to MNCs. Each firm is then assigned an aggregate score. When MNCs approach Procomer with an input need, Procomer identifies which suppliers can produce that input, ranks them based on their score, and shares with the MNC a shortlist of the highest ranked suppliers.[21]

Online Appendix F.2 describes the historical records shared by Procomer with BCCR, the steps undertaken to digitize them, the interviews we carried out with former and current Procomer staff to uncover missing institutional details, and the sample construction. We learned that, while the program was not designed as an experiment, by applying sensible restrictions to the universe of deals mediated by Procomer, one can retrieve a set of deals with a quasi-experimental setup. Specifically, we focus on deals between domestic suppliers and MNCs that are first-time deals with an MNC for the domestic firm, occur in our sample period, and where the shortlisted contenders had not yet supplied to an MNC either.

*Survey data.* In the summer of 2018, we conducted surveys of both MNCs and their domestic suppliers. Our main objective was to shed light on typically unobservable aspects of relationships between the two types of firms. We targeted both firms involved in deals mediated by the "Productive Linkages" program and deals that happened unmediated, in the broader economy. This allowed us to also inquire about the potential benefits of mediation.

The surveys were administered in two versions: a longer field survey conducted at the main location of the firm and a shorter web-based one. Core questions were mirrored between surveys to both domestic firms and MNCs. Given the retrospective nature of some of the topics covered, the ideal respondent was the founder or general manager of the domestic firm and

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[20]A firm can split its reporting across several tax IDs (e.g., by assigning all workers to one tax ID and all sales to another). If they share ownership and make decisions as a unit, tax IDs should not be treated as independent firms but should be aggregated into firm groups. Throughout the paper we use *firms* to refer to *firm groups*.

[21]Procomer has a strong reputation both in Costa Rica and abroad. In several years, the International Trade Centre granted Procomer the title of "Best Trade Promotion Organization from a Developing Country." The World Bank frequently mentions the "Productive Linkages" program as a role model for its ability to improve the local integration of MNC affiliates (see for example Akhlaque, Lopez, Chua, and Coste, 2017).

the supply chain manager of the MNC. The need to reach specific employees compounded the already difficult task of establishing a first contact with these firms.

We gathered responses from a total of 164 firms, of which 38 were surveyed in person and 126 online. 106 respondents are domestic suppliers to MNCs and 58 are MNCs based in Costa Rica. When pooling survey answers from both buyers and sellers, these 164 responses cover at least one side of the buyer-seller pair for about 20% of the pairs of interest. Comparisons of the firms that did and did not respond suggest that a response bias is unlikely. Online Appendix G describes the surveys in detail.

## 2.2 Description of MNCs, Domestic Suppliers, and Their First Linkage

*MNCs in Costa Rica.* We start from the 2,171 firms in Costa Rica that belong to corporate groups where at least one firm is partially foreign-owned.[22] From this set of firms, we create three mutually exclusive subsets: firms that are fully domestically-owned (despite being part of a corporate group where another firm is partially foreign-owned), firms that are themselves at least partially foreign-owned but whose median number of workers is under 100 (across all years of activity in the country), and firms that are themselves at least partially foreign-owned and whose median number of workers is over 100.[23]

In this paper we focus on the effects of starting to supply to the 622 firms in the third category.[24] All 622 firms are MNC affiliates, with known global ultimate ownership and a substantial presence in Costa Rica.[25] From the universe of firm-to-firm transactions in Costa Rica we learn that between 2010 and 2015, 444 of these 622 MNCs became the first MNC buyer from one of 3,697 domestic firms. 47% of these MNCs are from the United States, with the other 53% coming from either Latin America and the Caribbean or Western Europe.

These 444 MNCs differ from one another in ways that are potentially relevant to the outcomes of first-time suppliers. While manufacturing is the most frequent sector among these MNCs (covering 40% of these MNCs), the remaining 60% of MNCs fall into sectors as diverse as retail, agriculture, and information and communication. Alternatively, 66% of these MNCs are in low-tech or medium low-tech sectors (as classified by the OECD), with the other 34%

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[22]A corporate group is a set of firms that share ownership, but do not necessarily behave as one business.

[23]This size threshold is less restrictive than other choices in the literature. The average annual sales of the plants from Greenstone, Hornbeck, and Moretti (2010) are 11 times larger than the average sales of our 622 MNCs. Abebe, McMillan, and Serafinelli (2017) consider only openings of FDI plants in manufacturing where, in the year of the plant opening or in the year that follows, the plant hires at least 100 workers or at least 1% of the workers in local manufacturing.

[24]Firms in the first category (fully domestically-owned firms) operate in different sectors than those of firms that are partially foreign-owned and part of their same corporate group. Given the loose connection between firms part of the same corporate group, particularly when in different sectors, we exclude them from the analysis. The typical firm in the second category is not an MNC affiliate (but a single location firm with partial foreign ownership) and serves local demand, either in service sectors (e.g., hotels) or in sectors with low domestic input requirements (e.g., import/export retail or real estate agencies). We focus on firms in the third category to also circumvent issues related to FDI statistics, such as the rising use of shell companies. These firms hire 75% of the workers and export 90% of the totals across firms in the three categories combined. See Online Appendix F.1.3.

[25]As customary (Antràs and Yeaple, 2014; Caves, 2007), we define an MNC as "an enterprise that controls and manages production establishments/plants located in at least two countries." We focus on MNCs with their parent in a foreign country and affiliates in Costa Rica (as opposed to MNCs whose parent is Costa Rican).

split between medium high-tech and high-tech sectors. Moreover, while Costa Rica's Free Trade Zone (FTZ) regime is the mainstay of its export and investment promotion strategy, 61% of these 444 MNCs operate outside FTZs. In Section 6 we ask whether differences in these characteristics of the first MNC buyer may affect subsequent supplier outcomes.

*Domestic suppliers to MNCs.* We start from the universe of domestic firms in Costa Rica and restrict our attention to those that have at least a median of three workers and median yearly revenues of 50,000 U.S. dollars (CPI-deflated to 2013 dollars) across all years of activity. We remove firms that are state-owned, registered as households, NGOs, or part of the financial, construction, and education sectors. This leaves us with 24,370 firms. Of these firms, we use the universe of firm-to-firm transactions between 2008 and 2017 to identify and keep only two types of firms: the 3,697 firms that become first-time suppliers to an MNC sometime between 2010 and 2015,[26] and the 14,338 firms never supplying to an MNC between 2008 and 2017. Our interest lies in the firms in the first category, but we also use firms in the second category to construct counterfactuals.

Across the 3,697 first-time suppliers to an MNC, the average (median) firm is small or medium-sized, hiring 19.5 (7.8) workers in 2009.[27] 72% of firms operate in low-tech or medium low-tech sectors, such as retail (including repair and maintenance) or accommodation and food services. The remaining 28% are split between medium high-tech and high-tech sectors, such as the manufacturing of machinery and equipment, or professional, scientific, and technical services. In Section 6, we check whether the sector of first-time suppliers may help or hinder their ability to benefit from supplying to MNCs.

Figure 1 contains photographs of four domestic firms that belong to and are representative of our sample of first-time suppliers to MNCs. These photographs are meant to provide an illustration of their size, activity, and organization. The first two firms supply automotive mechanic services and retail and maintenance of cutting tools. They hire less than five full-time workers, their facilities are modest and space-constrained, and their processes seem artisanal. The other two firms specialize in tailored precision machining and industrial supplies. They hire between 10 and 20 full-time workers, the layout of their plants is more spacious and organized, and exhibit more capital stock and standardization in processes.

*Relationships between MNCs and their domestic suppliers.* In Costa Rica, MNCs and domestic firms can establish a buyer-seller relationship either independently, unmediated by any government institution or mediated by Procomer through the "Productive Linkages" program.

Because more than 99% of relationships between MNCs and domestic firms (both in number and value) are formed without mediation, we prioritize the analysis of unmediated relationships. As mentioned above, we find 3,697 domestic firms who supply to an MNC for the first time sometime between 2010 and 2015, and do so in an unmediated fashion. We refer to these first-time supplying instances as (unmediated economy-wide) events. Across these

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[26]We start in 2010 to ensure we measure correctly the first year when a firm supplies an MNC. After 2015, we are no longer able to observe at least two years after each first-time linkage. See Online Appendix F.1.2 for details.

[27]In 2009 the average (median) never-supplier hires 11.6 (6.0) workers. These statistics for first-time and never-suppliers do not yet account for different sectoral and provincial compositions of the two samples.

events, the average (median) first sale to an MNC is of 62,400 (18,590) U.S. dollars and represents an average (median) share of 19 (6) % of that year's total sales. The relationship with the first MNC buyer lasts on average (median) 2.76 (2) years. These values and durations suggest that the relationship with the first MNC buyer is plausibly consequential for the supplier.

We contrast these statistics with those for the sample of events mediated by the "Productive Linkages" program and find them to be comparable.[28] In our field surveys, we asked domestic suppliers with deals through Procomer about why they sought such deals in addition to their unmediated deals. For 60% of these firms, Procomer granted better access to MNCs, for 53%, Procomer deals were no different from their other deals but provided another source of business, and for 40%, Procomer lent them credibility in front of MNCs. Hence, it seems that whether first deals with MNCs are mediated or not is not a first-order feature of these deals. On the grounds of these similarities, we use the "Productive Linkages" analysis as a robustness check to our main economy-wide analysis.

Our surveys provide context on the expectations of both MNCs and domestic suppliers ahead of a first linkage. When evaluating a supplier in Costa Rica, MNCs pay particular attention to four aspects: the quality of the inputs delivered, the willingness or ability of the supplier to adapt to the needs of the MNC, the price, and organizational traits such as reliability or the traceability of inputs. MNCs cannot afford a slow learning curve of the domestic supplier; their expectations need to be met soon after establishing the contract (or else the contract is discontinued). Before their first MNC buyer, all domestic firms expected MNCs to differ from domestic buyers. The largest expected differences involved MNCs placing larger orders, being more reliable payers, offering longer contracts, and helping suppliers to adopt better management practices. Despite expecting differences, domestic firms were still taken by surprise by the quick pace, breadth and depth of the changes necessary to supply to MNCs. For many of them, what followed after their first MNC deal was *"as if being thrown into the water without knowing how to swim and having to learn fast"* (direct quote from one business owner).

# 3 Event-Study Designs

## 3.1 Economy-Wide Event-Study Design

In our main empirical analysis, we study the effects of becoming a first-time supplier to an MNC in Costa Rica. Between 2010 and 2015, 3,697 such events occur across the Costa Rican economy.[29] More specifically, we estimate the following event-study specification:

$$y_{it} = \alpha_i + X_{it}^{\top}\beta + \lambda_{spt} + \sum_{k=\underline{C}}^{\overline{C}} \theta_k D_{it}^k + \varepsilon_{it}, \tag{1}$$

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[28]For descriptive statistics on the events mediated by "Productive Linkages", see Online Appendix F.2.2.

[29]There are 3,813 domestic firms that became first-time suppliers to 471 MNCs. However, in the main event-study regression (1) studying the impact on total sales, only 3,697 of these domestic firms are used in the estimation, with the rest being dropped due to the fine set of fixed effects used. For consistency, in Section 2.2 we present summary statistics only for those 3,697 firms and their associated 444 first MNC buyers.

where $y_{it}$ is an outcome variable for firm $i$ in calendar year $t$, $\alpha_i$ is a firm fixed effect, and $X_{it}$ is a vector with firm-level time-varying characteristics. $\lambda_{spt}$ are four-digit sector $\times$ province $\times$ calendar year fixed effects. We define the event-time dummies as $D_{it}^k := \mathbb{1}[t = \tau_i + k]$ $\forall k \in (\underline{C}, \overline{C})$, $D_{it}^{\overline{C}} = \mathbb{1}[t \geq \tau_i + \overline{C}]$, and $D_{it}^{\underline{C}} = \mathbb{1}[t \leq \tau_i + \underline{C}]$, where $\mathbb{1}[.]$ is the indicator function and $\tau_i$ is the first year when firm $i$ sells to an MNC. $\varepsilon_{it}$ is an error term. We normalize $\theta_{-1} = 0$ and set $\underline{C} = -5$ and $\overline{C} = +5$.

The interpretation of the $\theta_k$ sequence depends on the sample over which we run the event-study regression. In all our economy-wide regressions, we use two samples: the *full sample* includes both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC in the firm-to-firm transaction data, whereas the *restricted sample* contains only the firms that eventually become first-time suppliers to MNCs. With the full sample, we compare the outcomes of first-time suppliers in event year *k* to the outcomes in event year *-1* of firms that are yet to supply to an MNC (future first-time suppliers and never-suppliers alike) and that are in the same narrowly-defined sector and province.[30] With the restricted sample, we compare the outcomes of suppliers in event year *k* to the outcomes of future first-time suppliers in the same narrowly-defined sector and province in the year before their event (in excess of fixed effects).[31]

Identification of the event-study coefficients hinges on the assumption that firms yet to supply to MNCs form a credible counterfactual for firms that start supplying to MNCs, after accounting for time-invariant (observed and unobserved) differences between firms and common sector-by-province-by-year shocks.[32] One might be concerned that – even when chosen from the same four-digit sector and province – never-suppliers do not provide a suitable counterfactual for first-time suppliers. With the restricted sample we can directly test if our estimates are explained by the contrast to never-suppliers or by the staggered timing of a first transaction with MNCs. To preview the results, we find similar estimates across samples, which points to the event as the primary driver of our estimated effects.

Implicit in attributing these effects to becoming a supplier to MNCs is the assumption that there is no selection of firms into supplying to MNCs based on transitory firm-specific shocks that can determine outcomes (Blundell and Dias, 2009).[33] More specifically, shocks with the following three characteristics can pose a threat to identification: (i) they affect the

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[30]For never-suppliers, $D_{it}^k := 0$, $\forall t$ and $\forall k$. The outcomes of never-suppliers are thus part of the set of outcomes assigned to event year *-1*, together with the outcomes of first-time suppliers in event year *-1*. We cluster standard errors at the two-digit sector $\times$ province level to account for possible correlations in outcomes among firms in these cells. We cannot add event-year clustering as never-suppliers do not have an event year.

[31]With this sample, we cluster standard errors at the province $\times$ event year level. Event year clustering is recommended whenever event dates are concentrated on a few values, as in our case from 2010 to 2015.

[32]This design is not challenged by selection on levels, observable or not. For instance, even before starting to supply to MNCs, first-time suppliers hire on average 19% more workers than never-suppliers in the same four-digit sector and province. In addition, a consistent estimate of the average treatment effect requires that treated and control firms experience the same macro shocks (Blundell and Dias, 2009). Differential trends might arise if treated and controls operate in different markets. We limit comparison firms to nearby firms in the same four-digit sector to control for common shocks, such as those to factor markets or transportation networks.

[33]In other words, "the availability of panel data allows us to consistently estimate treatment effects without assuming ignorability of treatment and without an instrumental variable, provided the treatment varies over time and is uncorrelated with time-varying unobservables that affect the response" (Wooldridge, 2002).

timing of the event, (ii) they affect firm performance after the event, but (iii) they do not affect firm performance before the event. The last condition is important, as we do not find any evidence of pre-existing differential trends for first-time suppliers to MNCs.

Without exhaustive information on first-time suppliers beyond what is available in tax data, it is hard to dismiss this threat definitively. To make progress on this, Section 4.2.1 conducts a battery of checks on its plausibility, such as whether results are driven by changes in firm management contemporaneous with the event. We ultimately conclude that there is limited scope for results to be driven by firm-specific time-varying unobservables satisfying the three conditions above. That is, the event-study design appears suitable for our context and intention to identify the treatment effects of joining MNC supply chains.

## 3.2    Robustness Check: "Winner vs. Losers" Event-Study Design

We use Procomer's "Productive Linkages" program as a robustness check. Its rules generate quasi-experimental variation in opportunities to supply to MNCs among firms shortlisted for a given deal with an MNC. Procomer undertakes thorough evaluations of domestic firms willing to supply to MNCs and assigns them an overall score of readiness to do so. Based on scores, Procomer proposes shortlists of candidate suppliers to MNCs. As most of the information behind scores is typically not available in tax data, these shortlists are likely to provide stronger control groups than those based on tax data alone.[34]

The shortlists of Procomer are similar in spirit to the location rankings for "million dollar plants" (MDP) from Greenstone, Hornbeck, and Moretti (2010). Our argument parallels theirs: shortlisted firms (counties) missing a deal with an MNC (MDP) offer a valid counterfactual to what would have happened with the winners' performance had they not won the deal. In contrast to Greenstone, Hornbeck, and Moretti (2010), we observe the Procomer scores behind the ranking shared with MNCs. In Section 4.2.2, we show the similarity between winners and losers in scores, in addition to other observable characteristics.

The "winner vs. losers" event-study design is a generalized triple-difference design where firms experience a first deal with an MNC in different years. We modify equation (1) to allow for an extra interaction between event dummies $D_{idt}^k$ and an indicator dummy of winning deal $d$, $\mathbb{1}\{Winner\}_{id}$. We label the winner and losers of the same deal with the same $d$ subscript. We investigate the effect of being considered for deal $d$ on both the winner and losers of that deal by running the following regression:

$$y_{idt} = \alpha_i + X_{it}^\top \beta + \gamma_d + \lambda_t + \sum_{k=\underline{C}}^{\overline{C}} \theta_k^L D_{idt}^k + \sum_{k=\underline{C}}^{\overline{C}} \theta_k^{Diff} \mathbb{1}\{Winner\}_{id} D_{idt}^k + \varepsilon_{idt}, \qquad (2)$$

where $y_{idt}$ is the outcome of firm $i$ part of deal $d$ in year $t$, $\lambda_t$ is the calendar year fixed effect, and $\mathbb{1}\{Winner\}_{id}$ is an indicator function that equals 1 if firm $i$ is the winner of deal $d$. $\gamma_d$ are

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[34]For instance, Procomer asks whether the firm uses an enterprise resource planning software or whether it carries out financial feasibility studies for its projects. See Figure F6 (Online Appendix F.2.1) for more examples.

deal fixed effects that force the effects on the winner to be measured with respect to those on the actual contenders to the same deal. Our coefficients of interest are $\theta_k^L$ and $\theta_k^{Diff}$, which are interpreted as the effect of the event on the losers and on the difference in outcomes between winners and losers, respectively. All other variables are defined the same as for equation (1).

# 4  Event-Study Results on Improvements in Firm Performance

## 4.1  Baseline Results

We implement the event-study specification (1) to estimate the effects of starting to supply to an MNC on firm scale and standard measures of TFP. We also bring in the firm-to-firm transactions to study the effects on the sales made to buyers other than the first MNC buyer. These results characterize the 3,697 domestic firms who become first-time suppliers to an MNC in Costa Rica between 2010 and 2015. Hereafter, we mention the results from the full sample that includes both first-time suppliers and firms never supplying to an MNC. For completeness, all tables also report the results for the restricted sample that excludes never-suppliers.

*Firm scale.* Figure 2 plots the event-study coefficients for total sales, the number of workers, net assets, and input costs. Reassuringly, we find no evidence of selection into supplying based on past firm growth. It is only after firms start supplying to MNCs that they experience strong and lasting growth. These effects already manifest themselves in the year of their first transaction with an MNC, when the average growth relative to the previous year is of 16% in sales, 6% in the number of workers, and 9% in input costs. Firms continue expanding over the next two years to plateau thereafter at 33% higher sales, 26% more workers, 22% more assets, and 23% higher input costs. Table 1 provides additional details. In particular, it shows that the full sample estimates hold up to dropping the never-suppliers. This suggests that the driver of our baseline results is the event, and not the comparison to never-suppliers.

The magnitude and long-run nature of these effects are noteworthy. The average (median) first sale to an MNC is of 62,400 (18,590) U.S. dollars and represents an average (median) share of 19% (6%) of that year's total sales. In other settings where firms receive demand shocks that are comparable (or even bigger), firms do not grow as much. For instance, Atkin, Khandelwal, and Osman (2017) find that Egyptian firms who receive large export orders for rugs (with cumulative payments of 155,682 U.S. dollars for 11 weeks of work) did not increase their number of employees and capital usage. Similarly, supply-side interventions such as business training can also fail to boost firm scale (Karlan and Valdivia, 2011).

*Business with other buyers.* The natural concern with these findings of firm growth is that they are largely explained by the addition of a new (MNC) buyer. We now leverage the firm-to-firm transaction data to investigate this possibility. In addition to the pattern of total sales, Figure 3 shows the patterns of sales to all buyers *except* the first MNC buyer (*sales to others*), all corporate buyers (*total corporate sales*), and all corporate buyers *except* the first MNC buyer (*corporate sales to others*). The *corporate buyers* of a firm in a given year are those reported in the

firm-to-firm transaction data, i.e., firms in Costa Rica whose purchases of goods or services exceed 4,200 U.S. dollars that year. Sales to others are equal to total sales minus the sales to the first MNC buyer. Total corporate sales are those made to all corporate buyers. Corporate sales to others exclude the sales to the first MNC buyer.[35]

Across these four sets of buyers, we find no evidence of differential trends in sales before the event of a first sale to an MNC. However, we find large and lasting increases in the four types of sales after the event. Most importantly, these increases are maintained even after we exclude the sales to the first MNC buyer. In the year of the event, sales to others decrease by 19%. This suggests that firms may be capacity-constrained in the short-run. Four years after the event, sales to others increase by 20%, while corporate sales to others increase by 45%.[36]

Next, we ask whether these changes in sales to others work through the change in the number of buyers (extensive margin) or average sales (intensive margin). Figure 3 (Panel 3e) plots the event-study coefficients from a regression where the dependent variable is the log number of corporate buyers (except the MNC triggering the event). We find no differential trends in the number of corporate buyers in the years preceding a first contract with an MNC. There is clear evidence, however, of a gradual increase in the number of other corporate buyers after the event, such that, four years later these firms have about 36% more corporate buyers.[37]

To study responses along the intensive margin, we study the average value of transactions across corporate buyers in each event year. The year when firms make their first sale to an MNC, they see a large decline in their average transaction with other corporate buyers. However, in the next four years, the average transaction becomes 14% higher than in the year before the event. Table A4 (Online Appendix A) shifts to an event-study where each observation is the transaction value associated to a supplier-buyer-year triad. With supplier×buyer fixed effects, we show that four years after the event of the supplier, sales within supplier-buyer pairs are 5% higher. Tables 2 and 3 provide more details and robustness checks to our results in Figure 3 (e.g., we show that results are not driven by demand from buyers who themselves started supplying to MNCs).[38]

*Standard measures of TFP.* We first estimate TFP using OLS, assuming either a Cobb-Douglas or a translog production function. To this end, in specification (1), we use log sales

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[35]Aside from total corporate sales, total sales contain exports and sales to end consumers (general public) and firms in Costa Rica whose purchases that year sum up to less than the reporting threshold. We call this difference *non-corporate sales*. Total sales come from corporate income tax returns. Corporate sales and corporate sales to others come from the firm-to-firm transaction data.

[36]Sales to others increase less than corporate sales to others due to a slower increase of 16% in non-corporate sales (see column (1) in Table A3, Online Appendix A). Figure A3 (Online Appendix A) shows how the composition of the sales of first-time suppliers to MNCs changes with the event time. Sales are assigned to five types of buyers: the government, domestic buyers, partially foreign-owned buyers (but not MNC affiliates), MNCs, and exports.

[37]Figure A4 (Online Appendix A) reveals that part of these new buyers are MNCs other than the first MNC buyer. While the lack of pre-trends is mechanical, the continued increase in the number of new MNC buyers is not.

[38]Our findings of increased sales to others suggest that suppliers may not be the only ones who benefited from their new supplying relationship, but that these other buyers benefited as well. Kee (2015) uses a representative sample of Bangladeshi garment firms to show that domestic firms who share suppliers with foreign-owned firms experience both expansions in product scope and productivity. Kee's paper provides empirical support for the theory of Rodríguez-Clare (1996) and Carluccio and Fally (2013). While these potential gains to domestic buyers are certainly relevant to any estimation of the aggregate effects of MNCs, they are beyond the scope of this paper.

as the outcome variable and the logs of the number of workers, net assets, and input costs as the time-varying controls. We also construct a TFP index for the Cobb-Douglas production function. Instead of estimating input coefficients, we "residualize" sales by subtracting firm-level inputs used, weighted by their respective two-digit-level cost shares.[39] As OLS does not account for the potential endogeneity of firm-level input choices, we also use the methods proposed by Levinsohn and Petrin (2003) and Ackerberg, Caves, and Frazer (2015).

Figure 4 summarizes these results and Table 4 provides details. Reassuringly, firms that start supplying to MNCs do not display a history of TFP growth. After their events however, suppliers exhibit large increases in TFP, such that four years later, TFP is 6 to 9% higher than in the year before the event.[40] Under certain assumptions, we can interpret these estimates as capturing the behavior of true TFP. In particular, if we assume away input and output price variations correlated with the event, then the methods of Levinsohn and Petrin (2003) and Ackerberg, Caves, and Frazer (2015) already address the other main concern of TFP estimation (input choice endogeneity) and provide credible estimates of true TFP.

We now address the likelihood of one specific type of price variation that could be triggered by the event and lead to an overestimation of true TFP: higher mark-ups charged by the domestic firm after becoming a first-time supplier to an MNC. While we cannot directly rule out this possibility – as we do not observe prices and quantities separately – we provide several pieces evidence against it.

We first use the empirical model of De Loecker and Warzynski (2012), that allows for the estimation of mark-ups by relying on standard cost minimization conditions for variable inputs free of adjustment costs. Table A2 (Online Appendix A) points to a decline in the mark-up of domestic firms, after they become suppliers to MNCs. Hence, if anything, mark-up effects would lead to an underestimation of the true TFP gain.

Further, the answers from our surveys to domestic suppliers and MNCs are compatible with these mark-up estimates. Out of 106 domestic firms, 43 firms found that it was particularly challenging to find a first MNC buyer. Among the three biggest challenges was the fact that MNCs expected lower prices than these firms could offer. Of the 49 domestic firms who assessed that they were explicitly helped by their first MNC buyer to adjust, 34 firms said that MNCs expected in return either unchanged prices (for improving quality) or lower prices (for unchanged quality or even for improving quality).

We then asked domestic firms about their pricing practices for the same order (defined as same product, quality, and quantity) coming from either MNC or domestic buyers. 58% replied that they usually charge the same price to both types of buyers, with the other 42% split in half between whether they charge MNCs more or less. During the in-person surveys, we asked domestic firms if they had ever incurred losses from deals with MNCs. 11 of 15 firms

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[39]The dependent variable for the Cobb-Douglas TFP index is $Y_{ist} - \alpha_{k,s2D} \times K_{ist} - \alpha_{l,s2D} \times WB_{ist} - \alpha_{m,s2D} \times M_{ist}$, where $\alpha_{l,s2D}$=(two-digit sectoral wage bill)/(two-digit sectoral revenues), $\alpha_{m,s2D}$=(two-digit sectoral input costs)/(two-digit sectoral revenues), and $\alpha_{k,s2D} = 1 - \alpha_{l,s2D} - \alpha_{m,s2D}$ (to avoid the need to measure capital costs).
[40]Table A1 (Online Appendix A) shows results for more measures of performance, e.g., profits or sales per worker.

stated that they have made deals at a loss, particularly among the first MNC deals.[41]

From surveys of 58 MNCs, we learn that prices are among the top three criteria in choosing a local supplier. Of the 40 MNCs that claimed to provide explicit help to their new domestic suppliers, 27 expect, in return, prices that either remain unchanged or fall (for an improving quality). MNCs have a privileged access to imports (particularly those in FTZs, which are exempted from custom duties) and, through their corporate commodity manager, are well-informed on suitable suppliers abroad. This suggests that there is little room for domestic suppliers to obtain higher mark-ups from MNCs. Overall, irrespective of the angle of the questions and whether they were addressed to MNCs or domestic firms, we find no indication that suppliers extract higher mark-ups from MNCs. To the contrary, MNCs expect lower mark-ups. Our survey evidence (see Online Appendix G.3) is in line with previous evidence.[42]

Finally, we have just seen that starting to supply to MNCs improves the business performance of domestic firms with other buyers, both on the extensive and intensive margins. While this can occur despite price hikes, it suggests that the appeal of the products offered by these suppliers must have increased more than their prices. We conclude that it is unlikely that mark-ups explain the strong and persistent gains in standard measures of TFP.

## 4.2 Robustness Checks to the Baseline Results

### 4.2.1 Main Economy-Wide Event-Study Design

There is one remaining threat to identification that is not entirely addressed by our findings thus far: the selection of firms into supplying to MNCs based on transitory firm-specific shocks that can determine outcomes. We now investigate the plausibility of this threat.

To start, we asked in our surveys whether domestic firms took special measures to get ready for or attract their first MNC buyer. 44% of domestic firms replied that they did not. Of the other 56%, the most common measures taken ahead of a first sale to MNCs involved efforts to contact MNCs (in-person, online, at business fairs etc.). These efforts are likely to increase the probability of a first deal with an MNC, but unlikely to directly affect TFP. Our surveys also asked domestic firms whether there was any notable change that happened in the firm just before the first contract with the MNC. To the extent that this change can explain the wide-ranging effects just documented, then we would be misattributing these effects to the first deal with the MNC. 100 of the 106 domestic firms denied that such a change took place. None of the six positive answers challenges the interpretation of our estimates as measuring the treatment effect of becoming a supplier to MNCs. See Online Appendix G.3 for details.

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[41]The typical domestic supplier seems to bear most of the risk. For one supplier: "when the MNC develops a prototype for an input, they send us a blueprint. They have a budget for that input, which we agree with. During the process of development (more meetings, R&D processes and follow-ups), there are a lot of changes and improvements that increase the initial cost. We sometimes have to absorb this extra cost to keep the deal and the buyer, and to be taken into account in the future."

[42]Javorcik, Keller, and Tybout (2008) interview suppliers to Wal-Mart in Mexico who describe the bargaining style of Wal-Mart as "take-or-leave-it." To sell to Wal-Mart, firms must accept lower profit margins. Surveys from the Czech Republic find that 40% of suppliers to MNCs had to lower prices 1-30% (Javorcik, 2008).

Moreover, we use administrative data from the Costa Rican Social Security Fund to rule out what we believe to be the most plausible confounding factor: a change in management preceding the first contract with an MNC buyer. A well-connected and talented manager can bring in both this contract and improvements in firm performance. Of the 3,697 first-time suppliers, we identify those having replaced one of their top two earners (plausibly the top tier of managers) in either the year of the first transaction with an MNC or the year before. For this replacement to qualify as a threat, we focus on workers that are new-hires (as opposed to internal promotions). Reassuringly, our estimates are robust to excluding those domestic firms having hired new managers just before their event (see Table B4 in Online Appendix B.2).

We also probe the robustness of our baseline event-study results to other common concerns about the event-study methodology. Results are qualitatively similar when we vary the set of fixed-effects used in our baseline regressions (see Tables B1 to B3 in Online Appendix B and the discussion that precedes them). Results are also similar when we estimate the regressions on a balanced sample in event time (see Table B5 in Online Appendix B.3). Finally, to accommodate the possibility that the treatment onset is the first contact with an MNC and such contacts occur a year before the first transaction, we redefine the event-year as the year before the first transaction. Results only change in their almost mechanical delay by a year (see Online Appendix B.4). These alternate specifications corroborate the suitability of our event-study specification to estimate the effects of interest.

### 4.2.2 "Winner vs. Losers" Event-Study Design

As argued in Section 3.2, the "Productive Linkages" program delivers plausible quasi-experimental variation in opportunities to supply to MNCs. Moreover, as described in Section 2.2, deals with MNCs mediated by this program appear to be similar along several key characteristics to economy-wide deals. We now examine whether our findings from the economy-wide event-study design are similar to those obtained from the "Productive Linkages" design.

We first compare winners and losers before the relevant deal (i.e., the deal won by the winner and the deal to which the loser was a contender). Figure 5a shows the histograms of winners' and losers' scores (based on which Procomer established the short-lists), while Figure 5b plots the histogram of within-deal differences between winners' score and the average of losers' scores. In both figures there is no systematic tendency for the winners' scores to be larger than the losers'. One might interpret this finding as the scores being uninformative. Various pieces of evidence contradict this interpretation, however. First, Procomer scores are positively correlated with firm performance, measured with administrative data.[43] Second, Procomer aims to establish a good reputation for both domestic suppliers and its ability to identify them; assigning uninformative scores would undermine the confidence of MNCs. Table F8 (Online Appendix F.2.2) compares winners and losers in the year before the deal and fails to find statistically significant differences between winners and losers. Last, all firms that

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[43]Figure F7 (Online Appendix F.2.2) plots Procomer scores against firm value-added per worker. We find similar positive correlations for other measures of firm performance.

were losers in some deal ultimately became suppliers to MNCs. We conclude that the only meaningful difference between winners and losers is the timing of a first deal with an MNC.

We then proceed to estimating the "winner vs. losers" event-study specification from equation (2). Figure 6 plots the estimates of the $\theta_k^L$ and $\theta_k^{Diff}$ coefficients, where the $\theta_k^L$ estimates depict the average behavior of losers to a deal and the $\theta_k^{Diff}$ estimates depict the average behavior of winners relative to that of losers to their same deal. We look into five measures of firm performance: total sales, the number of workers, the TFP index, the sales to others, and the number of other corporate buyers. Reassuringly, winners do not exhibit pre-existing trends with respect to the losers. In contrast, after winning their first deal, winners improve their performance. While estimates are noisy due to the small sample size, they are comparable to those obtained from the main economy-wide analysis. As estimates of $\theta_k^L$ for $k>0$ suggest, the gains in winner performance do not come at the expense of the losers' performance, whose performance is left unscathed by the loss of the deal. Table 5 provides more details.

While the main economy-wide design and the "winner vs. losers" design have different advantages and disadvantages, it is comforting to see that their results are qualitatively similar.

### 4.2.3 Robustness Check on Interpretation: Improvements in Third-Party Reporting

One might worry that domestic firms starting to supply to MNCs improve their tax compliance in ways that cast doubt on the interpretation of our baseline results. The third-party reporting structure of the firm-to-firm transaction data offers a unique opportunity to evaluate this concern. In theory, third-party reporting has self-enforcing properties. However, when tax authorities lack resources to pursue inconsistencies between the reports of the buyer and supplier of a transaction, the odds of being audited are not equally distributed across transactions and firms. This weakens the incentives of compliance for transactions or firms under lower scrutiny. If domestic suppliers believe that MNCs are more prone to audits than domestic buyers, these suppliers may pay additional attention to their D-151 reporting.[44]

Firms can improve their D-151 reporting by reducing gaps in reported values for transactions declared by both firms in a buyer-seller pair and/or by lowering the share of transactions only reported by one party. We construct three proxies of reporting quality. The first is a weighted average of the within-pair percentage difference between the larger and the smaller of the two values reported, across all pairs where a given firm is the seller. If buyers consistently report larger amounts than sellers (as tax evasion incentives would suggest), then this measure captures the extent of under-reporting of one's sales compared to the reports of one's buyers. The second measure keeps only pairs where a firm is the buyer and is meant to quantify the extent of over-reporting of its purchases. Finally, we construct a measure of the frequency of transactions found only in the D-151 forms of one firm in the pair.

In Online Appendix B.5 we show that becoming a supplier to MNCs is unlikely to have a bearing on either measure of third-party reporting quality, and if it does, the effect is the

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[44]Pomeranz (2015) finds that randomly-assigned audit announcements lead to an increase in value-added tax payments by both treated firms and their suppliers. The increase is higher for treated firms than for their suppliers.

opposite to that predicted by a reduction of tax-evasive behaviors. Hence, we do not ascribe our results to changes in third-party reporting behavior.

# 5 Alternative Model-Based Measures of Firm Performance

In Section 4.1 we studied standard measures of TFP recovered from production function estimations that use sales and expenditure data. These measures already address key challenges of TFP estimation, such as the potential endogeneity of input choices. Nonetheless, an important concern that is not addressed by these measures is that of unobserved variation in prices across firms (De Loecker and Goldberg, 2014). While we find evidence against increases in mark-ups, input and output prices can still change with the event. Not accounting for such changes in prices can bias the estimation of input elasticities in the production function and confound changes in prices or returns to scale with changes in true TFP.

In the absence of disaggregated firm-level data on prices and quantities, we make progress via a simple model that exploits the richness of our transaction data to deliver model-consistent estimates of TFP. The model allows for firm-level changes in prices and scale effects by assuming a fairly general structure for demand and cost functions. The intuition is analogous to that of revealed preferences approaches used to infer TFP and/or quality adjustments from demand estimation.[45] We first infer changes in a *composite TFP* (TFP and other factors, such as reputation, that improve the appeal of the firm) from changes in a measure of adjusted sales to buyers other than the first MNC buyer (hereafter, *adjusted sales to others*). The adjustment controls for potential returns to scale and effects of the MNC demand shock on prices. We then decompose the sales to others into the intensive (average sales, conditional on buying) and extensive (number of buyers) margins. Increases in *average adjusted sales to others* are informative on changes in TFP alone. Among others, this approach has the advantage that it does not require the estimation of production function elasticities.[46]

We summarize the model and its results here, and present more details on derivations and robustness checks in Online Appendix C and Online Appendix D, respectively.

## 5.1 Model Environment

Let us consider a domestic supplier firm (henceforth, the supplier) selling a variety of a good to a number of buyers indexed by $i$. The supplier produces a total quantity of the variety $Q = \sum_i q_i$ with a total cost $TC(Q) = \kappa \left( \frac{Q}{\phi} \right)^{\frac{1}{\gamma}}$, where $\kappa$ is a constant, $\phi$ is a productivity shifter (TFP), and $\gamma > 0$ is the returns to scale parameter of the production function.[47]

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[45]See Broda and Weinstein (2006, 2010); Khandelwal (2010); Hallak and Schott (2011); Feenstra and Romalis (2014); Hottman, Redding, and Weinstein (2016); Bartelme, Costinot, Donaldson, and Rodríguez-Clare (2018).

[46]We circumvent the need to estimate production function elasticities by using transaction data to indirectly infer TFP changes. This is one way in which our approach differs from that of De Loecker (2011). To control for price variation, De Loecker (2011) combines a CES demand system with production function estimation.

[47]In the case of perfectly competitive input markets, our expression for the total cost function encompasses both Cobb-Douglas and general returns to scale CES production functions.

We assume that the supplier uses a market penetration technology such that in equilibrium, a higher TFP supplier has a higher probability to sell to any buyer $i$ (therefore selling to more buyers in equilibrium). This can be microfounded with either marketing (Arkolakis, 2010) or search costs (Bernard, Moxnes, and Saito, 2019). Additionally, there can be other factors such as the reputation or visibility of the supplier that, while potentially related to TFP, can also improve the probability of selling to a buyer. We will generically call all these factors *reputation* and denote them by $r$. We define the probability of selling to buyer $i$ as $n_i \equiv n_i(\phi, r) \in [0, 1]$. We refer to $\phi$ and $r$ as the *supply-side parameters*.

Each buyer combines a continuum of differentiated varieties according to a CES aggregator with elasticity $\sigma > 1$. At price $p(\phi)$, the effective demand for the variety of the supplier is given by $q_i(\phi, r) = n_i(\phi, r) b_i p(\phi)^{-\sigma}$. Here, $b_i = \frac{y_i}{P_i^{1-\sigma}}$, where $y_i$ is the budget and $P_i$ is the price index faced by buyer $i$. Implicitly, the supplier is free to supply to buyers other than the first MNC buyer (we rule out exclusivity clauses) and does not price discriminate among buyers. Both assumptions are motivated by our surveys. We also abstract from interactions between the market for this good and other markets, acting through general equilibrium effects.[48]

## 5.2 The Effect of the Event on Model-Based Measures of Firm Performance

As in our empirical analysis, consider the event where the supplier starts selling to its first MNC buyer ($MNC_0$). The event *may* lead to changes in one or both of the supply-side parameters ($\phi$ and $r$). Our model aims to help us estimate the change in $\phi$ (TFP).

We define $\widetilde{Q} = \sum_{i \neq MNC_0} q_i$ and $\widetilde{B} = \sum_{i \neq MNC_0} n_i b_i$ as the quantity sold to and the aggregate demand shifter of all other buyers (i.e., all buyers other than $MNC_0$). Using the structure of our model, we show in Online Appendix C that sales to other buyers can be written as:

$$\ln(p\widetilde{Q}) = \kappa' + \delta \ln(pQ) + \ln(\widetilde{B}) + (\sigma - 1)\ln(\phi), \tag{3}$$

where $\kappa'$ is a constant and $\delta \equiv \delta(\gamma, \sigma) = (\gamma - 1)(\sigma - 1) \in (1 - \sigma, 1)$.

This $\delta$ parameter captures the effect of returns to scale interacted with the demand curve parameter. $\delta$ plays a key role in defining what we call the adjusted sales to others. When $\delta \neq 0$ ($\gamma \neq 1$), sales to other buyers depend on firm scale (i.e., total sales), as a change in firm scale affects the optimal price even when TFP remains constant. This parameter is similar to a parameter defined in Bartelme, Costinot, Donaldson, and Rodríguez-Clare (2018), which is used to estimate external economies of scale at the sector level.

We then take the total derivative of both sides of equation (3) and rearrange terms such that the left-hand side depends only on information observable in firm-to-firm transaction data and $\delta$. We then assume that the demand shifters of buyers $i$ other than $MNC_0$ ($b_i = y_i / P_i^{1-\sigma}$)

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[48]Under these assumptions, the profit-maximizing price is equal to the familiar mark-up over marginal cost, $p = \frac{\sigma}{\sigma-1} MC(Q)$. The second order condition for profit maximization asks for the returns to scale to not be "too large," i.e. $1 - \frac{1}{\gamma} < \frac{1}{\sigma} < 1$.

do not change systematically due to the event.[49] Finally, we take expectations over all domestic firms that become first-time suppliers to an MNC and find that:

$$\mathbb{E}\left[\mathrm{dln}\left(\frac{p\widetilde{Q}}{(pQ)^\delta}\right)\right] = (\sigma-1)\varepsilon_\phi + \varepsilon_{\widetilde{n}}, \tag{4}$$

where $\varepsilon_\phi = \mathbb{E}\left[\mathrm{dln}(\phi)\right]$ and $\varepsilon_{\widetilde{n}}$ is the expectation of a weighted average of $\mathrm{dln}(n_i)$ $\forall i \neq MNC_0$.[50] The left-hand side of equation (4) is the expectation of the change in adjusted sales to others.

Let us now define $\varepsilon_{\phi'} = \varepsilon_\phi + \frac{1}{(\sigma-1)}\varepsilon_{\widetilde{n}}$ and call it *composite TFP*. The following result emphasizes what needs to be known to estimate changes in composite TFP via equation (4).[51]

**Result 1.** *With values for $\delta$ (the parameter capturing the effect of returns to scale interacted with the demand curve parameter), $\sigma$ (the elasticity of demand), $pQ$ (total sales), and $p\widetilde{Q}$ (sales to others, before and after the event of interest), one can estimate $\varepsilon_{\phi'}$ (the change in composite TFP) after an event. Specifically, $\varepsilon_{\phi'} = \frac{1}{(\sigma-1)}\mathbb{E}\left[\mathrm{dln}\left(\frac{p\widetilde{Q}}{(pQ)^\delta}\right)\right]$.*

**Proof.** *See Online Appendix C.*

We can think of changes in composite TFP as measuring changes in supply-side features that affect suppliers' growth both through their number of buyers (extensive margin) and through their average sales made to actual buyers (intensive margin). Composite TFP is thus akin to a multi-dimensional productivity which includes TFP to reputation.

There are (at least) three ways to relate $\varepsilon_{\phi'}$ with $\varepsilon_\phi$. First, note that $\varepsilon_{\phi'} = \varepsilon_\phi$ only if $\varepsilon_{\widetilde{n}} = 0$. That is, increases in composite TFP and TFP would be equal only when the increase in adjusted sales to others occurs uniquely through the intensive margin. Given that we find an increase of 36% in the number of buyers, we expect the increase in composite TFP to be larger than the increase in TFP alone. Second, whenever $\varepsilon_{\widetilde{n}}$ depends only on firm-level features other than $\phi$ (say, reputation), then changes in composite TFP not only capture changes in TFP but also changes in these other features that affect the appeal of the firm. This case motivates the interpretation of $\varepsilon_{\phi'}$ as multi-dimensional productivity. Finally, it is very plausible that $\varepsilon_{\widetilde{n}}$ does depend on $\phi$ as well. In the likely case that $\varepsilon_\phi$ positively affects $\varepsilon_{\widetilde{n}}$, then an increase in composite TFP is likely to "double-count" the increase in TFP.[52]

To estimate the increase in TFP alone ($\varepsilon_\phi$), we make two additional assumptions. First, we assume that there is a large number of potential buyers in the country. Second, we assume that for any changes in $\phi$ and/or $r$, all buyers $i$ equally adjust their probability to buy from the

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[49]More precisely, we assume $\varepsilon_{\widetilde{b}} = 0$, where $\varepsilon_{\widetilde{b}}$ is the expectation of a weighted average of $\mathrm{dln}(b_i)$, $\forall i \neq MNC_0$. This does not rule out changes in the composition of buyers (thus changes in the average $b_i$ of the actual buyers). It only rules out systematic changes in the $b_i$s of all other potential buyers due to the event of the supplier.

[50]The weight for buyer $i$ is equal to $n_i / (\sum_{k \neq MNC_0}^N n_k b_k)$.

[51]Note that if one is only interested in whether the event leads to an overall improvement in supply-side parameters ($\phi$ and/or $r$), one does not need to take a stand on the value of $\sigma$. Formally, $\mathbb{E}\left[\mathrm{dln}\left(p\widetilde{Q}/(pQ)^\delta\right)\right] > 0$ if and only if there are overall improvements in supply-side parameters ($\phi$ and/or $r$).

[52]For example, in the *ad hoc* case where $\varepsilon_{\widetilde{n}} = (\sigma-1)\varepsilon_\phi$, then $\varepsilon_{\phi'} = 2\varepsilon_\phi$ (i.e. the increase in composite TFP overestimates the increase in actual TFP by 100%).

supplier, i.e., $\text{dln}(n_i) = \text{dln}(n), \forall i \neq MNC_0$. Under these conditions, $\varepsilon_{\widetilde{n}} = \mathbb{E}\left[\text{dln}(\widetilde{N})\right]$, where $\widetilde{N}$ is the number of buyers other than $MNC_0$.[53] This leads us to Result 2.[54]

**Result 2.** *With values for $\delta$ (the parameter capturing the effect of returns to scale interacted with the demand curve parameter), $\sigma$ (the elasticity of demand), $pQ$ (total sales), $p\widetilde{Q}$ (sales to others), and $\widetilde{N}$ (the number of other buyers, before and after the event of interest), one can estimate $\varepsilon_\phi$ (the change in TFP) after an event. Specifically, $\varepsilon_\phi = \frac{1}{(\sigma-1)}\mathbb{E}\left[\text{dln}\left(\frac{p\widetilde{Q}/(pQ)^\delta}{\widetilde{N}}\right)\right]$.*

**Proof.** *See Online Appendix C.*

Given that our administrative data allows us to track total sales, sales to others, and the number of other buyers, the remaining step before bringing these results to the data is to settle on credible estimates of $\delta$ and $\sigma$. In the following section we describe our IV approach to estimating $\delta$. With its estimate in hand, we use the event-study specification in equation (1) with adjusted sales and average adjusted sales as dependent variables. Last, we follow Broda and Weinstein (2006) and set $\sigma$ equal to 6, which is a standard value in the trade literature.

## 5.3 IV Estimation of the $\delta$ Parameter

Our preferred estimate of $\delta$ comes from an IV strategy. Consider a buyer $j$ and the same assumptions of our model. Denote by an overline all variables that aggregate across all buyers other than $j$. We can write the expectation of the total differential of log sales to buyers different from $j$ divided by the number of buyers different from $j$ as:

$$\mathbb{E}\left[\text{dln}\left(\frac{p\overline{Q}}{\overline{N}}\right)\right] = \delta\mathbb{E}\left[\text{dln}\left(pQ\right)\right] + (\sigma-1)\varepsilon_\phi + \varepsilon_{\overline{b}},$$

The empirical counterpart of this equation is given by the following linear regression:

$$\Delta\ln\left(\frac{p\overline{Q}}{\overline{N}}\right)_{it} = \alpha_i + \lambda_{spt} + \delta\Delta\ln(pQ)_{it} + \nu_{it}, \tag{5}$$

where the structural error $\nu_{it}$ contains both a multiple of the change in firm TFP and changes in the aggregate demand shifter of other buyers (net of firm and four-digit sector × province × year fixed effects, $\alpha_i$ and $\lambda_{spt}$ respectively).

The OLS estimate of $\delta$ is likely to be inconsistent, as the error term (e.g., its component coming from a potential change in TFP) may not only affect average sales to other buyers

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[53]The first assumption implies that with a large number of potential buyers, the total number of other buyers of the supplier ($\widetilde{N}$) is given by the sum of their probabilities of buying from the supplier ($n_i$): $\widetilde{N} = \sum_{i\neq MNC_0}^N n_i$. A weaker version of the second assumption would suffice, but for the sake of exposition we proceed with this stronger version. We provide a discussion of this assumption and its implications in Online Appendix D.5.

[54]Similar to the case for Result 1, if one is only interested in testing whether the event leads to an increase in TFP, then one does not need to take a stand on $\sigma$. $\mathbb{E}\left[\text{dln}\left(\frac{p\widetilde{Q}/(pQ)^\delta}{\widetilde{N}}\right)\right] > 0$ if and only if $\varepsilon_\phi > 0$.

directly through prices, but may also be correlated to total sales. We can overcome this endogeneity via an IV approach. We require the instrument (a) to shift the total sales of firm $i$, and (b) to affect the average sales to buyers different from $j$ only through a potential scale effect. The ideal instrument would not be correlated with either changes in the TFP of firm $i$, or changes in the demand parameters from buyers other than buyer $j$. We propose a special case where buyer $j$ is the government. Our instrument exploits the moment in which a supplier gets a first procurement contract from the government. More precisely, our proposed instrument for the change in log total sales of supplier $i$ at time $t$ is a dummy variable indicating whether supplier $i$ is awarded a procurement contract at time $t-1$ or not.

The exclusion restriction is plausible because (i) the government is a buyer which is unlikely to provide learning opportunities to suppliers (so that supplying to the government at $t-1$ is uncorrelated with changes in firm TFP at $t$), and (ii) it is unlikely that supplying to the government at $t-1$ is systematically correlated with changes in average demand shifters of other buyers at time $t$.[55] Moreover, our instrument is relevant, as procurement contracts with the government in year $t-1$ affect the change in total sales from $t-1$ to $t$. See Online Appendix D.1 for additional details.

Table D2 (Online Appendix D.2) reports the results from this IV strategy. Our preferred estimate of $\delta$ is of $-0.22$ and stems from the full sample including both firms that experience the event of starting to supply to the government and firms that never supply to the government. That said, if we use $\delta = -0.08$, the estimate from the restricted sample, results do not change significantly. The first-stage F-statistic is 50 (110 for the restricted sample).

## 5.4 Model-Based Results

*Result 1.* In columns (1) and (2) of Table 6, we study the behavior of composite TFP before and after domestic firms become first-time suppliers to an MNC. The dependent variable of these event-studies is $1/(\sigma - 1)$ times the log of adjusted sales to others. We construct adjusted sales to others in two ways: one combines corporate income tax returns data with the firm-to-firm transaction data, the other uses only the firm-to-firm transaction data.[56] In both cases, we find no evidence of differential trends before the event and a strong and positive growth afterwards. Four years later, composite TFP is 6% higher than in the year before the event.[57]

Figure 7 compares this model-based measure of composite TFP to those from three stan-

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[55]Note that the structural error $\nu_{it}$ does not depend on $r$. Equation (5) already takes into account the extensive margin, hence any supply-side parameter other than $\phi$ affecting the probability of selling to new buyers. Even if starting to sell to the government induces an improvement in one's reputation, this does not invalidate our instrument. One concern is that changes in TFP might drive procurement contracts with the government in the first place. This is partially alleviated by using the instrument with a lag, as future changes in TFP are less likely to predict past contracts. In addition, Table D1 (Online Appendix D.1) shows event-study regressions where the event is defined as the first time a domestic firm gets a procurement contract with the government. We do not find evidence of selection based on pre-trends in TFP. We only find small and short-lived changes in TFP after the event, lending support to our exclusion restriction. See Online Appendix D.1 for more details.

[56]The total sales from firm-to-firm transaction data are the total corporate sales defined in Section 4.1, whereas the sales to others from firm-to-firm transaction data are the corporate sales to others defined in the same section.

[57]We prefer the estimate in column (1) because it captures the behavior of sales to *all* other buyers, not only those recorded in the firm-to-firm transaction data.

dard measures of TFP: a Cobb-Douglas TFP index, and Cobb-Douglas and translog production function estimation residuals. For direct comparability, all estimates use total sales (to others) from corporate income tax returns data. The message from this figure is clear: estimates from all four measures of TFP are statistically similar.[58]

*Result 2.* Column (3) of Table 6 shows the effect of becoming a supplier to MNCs on TFP alone (as opposed to composite TFP). The dependent variable is now $1/(\sigma-1)$ times the log of average adjusted sales to others. We construct average adjusted sales to others only from firm-to-firm transaction data, as this allows us to track changes in the intensive and extensive margin for the same set of buyers. Again, we find no evidence of differential trends in TFP before the event and strong and positive growth after.

Contrasting these results with those from Result 1 informs us on the importance of the extensive margin (recall that composite TFP and TFP are only equal when $\varepsilon_{\widetilde{n}} = 0$). To this end, we compute (one minus) the ratio of the TFP gain according to Result 2 (0.047 from column (3) from Table 6) over the gain in composite TFP according to Result 1 (0.109 from column (2)). This exercise indicates that the increased ability to get new buyers (the extensive margin) accounts for 57% of the change in composite TFP. One limitation of the TFP estimates from column (3) is that they describe the behavior of transactions with corporate buyers alone.

To make statements that describe TFP based on the average sales to *all* other buyers (not just those recorded by the firm-to-firm transaction data) one requires additional assumptions on the pattern of the number of buyers whose transactions are under the reporting threshold. Under the proportionality assumption that the extensive margin matters as much for the sales to corporate buyers above the threshold as to those below, the TFP estimate from Result 2 would become 43% of the 6% estimate from Result 1 (column (1) from Table 6), or around 3%.

Estimating the share of these extensive margin effects uniquely due to changes in TFP ($\phi$) or reputation ($r$) is outside the scope of this paper. We therefore remain agnostic on how $\phi$ and $r$ relate to each other and to the probability of selling to a new buyer ($n_i$). We only assume that both $\phi$ and $r$ have a positive effect on this probability. That said, $\phi$ is likely to be positively correlated with $r$; a firm that reveals itself as able to learn and adapt fast is likely to improve its reputation, and vice versa. Section 6 provides intuition on this relationship from our surveys.

An exhaustive anatomy of the changes undergone by first-time suppliers to MNCs requires significantly more data than what is commonly recorded for an entire economy (e.g., data on prices, product quality, product scope, reputation). Nonetheless, the findings in this section represent a step forward in terms of understanding these changes, relative to what can be known from corporate income tax returns data alone. In particular, we have shown that by combining firm-to-firm transaction data with a simple model, we can learn about the potential role of the extensive margin. While part of the improved ability to sell to more buyers may be

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[58]The only difference that is statistically significant pertains to the year of the event. During that year, suppliers experience a net increase in total sales and a concomitant fall in sales to others. While standard measures of TFP only take into account the net increase in total sales, our model rationalizes the decrease in sales to others as a decrease in composite TFP. This fall in sales to others is likely to be driven by adjustment frictions upon starting to supply to MNCs, outside the scope of this model.

a consequence of gains in TFP, the extensive margin seems able to compound these gains.

## 5.5 Robustness Checks for the Model-Based Results

Our baseline model-based results use $\delta = -0.22$ and $\sigma = 6$, which imply returns to scale $\gamma = 0.96$. Online Appendix D explores their sensitivity to both parameters. We first vary $\delta$ between -1.2 and 0.3, keeping $\sigma$ at 6. For this $\sigma$ and range of $\delta$, the returns to scale of the production function lie between 0.76 and 1.06. Tables D3 and D4 implement Result 1 using balance sheet and firm-to-firm transaction data to construct the adjusted sales to others, whereas Table D5 implements Result 2 using firm-to-firm transaction data to construct the average adjusted sales to others. As expected, the more negative (positive) the $\delta$ – i.e., the more decreasing (increasing) the returns to scale, $\gamma$ – the larger (smaller) are the implied TFP gains from the event. For values of $\delta$ close to -0.22, results remain largely unchanged.

Figure D5 shows how results vary not only with $\gamma$ (or $\delta$) but also with $\sigma$. As one would expect, the more elastic the demand curve (the larger the $\sigma$), the more sensitive are the sales to others to changes in prices. This means that a larger $\sigma$ requires a smaller TFP gain to rationalize a given increase in sales to others. At the same time, the more decreasing the returns to scale (the smaller the $\gamma$), the higher prices will get after a given increase in the scale of the supplier. For this reason, the smaller the $\gamma$, the larger is the increase in TFP that generates a given increase in sales to others. That said, our baseline results are robust to values of $\gamma$ and $\sigma$ around our preferred values of 0.96 and 6, respectively.

Finally, we also infer $\sigma$ and $\gamma$ from estimates of mark-ups and input elasticities of the production function of first-time suppliers to MNCs (following De Loecker and Warzynski, 2012). This can be done since our model implies a one-to-one relationship between the mark-up $\mu$ and the demand elasticity $\sigma$ ($\mu = \sigma/(\sigma - 1)$). Moreover, the returns to scale $\gamma$ can be computed as the sum of the input elasticities of the production function. This approach gives us $\sigma = 5.03$ and $\gamma = 0.92$ (hence $\delta = -0.33$). Results for these values are similar to our baseline results. See Online Appendix D.3 for details.

# 6 Additional Evidence on Mechanisms

In this section, we present additional evidence on the ways in which domestic firms interact with MNCs and how they adjust in response to their new status as suppliers to MNCs.

*Evidence from administrative data on heterogeneous effects.* We use the administrative data and the economy-wide event-study to characterize the heterogeneity of effects by sector. We split domestic firms based on either their sector or that of their first MNC buyer and run separate regressions on each sector-specific sample. Sectors fall into one of four categories: manufacturing, retail (including repair and maintenance), services, or agriculture. Table 8 looks into the Cobb-Douglas TFP index. Suppliers in manufacturing benefit most from starting to supply to MNCs, with an 11% higher TFP four years later, while suppliers in retail and services

attain only half of this gain. Suppliers in agriculture see no effect. When we split firms by the sector of the MNC buyer, only those starting to supply to an MNC in manufacturing see their TFP grow. Our overall estimate of a 6% higher TFP index four years later is therefore driven by suppliers whose first MNC buyer was in manufacturing, or by suppliers in manufacturing and – to a lesser extent – in retail and services.

Table 7 divides firms based on the technological (knowledge) intensity of the sector of either the supplier or the first MNC buyer. We categorize sectors as high- or low-tech according to OECD classifications. The high- (low-)tech category also includes high (low) knowledge-intensive services.[59] Suppliers in low-tech sectors are those who benefit the most from starting to supply to MNCs. Conversely, suppliers whose first MNC buyer is in a high-tech sector are those whose performance improves the most. We also split suppliers depending on whether their first MNC buyer is under the Free Trade Zone (FTZ) regime or not. First-time suppliers to an MNC in FTZs experience stronger performance gains. The findings on the high-tech or FTZ nature of the MNC are compatible with each other and with those from Table 8, given the sizable overlap between MNCs in FTZs, high-tech MNCs, and MNCs in manufacturing. The findings on suppliers' sectoral splits are reconciled by the fact that 87% of suppliers in high-tech sectors operate in knowledge-intensive services (e.g., professional, scientific and technical services), while 58% of suppliers in low-tech sectors are in manufacturing and retail.

This heterogeneity analysis suggests that the nature of inputs supplied can affect the extent to which suppliers can learn from MNCs and improve their performance. MNCs are more likely to be invested in the success of supplying relationships where the input has a direct bearing on their core output. Also, suppliers might receive more support from MNCs whose product is high-quality (or complex), as imperfections in inputs can be particularly costly. This might explain why high-tech (or manufacturing) MNCs trigger the highest performance gains and particularly so for domestic firms in manufacturing.[60]

*Evidence from surveys to managers in domestic suppliers and MNCs.* We now summarize the key takeaways from our surveys, inviting readers to Online Appendix G for details.

To set the stage, our surveys first asked MNCs about the factors that were important to their decision to open an affiliate and later stay and/or expand in Costa Rica. To both questions, the local availability of suitable suppliers ranked only sixth among the eight options.[61] We then asked MNCs about the corporate hierarchy of sourcing decisions. The headquarters (HQ) is involved in all sourcing decisions and particularly so in those involving core inputs. In theory, local affiliates show interest in having more domestic suppliers. In practice, they seem

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[59]The OECD classifies manufacturing sectors as high-tech, medium high-tech, medium low-tech or low-tech, and service sectors as high- or low-knowledge intensive. We label as *high-tech* the high-tech or medium high-tech manufacturing sectors and high knowledge-intensive service sectors, all others are referred to as *low-tech*.

[60]This intuition is supported by survey responses of MNCs on the explicit or direct help extended to domestic suppliers. Of the 31% of MNCs who denied providing any explicit help, 78% are in low-tech sectors, whereas of the 69% of MNCs who claimed providing help, 58% are in high-tech sectors. MNCs in manufacturing are more likely to grant several types of support at once (e.g., reciprocated visits, sharing of blueprints and best practices, putting the domestic firm in contact with suppliers to other affiliates).

[61]The five factors weighting more heavily in the decision of MNCs to invest in Costa Rica were the education of workers, the tax incentives, the distance to target markets, the Costa Rican market, and wages.

reluctant to trust domestic firms with critical inputs and prefer, instead, the global suppliers recommended by the HQ. Domestic firms are more likely to be considered for secondary inputs. Domestic firms echoed a difficulty to establish a first contract with MNCs. For the 43 of the 106 domestic firms for whom it was particularly difficult to start supplying to MNCs, the three most frequent reasons were that MNCs did not know or trust them, that MNCs were difficult to contact, and that MNCs expected lower prices than they could offer.

Against a backdrop of relatively low integration in Costa Rica, we asked MNCs whether, once they agree to be supplied by a domestic firm, they offer the firm any explicit support to boost its ability to supply to them successfully. A total of 40 out of 58 MNCs (69%) replied positively. The three most frequent ways in which MNCs claimed to help domestic firms were the sharing of *blueprints* or clear details about the expected product or services, visits of the supplier to the MNC to learn about the processes where its input is used, and visits of the MNC to the supplier to carry out audits and offer guidance on improvements. We also asked the mirror questions to domestic firms. In terms of explicit help, 47 of 106 domestic firms (44%) acknowledged receiving such help. The three most important forms of help coincided with those mentioned by MNCs. What follows is a quote where the general manager of a domestic supplier describes the usefulness of the help offered by their first MNC buyers:

> We felt that, while working with a multinational, we could tap into a "global catalog" of best practices. On the spot, we were learning a lot, not having to go through the same struggles as suppliers to other affiliates in the past, skipping hardships, and having a steeper learning curve.

MNCs are more likely to perceive these interactions as direct help than domestic suppliers for two reasons. First, MNCs are particularly demanding with their suppliers and new suppliers have a short period of time to adapt. Second, domestic suppliers declared that most of the efforts to adapt to the expectations of MNCs are born by the domestic firm alone. When we asked MNCs what they assess to be the biggest disadvantage or risk for domestic firms that become their suppliers, the pressure to adapt fast was among the most frequent answers. In the words of the supply chain manager of one MNC:

> The biggest disadvantage of starting to work with us has to do with our "zero tolerance" policy. There is no forgiving of mistakes in the "major league." [...] New suppliers can have some failures at the beginning, but very fast they need to succeed in delivering whatever they committed to deliver. We cannot afford to be the sponsor of a supplier that does not rise to the occasion. We are willing to help them, and we do help them, but cannot be a charitable benefactor forever and ever. Suppliers are under a lot of pressure to adapt fast, to change all their paradigms of how to do business.

We then surveyed domestic firms about the changes that they experienced after their first supplying relationship with an MNC. 62% of the 106 domestic respondents mentioned having expanded their product scope, in particular with higher-quality goods and services demanded

by MNCs.[62] These higher-quality products required firm-wide changes; for instance, introducing a quality management system. Also, higher-quality products require better inputs. This explains why 39% of suppliers had to change their sourcing strategy, 44% hired more high-skilled workers, and 27% had existing workers work harder. 50% of firms improved their managerial and organizational practices, in part advised by MNCs, in part prompted by pressure from MNCs to meet the agreed standards and to do so consistently.[63]

Overall, domestic firms implemented several interrelated changes as a consequence of becoming suppliers to MNCs. When asked about the most important of them, respondents typically struggled to isolate one change as being distinctively more important than the rest. The testimonial of the general manager of one domestic supplier emphasizes the interrelated nature of these changes:

> The biggest change came with the expansion of the portfolio of goods and services we offered. This part has been the most challenging and the riskiest. That said, this change implied many others. One must be very agile in the organization of production, have inventories for very different inputs, improve financing etc. It can be a wild experience, far from one's comfort zone.

Did starting to supply to MNCs also help the reputation of these domestic firms? Our surveys suggest that it did. When asked whether it was easier to find more MNC buyers after the first such buyer, 83 domestic firms (78%) responded positively. Of these, 86% stated that it became easier to gain the trust of new MNCs. Similarly, their improved visibility in the domestic market also helped with domestic buyers. That said, earning a reputation does not automatically imply that this reputation is positive and thus helpful in selling to new buyers. Domestic firms were motivated to learn and adapt quickly to the expectations of their first MNC buyers, in order to avoid being characterized as bad suppliers. In fact, MNCs believed that one of the biggest risks for suppliers was to be revealed as incapable of coping with the standards of MNCs and for this information to be shared with other potential clients, particularly other MNCs. This points to an important relationship between a firm's reputation and TFP. While investigating this relationship is outside the scope of this paper, it suggests that reputation can magnify the importance of differences in TFP on overall firm performance.

# 7  Conclusion

In this paper, we show that upon becoming suppliers to MNCs, domestic firms in Costa Rica experience strong and persistent gains in firm performance. For instance, four years after,

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[62]It is plausible that if domestic firms expand their offer of goods or services, they become attractive to buyers in more areas of activity. Table A5 (Online Appendix A) uses the main economy-wide samples (based on administrative data) to show that, four years after having a first MNC buyer, domestic firms sell to buyers in 25% more two-digit sectors and 29% more four-digit sectors. These increases are beyond those mechanically granted by increases in firm size, as we already control for the total sales of the domestic firm. We also find weaker evidence of an increase in the number of sectors from which domestic firms purchase their own inputs.

[63]According to the supply chain manager of one MNC: "A big risk for domestic firms that start supplying to MNCs comes from failing to deliver consistently their product or service at the expected parameters. The product or service supplied is continuously assessed. Suppliers cannot miss the mark, not even once. If they supplied everything correctly one time, then in theory they have the technical ability to do that again. But this consistency has to do, more than anything, with a managerial vision of excellence."

domestic firms hire 26% more workers and experience gains of 6 to 9% in standard measures of TFP. We then exploit the fact that we can observe all firm-to-firm sales of first-time suppliers to explore additional measures of firm performance. Sales to buyers other than the first MNC buyer increase by 20%, with this growth occurring both on the extensive (number of buyers) and intensive (sales conditional on buying) margins. We propose a simple model wherein TFP and reputation affect the extensive margin, but TFP alone affects the intensive margin. We find a model-based increase in TFP of 3% four years after. Finally, we collect survey data from managers in both domestic firms and MNCs, from which we learn that first-time suppliers experience wide-ranging improvements such as those to their managerial practices and reputation. These insights from surveys corroborate our model-based findings.

We highlight four avenues for future research. To start, our surveys underscore the interdependence of the upgrades made by domestic firms upon becoming suppliers to MNCs. For example, successful expansions in product scope (typically with higher-quality products) need to go hand in hand with a higher efficiency, so that firms can switch seamlessly between products requiring different inputs and processes. Separately estimating the contributions of changes in efficiency, product scope, and quality to changes in TFP requires information not available in tax data. An environment closer to a randomized control trial would make it possible to disentangle these interrelated effects of supplying to MNCs.

Given the importance of finding new buyers for firm performance, new work could also investigate the factors that affect the number of buyers. One challenge is to separately identify the role of TFP (or reputation, broadly construed) on the probability of selling to new buyers. The plausible correlation between TFP and reputation (on top of well-known difficulties to measure them both) compounds any such attempt. In addition, increases in TFP (or reputation) are likely to increase the probability of selling to specific buyers, adding another layer of complexity to the role of new buyers in explaining firm performance.

Another question that arises is to what extent our results come from the multinational nature of buyers, as opposed to their managerial expertise or technological level. For instance, we find that firms who start supplying to MNCs in high-technology sectors experience the strongest TFP gains. The main obstacle faced here is that in the developing world, there are rarely any comparable domestic buyers. In countries with a sufficient number of comparable domestic buyers, one could ask whether MNC buyers trigger larger TFP boosts than otherwise similar domestic buyers. This also relates to the question of why only supplying to certain types of MNCs leads to TFP gains. Although these questions are beyond the scope of this paper, they are fruitful avenues for future work.

Finally, a natural next step is to study the general equilibrium effects of forming relationships with MNCs. A comprehensive evaluation of the benefits of MNC entry requires not only credible estimates of their effects on domestic suppliers but also estimates of their actual integration in the domestic economy. Firm-to-firm transaction data allow one to circumvent the use of I-O tables and provide such credible measures of integration.

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# Figures



Figure 1: Four Examples of Domestic Suppliers to MNCs

*Notes:* Figure 1 is a collage of four photographs taken by the authors during visits to four domestic suppliers to MNCs. All four firms have responded to the in-person long survey. Firms in the top row supply automotive mechanic services (left-hand side firm), and retail and maintenance of precision cutting tools (right-hand side firm). These firms have under five full-time employees, their facilities are modest and space-constrained. Their deals with MNC buyers are discontinuous, occurring mostly when MNCs have an emergency. Firms in the bottom row specialize in tailored precision machining (left-hand side firm), and tailored industrial supplies (right-hand side firm). These firms hire between 10 and 20 full-time employees, the layout of their plant is more spacious and organized, and they display more capital and standardization in processes. Their relationships with MNCs are longer-lasting and involve products or services that relate to the core activity of the MNC.
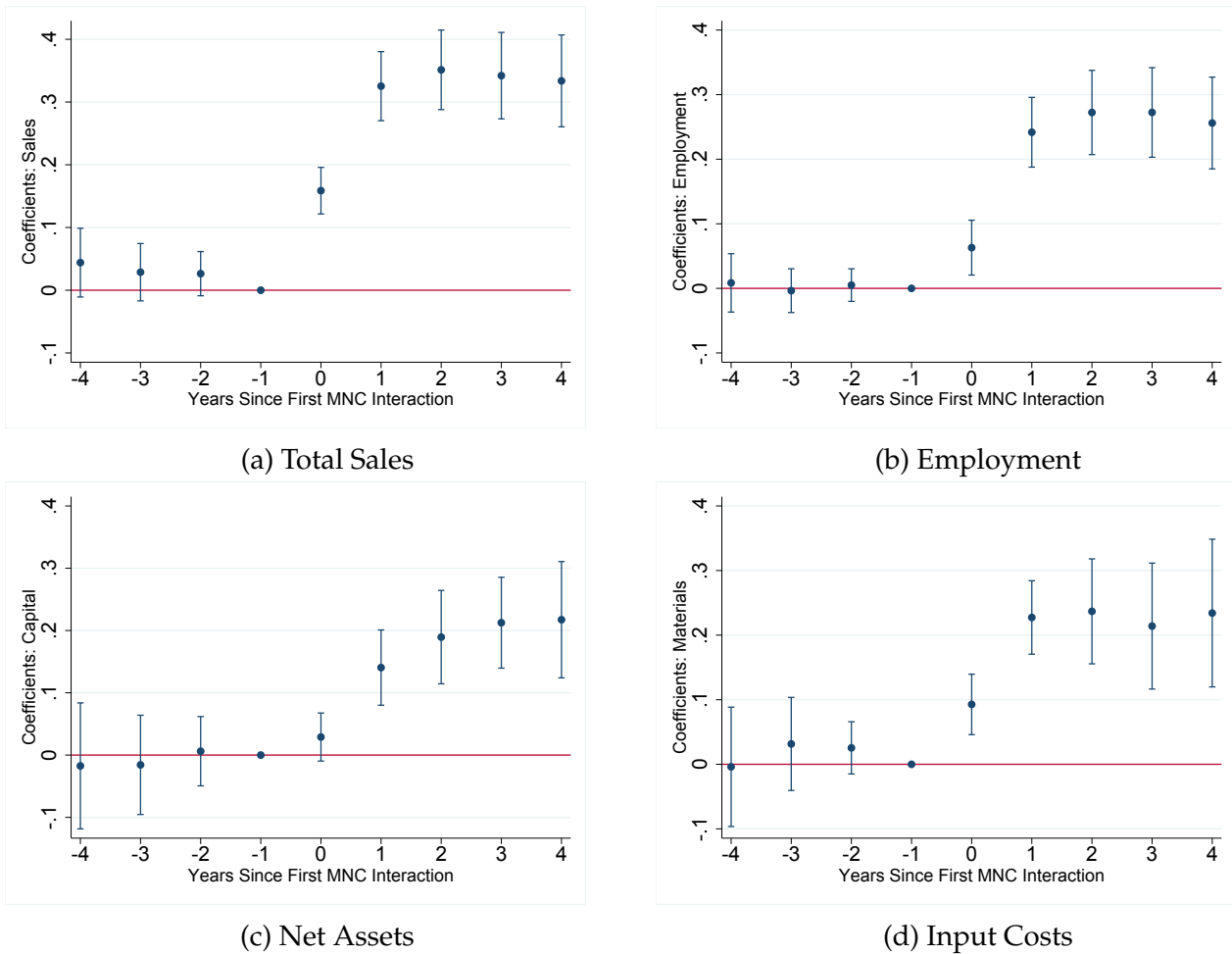
(a) Total Sales

(b) Employment

(c) Net Assets

(d) Input Costs

Figure 2: Domestic Firms Increase Their Scale after Starting to Supply to MNCs

*Notes:* Figure 2 plots the estimated $\theta_k$ event-study coefficients from a regression of the form given in equation (1), where the dependent variable is, in turn, log total sales (Panel 2a), log employment (Panel 2b), log net assets (Panel 2c), and log input costs (Panel 2d). The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and four-digit sector × province × calendar year fixed effects. The vertical lines reflect the 95% confidence intervals. The coefficients plotted correspond to columns (1)-(4) in Table 1, obtained from the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017.
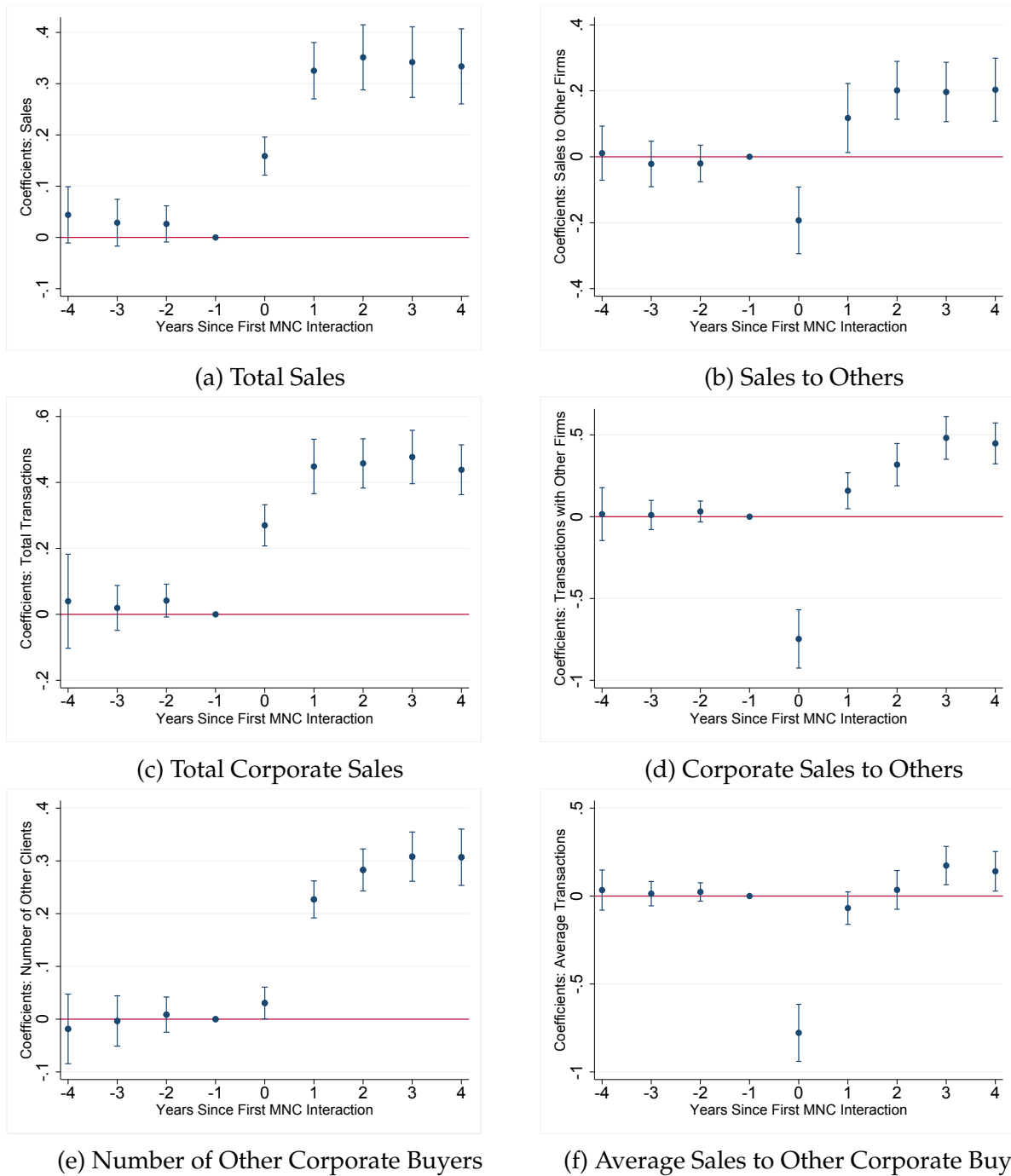
(a) Total Sales

(b) Sales to Others

(c) Total Corporate Sales

(d) Corporate Sales to Others

(e) Number of Other Corporate Buyers

(f) Average Sales to Other Corporate Buyers

Figure 3: Domestic Firms Improve Their Sales to Others after Starting to Supply to MNCs

*Notes:* Figure 3 plots the estimated $\theta_k$ event-study coefficients from a regression of the form given in equation (1), where the dependent variable is, in turn, log total sales (Panel 3a), log sales to buyers other than the first MNC buyer (Panel 3b), log total sales to corporate buyers (Panel 3c), log sales to corporate buyers other than the first MNC buyer (Panel 3d), log number of other corporate buyers (Panel 3e), and log average value of sales to other corporate buyers (Panel 3f). The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and four-digit sector × province × calendar year fixed effects. The vertical lines reflect the 95% confidence intervals. The coefficients plotted correspond to columns (1)-(2) in Table 2 and columns (1)-(4) in Table 3, obtained from the sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017.
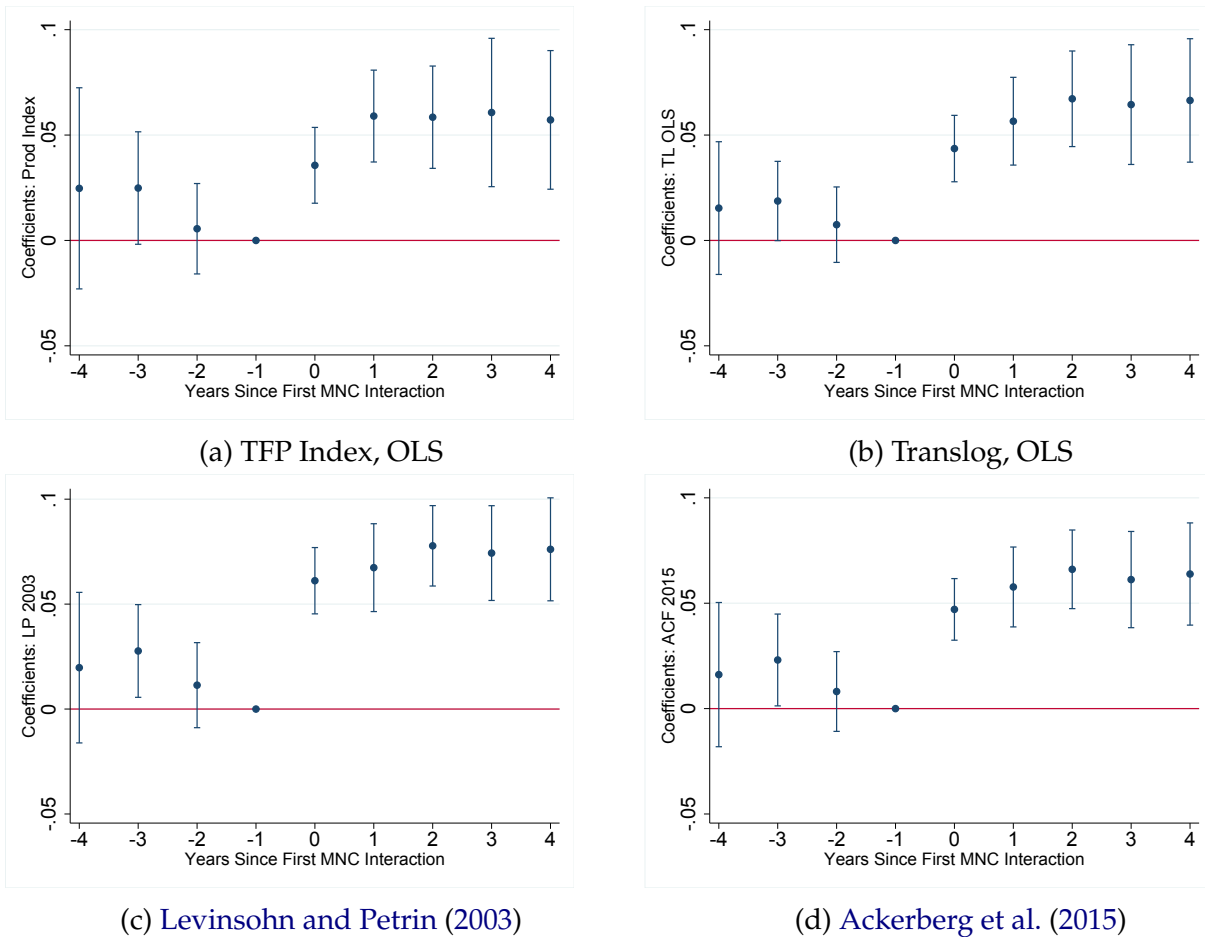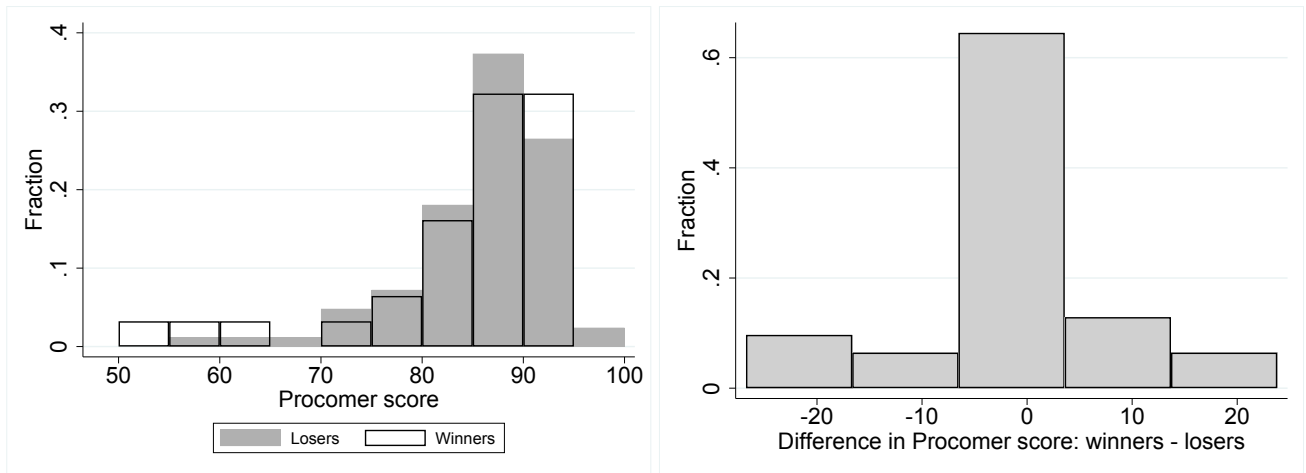
(a) TFP Index, OLS

(b) Translog, OLS

(c) Levinsohn and Petrin (2003)

(d) Ackerberg et al. (2015)

Figure 4: Domestic Firms Improve Their TFP after Starting to Supply to MNCs

*Notes:* Figure 4 plots the estimated $\theta_k$ event-study coefficients from specification (1) adapted to four measures of TFP. In Panel 4a we use as dependent variable a TFP index constructed assuming a Cobb-Douglas production function. This method "residualizes" sales by subtracting firm-level inputs used, weighted by the respective two-digit-level cost shares. Panels 4b use measures of TFP resulting from OLS production function estimation, under the translog functional form assumption. Panels 4c and 4d estimate TFP using the methods proposed by Levinsohn and Petrin (2003) and Ackerberg, Caves, and Frazer (2015). The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. The vertical lines reflect the 95% confidence intervals. The coefficients plotted correspond to columns (1), (3), (4), and (5) in Table 4 obtained from the sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017.

(a) Distributions of Scores          (b) Within-Deal Differences in Scores

Figure 5: Robustness Check: Scores of Firms in the "Productive Linkages" Program

*Notes*: Figure 5 compares the Procomer scores of winning and losing firms in our sample of first-time deals with MNCs mediated through the "Productive Linkages" program of Procomer. Panel 5a shows the histogram of Procomer scores for winners (white bars) and losers (grey bars). Panel 5 presents a histogram of differences between winner and loser scores. This difference is constructed by subtracting from the score of the winner the average score of the losing contenders to the same deal. These histograms characterize the sample of 31 "Productive Linkages" deals, involving 31 winners and 84 losers. This exercise is part of a robustness check to the baseline event-study results plotted in Figures 2, 3, 4 and 7.
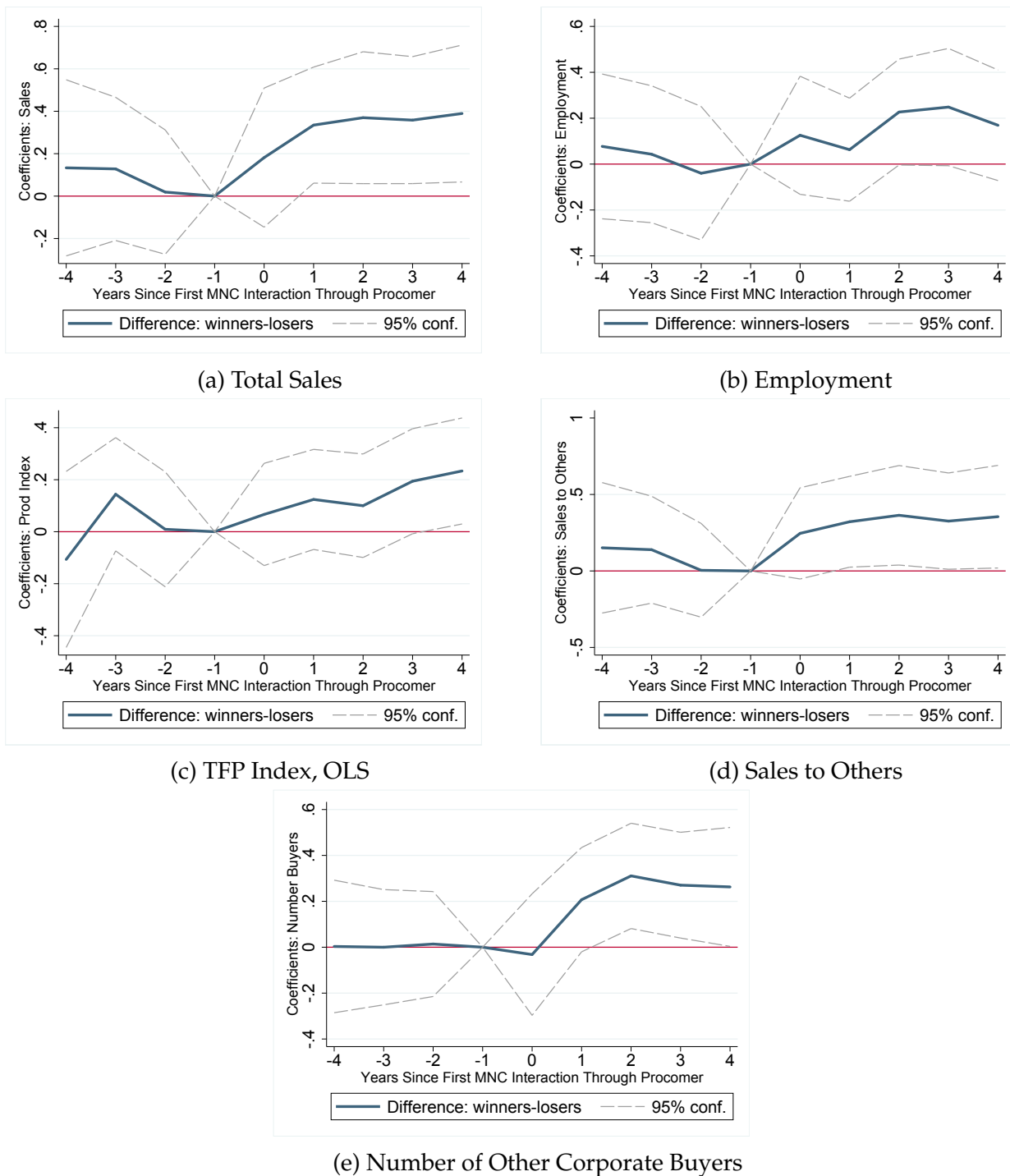
38

(a) Total Sales

(b) Employment

(c) TFP Index, OLS

(d) Sales to Others

(e) Number of Other Corporate Buyers

Figure 6: Robustness Check: Domestic Firms Improve their Performance after First "Productive Linkages" Deal

*Notes:* Figure 6 plots the estimated $\theta_k^{Diff}$ event-study coefficients from a regression of the form given in equation (2), where the dependent variable is, in turn, log total sales (Panel 6a), log employment (Panel 6b), log TFP index (Panel 6c), log sales to others (Panel 6d), and log number of other corporate buyers (Panel 6e). The event is defined as the first time a domestic firm experiences a deal with an MNC buyer, mediated by the "Productive Linkages" program. $\theta_{-1}^{Diff}$, the coefficient of the year prior to the event, is normalized to zero. The dashed lines delimit the 95% confidence intervals. The coefficients plotted correspond to columns (1)-(5) in Table 5. These regressions are run on the sample of 31 "Productive Linkages" deals, involving 31 winners and 84 losers. This exercise is part of a robustness check to the baseline event-study results plotted in Figures 2, 3, 4 and 7.
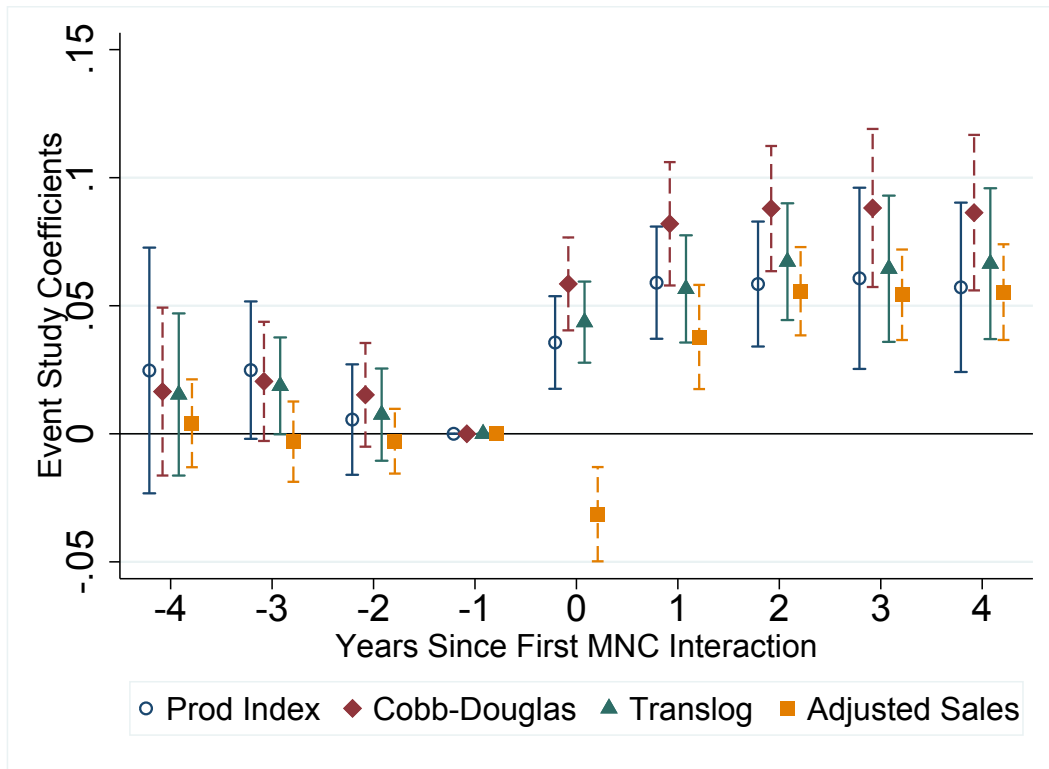
Figure 7: Standard Measures of TFP vs. Model-Based Measure of Composite TFP

*Notes:* Figure 7 plots the estimated $\theta_k$ event-study coefficients from specification (1) adapted to four different measures of TFP. The circular, rhomboid, and triangular sequences pertain to standard measures of TFP. "Prod Index" is the TFP index that uses as dependent variable a residualized version of sales. "Cobb-Douglas" and "Translog" come from OLS production function estimations assuming a Cobb-Douglas and translog specification for the production function. These three sets of coefficients can be found (in order) in columns (1), (2), and (3) of Table 4. The rectangular markers ("Adjusted Sales") depict the evolution of our model-based estimates of changes in *composite TFP* (which, in our model, encompasses true TFP, reputation, and their interaction). These estimates are the empirical application of Result 1, which states that changes in adjusted sales to others are informative on changes in composite TFP. The adjustment controls for both potential returns to scale and effects of the MNC demand shock on prices (via a parameter, $\delta$). These model-based estimates pertain to our preferred values for $\delta - 0.22$ and the elasticity of demand $\sigma = 6$. These estimates can be found in Column (1) of Table 6. The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. The vertical lines reflect the 95% confidence intervals. For direct comparability all the four sequences of event-study coefficients use total sales (to others) from corporate income tax returns data. Also, all estimates are obtained from the sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017.

# Tables

## Table 1: Domestic Firms Increase Their Scale after Starting to Supply to MNCs

| | Sales (1) | Employment (2) | Capital (3) | Materials (4) | Sales (5) | Employment (6) | Capital (7) | Materials (8) |
|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.044 | 0.009 | -0.017 | -0.004 | -0.022 | -0.054 | -0.067 | 0.003 |
| | (0.028) | (0.023) | (0.052) | (0.047) | (0.053) | (0.049) | (0.053) | (0.069) |
| *3 years before event* | 0.029 | -0.004 | -0.016 | 0.032 | 0.001 | -0.027 | -0.049 | 0.057 |
| | (0.023) | (0.017) | (0.041) | (0.037) | (0.041) | (0.035) | (0.044) | (0.049) |
| *2 years before event* | 0.026 | 0.005 | 0.006 | 0.025 | 0.007 | -0.010 | -0.005 | 0.036 |
| | (0.018) | (0.013) | (0.028) | (0.021) | (0.023) | (0.019) | (0.025) | (0.030) |
| | | | | | | | | |
| *Year of event* | 0.159*** | 0.063*** | 0.029 | 0.093*** | 0.191*** | 0.088*** | 0.092*** | 0.110*** |
| | (0.019) | (0.022) | (0.020) | (0.024) | (0.021) | (0.019) | (0.027) | (0.026) |
| *1 year after event* | 0.325*** | 0.242*** | 0.140*** | 0.227*** | 0.377*** | 0.286*** | 0.212*** | 0.252*** |
| | (0.028) | (0.028) | (0.031) | (0.029) | (0.035) | (0.031) | (0.045) | (0.044) |
| *2 years after event* | 0.351*** | 0.272*** | 0.189*** | 0.237*** | 0.408*** | 0.317*** | 0.281*** | 0.255*** |
| | (0.032) | (0.033) | (0.038) | (0.041) | (0.054) | (0.046) | (0.063) | (0.072) |
| *3 years after event* | 0.342*** | 0.272*** | 0.213*** | 0.214*** | 0.389*** | 0.313*** | 0.321*** | 0.241** |
| | (0.035) | (0.035) | (0.037) | (0.050) | (0.072) | (0.061) | (0.076) | (0.095) |
| *4 years after event* | 0.334*** | 0.256*** | 0.217*** | 0.234*** | 0.382*** | 0.295*** | 0.336*** | 0.252** |
| | (0.037) | (0.036) | (0.048) | (0.058) | (0.089) | (0.074) | (0.095) | (0.115) |
| | | | | | | | | |
| Mean Dep. Var. (level) | 0.85 | 13.2 | 2.93 | 0.78 | 1.45 | 18.9 | 0.96 | 1.40 |
| SD Dep. Var. (level) | 2.54 | 32.6 | 712.8 | 2.68 | 4.50 | 45.1 | 3.91 | 4.74 |
| | | | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| | | | | | | | | |
| Adjusted $R^2$ | 0.77 | 0.74 | 0.81 | 0.83 | 0.80 | 0.77 | 0.82 | 0.86 |
| # Observations | 116,683 | 116,683 | 94,038 | 67,194 | 23,961 | 23,961 | 21,792 | 14,199 |
| # Fixed Effects | 25,174 | 25,174 | 21,480 | 15,894 | 7,366 | 7,366 | 7,019 | 4,870 |
| # Firms | 18,035 | 18,035 | 14,804 | 10,834 | 3,482 | 3,482 | 3,287 | 2,195 |

*Notes:* Table 1 shows the results of running the event-study specification (1) adapted to four dependent variables capturing firm size: log total sales, log total number of workers, log net assets, and log input costs. The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and four-digit sector × province × calendar year fixed effects. Columns (1)-(4) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017. Clustering of standard errors is at the two-digit sector by province level. Columns (5)-(8) focus only on the restricted sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015 and use standard error clustering at event by province level. For sales, net assets, and input costs, means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Domestic Firms Improve Their Sales to Others after Starting to Supply to MNCs

| | Total Sales (1) | Sales to Others (2) | Sales to Others Untreated (3) | Total Sales (4) | Sales to Others (5) | Sales to Others Untreated (6) |
|---|---|---|---|---|---|---|
| *4 years before event* | 0.044 | 0.011 | 0.014 | -0.022 | -0.047 | -0.034 |
| | (0.028) | (0.042) | (0.042) | (0.053) | (0.119) | (0.124) |
| *3 years before event* | 0.029 | -0.022 | -0.021 | 0.001 | -0.041 | -0.037 |
| | (0.023) | (0.035) | (0.036) | (0.041) | (0.076) | (0.078) |
| *2 years before event* | 0.026 | -0.020 | -0.021 | 0.007 | -0.028 | -0.026 |
| | (0.018) | (0.028) | (0.029) | (0.023) | (0.036) | (0.037) |
| | | | | | | |
| *Year of event* | 0.159*** | -0.193*** | -0.189*** | 0.191*** | -0.122* | -0.125* |
| | (0.019) | (0.052) | (0.051) | (0.021) | (0.062) | (0.063) |
| *1 year after event* | 0.325*** | 0.118** | 0.122** | 0.377*** | 0.205** | 0.201** |
| | (0.028) | (0.053) | (0.052) | (0.035) | (0.090) | (0.092) |
| *2 years after event* | 0.351*** | 0.201*** | 0.199*** | 0.408*** | 0.320*** | 0.308** |
| | (0.032) | (0.045) | (0.049) | (0.054) | (0.115) | (0.119) |
| *3 years after event* | 0.342*** | 0.196*** | 0.203*** | 0.389*** | 0.333** | 0.326** |
| | (0.035) | (0.046) | (0.044) | (0.072) | (0.147) | (0.154) |
| *4 years after event* | 0.334*** | 0.203*** | 0.204*** | 0.382*** | 0.380** | 0.358* |
| | (0.037) | (0.049) | (0.048) | (0.089) | (0.171) | (0.181) |
| | | | | | | |
| Mean Dep. Var. (level) | 0.85 | 0.84 | 0.84 | 1.45 | 1.42 | 1.40 |
| SD Dep. Var. (level) | 2.54 | 2.54 | 2.52 | 4.50 | 4.51 | 4.47 |
| | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | No | No | No |
| | | | | | | |
| Adjusted $R^2$ | 0.77 | 0.70 | 0.69 | 0.80 | 0.64 | 0.63 |
| # Observations | 116,683 | 116,683 | 116,683 | 23,961 | 23,961 | 23,961 |
| # Fixed Effects | 25,174 | 25,174 | 25,174 | 7,366 | 7,366 | 7,366 |
| # Firms | 18,035 | 18,035 | 18,035 | 3,482 | 3,482 | 3,482 |

*Notes:* Table 2 shows the results of running the event-study specification (1) adapted to three dependent variables: log total sales (across all buyers, including the first MNC buyer), log sales to others (all buyers with the exception of the first MNC buyer), and log sales to others untreated (across all buyers with the exception of the first MNC buyer and other buyers that started supplying to MNCs themselves). The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and four-digit sector × province × calendar year fixed effects. Columns (1)-(3) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017. Clustering of standard errors is at the two-digit sector by province level. Columns (4)-(6) focus only on the restricted sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015 and use standard error clustering at event by province level. Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3: Domestic Firms Increase Their Corporate Sales to Others after Starting to Supply to MNCs

| | Total Corp Sales (1) | Corp Sales Others (2) | Number Other Buyers (3) | Av. Sales Other Buyers (4) | Total Corp Sales (5) | Corp Sales Others (6) | Number Other Buyers (7) | Av. Sales Other Buyers (8) |
|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.040 | 0.016 | -0.034 | 0.034 | -0.051 | -0.139 | -0.037 | -0.096 |
| | (0.073) | (0.082) | (0.024) | (0.058) | (0.072) | (0.148) | (0.039) | (0.137) |
| *3 years before event* | 0.020 | 0.010 | -0.007 | 0.014 | -0.029 | -0.103 | -0.007 | -0.088 |
| | (0.035) | (0.045) | (0.018) | (0.035) | (0.053) | (0.100) | (0.024) | (0.094) |
| *2 years before event* | 0.042 | 0.032 | -0.009 | 0.023 | -0.001 | -0.029 | -0.012 | -0.031 |
| | (0.025) | (0.033) | (0.015) | (0.027) | (0.036) | (0.045) | (0.016) | (0.048) |
| | | | | | | | | |
| *Year of event* | 0.270*** | -0.747*** | 0.015 | -0.778*** | 0.290*** | -0.636*** | 0.013 | -0.667*** |
| | (0.032) | (0.091) | (0.019) | (0.083) | (0.028) | (0.074) | (0.019) | (0.071) |
| *1 year after event* | 0.448*** | 0.159*** | 0.251*** | -0.068 | 0.491*** | 0.295*** | 0.241*** | 0.069 |
| | (0.042) | (0.056) | (0.023) | (0.047) | (0.047) | (0.095) | (0.030) | (0.089) |
| *2 years after event* | 0.458*** | 0.318*** | 0.319*** | 0.035 | 0.520*** | 0.484*** | 0.300*** | 0.202* |
| | (0.038) | (0.066) | (0.025) | (0.056) | (0.061) | (0.121) | (0.041) | (0.112) |
| *3 years after event* | 0.477*** | 0.481*** | 0.349*** | 0.173*** | 0.552*** | 0.683*** | 0.324*** | 0.370** |
| | (0.041) | (0.067) | (0.025) | (0.056) | (0.072) | (0.164) | (0.051) | (0.161) |
| *4 years after event* | 0.438*** | 0.448*** | 0.356*** | 0.141** | 0.534*** | 0.704*** | 0.327*** | 0.383* |
| | (0.039) | (0.064) | (0.029) | (0.057) | (0.089) | (0.201) | (0.062) | (0.191) |
| | | | | | | | | |
| Mean Dep. Var. (level) | 0.39 | 0.37 | 7.94 | 0.038 | 0.59 | 0.56 | 16.8 | 0.033 |
| SD Dep. Var. (level) | 1.20 | 1.21 | 29.1 | 0.056 | 1.79 | 1.81 | 53.8 | 0.045 |
| | | | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| | | | | | | | | |
| Adjusted $R^2$ | 0.75 | 0.63 | 0.86 | 0.57 | 0.74 | 0.59 | 0.84 | 0.51 |
| # Observations | 63,793 | 63,793 | 63,793 | 63,793 | 21,200 | 21,200 | 21,200 | 21,200 |
| # Fixed Effects | 16,833 | 16,833 | 16,833 | 16,833 | 6,925 | 6,925 | 6,925 | 6,925 |
| # Firms | 10,985 | 10,985 | 10,985 | 10,985 | 3,379 | 3,379 | 3,379 | 3,379 |

*Notes:* Table 3 uses only firm-to-firm transaction data and shows the results of running the event-study specification (1) adapted to four dependent variables: log total sales to corporate buyers (including the first MNC buyer), log sales to corporate buyers other than the first MNC buyer, log number of other corporate buyers + 1 (number of corporate buyers tracked by the firm-to-firm transaction data, excluding the first MNC buyer, + 1), and log average sales to other corporate buyers (total sales to other corporate buyers, divided by the number of other corporate buyers +1). The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and four-digit sector $\times$ province $\times$ calendar year fixed effects. Columns (1)-(4) correspond to the full economy-wide sample (including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017), columns (5)-(8) correspond to the restricted economy-wide sample (including only first-time suppliers to MNCs). Except for the number of buyers, means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Domestic Firms Improve in Standard Measures of TFP after Starting to Supply to MNCs

| | Prod Index (1) | CD OLS (2) | TL OLS (3) | LP (4) | ACF (5) | Prod Index (6) | CD OLS (7) | TL OLS (8) | LP (9) | ACF (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.025 | 0.016 | 0.015 | 0.020 | 0.016 | -0.009 | -0.012 | 0.017 | 0.028 | 0.027 |
| | (0.024) | (0.017) | (0.016) | (0.018) | (0.017) | (0.021) | (0.022) | (0.018) | (0.023) | (0.020) |
| *3 years before event* | 0.025* | 0.020* | 0.019* | 0.028** | 0.023** | -0.002 | -0.004 | 0.020 | 0.034* | 0.032* |
| | (0.014) | (0.012) | (0.010) | (0.011) | (0.011) | (0.015) | (0.015) | (0.015) | (0.017) | (0.016) |
| *2 years before event* | 0.006 | 0.015 | 0.007 | 0.011 | 0.008 | -0.002 | 0.010 | 0.010 | 0.015 | 0.013 |
| | (0.011) | (0.010) | (0.009) | (0.010) | (0.010) | (0.012) | (0.013) | (0.011) | (0.013) | (0.011) |
| | | | | | | | | | | |
| *Year of event* | 0.036*** | 0.059*** | 0.044*** | 0.061*** | 0.047*** | 0.040*** | 0.061*** | 0.041*** | 0.060*** | 0.043*** |
| | (0.009) | (0.009) | (0.008) | (0.008) | (0.007) | (0.011) | (0.009) | (0.007) | (0.008) | (0.008) |
| *1 year after event* | 0.059*** | 0.082*** | 0.057*** | 0.067*** | 0.058*** | 0.072*** | 0.090*** | 0.051*** | 0.068*** | 0.053*** |
| | (0.011) | (0.012) | (0.011) | (0.011) | (0.010) | (0.015) | (0.013) | (0.012) | (0.013) | (0.013) |
| *2 years after event* | 0.058*** | 0.088*** | 0.067*** | 0.078*** | 0.066*** | 0.076*** | 0.097*** | 0.054*** | 0.064*** | 0.050*** |
| | (0.012) | (0.012) | (0.012) | (0.010) | (0.010) | (0.020) | (0.017) | (0.017) | (0.017) | (0.017) |
| *3 years after event* | 0.061*** | 0.088*** | 0.064*** | 0.074*** | 0.061*** | 0.080*** | 0.101*** | 0.049** | 0.056** | 0.041* |
| | (0.018) | (0.016) | (0.014) | (0.012) | (0.012) | (0.026) | (0.021) | (0.020) | (0.021) | (0.021) |
| *4 years after event* | 0.057*** | 0.086*** | 0.066*** | 0.076*** | 0.064*** | 0.083** | 0.099*** | 0.043* | 0.047* | 0.036 |
| | (0.017) | (0.015) | (0.015) | (0.013) | (0.012) | (0.031) | (0.027) | (0.025) | (0.026) | (0.027) |
| | | | | | | | | | | |
| Mean Dep. Var. (level) | 0.93 | 1.12 | 1.12 | 1.12 | 1.12 | 0.90 | 2.00 | 2.00 | 2.00 | 2.00 |
| SD Dep. Var. (level) | 0.56 | 3.17 | 3.17 | 3.17 | 3.17 | 0.52 | 5.74 | 5.74 | 5.74 | 5.74 |
| | | | | | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | Yes | No | No | No | No | No |
| | | | | | | | | | | |
| Adjusted $R^2$ | 0.72 | 0.95 | 0.97 | 0.63 | 0.62 | 0.74 | 0.96 | 0.97 | 0.64 | 0.64 |
| # Observations | 64,419 | 64,419 | 64,419 | 64,419 | 64,419 | 13,706 | 13,706 | 13,706 | 13,706 | 13,706 |
| # Fixed Effects | 15,464 | 15,464 | 15,464 | 15,464 | 15,464 | 4,774 | 4,774 | 4,774 | 4,774 | 4,774 |
| # Firms | 10,492 | 10,492 | 10,492 | 10,492 | 10,492 | 2,144 | 2,144 | 2,144 | 2,144 | 2,144 |

*Notes:* Table 4 shows the results of running the event-study specification (1) adapted to five measures of TFP. The event is defined as a first time sale to an MNC. Columns (1) and (6) use as dependent variable a TFP index constructed under the assumption a Cobb-Douglas production function. This method "residualizes" sales by subtracting firm-level inputs used, weighted by the respective two-digit-level cost shares. Columns (2) and (7) use a measure of TFP resulting from OLS production function estimation. These columns assume a Cobb-Douglas technology, with revenues (CPI-deflated to 2013 U.S. dollars) as the output measure and total net assets, number of workers, and input costs as input measures for $K$, $L$, and $M$ respectively. Columns (3) and (8) differ from columns (2) and (7) in their assumption of a translog functional form. For both Cobb-Douglas and translog, we estimate the coefficients on factors of production over the entire sample of domestic firms, controlling for narrowly defined fixed effects. Columns (4) and (9) show results of production function estimation following Levinsohn and Petrin (2003). Columns (5) and (10) show results of production function estimation following Ackerberg, Caves, and Frazer (2015). $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. Columns (1)-(5) report-event study estimates for the sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017. Clustering of standard errors is at the two-digit sector by province level. Columns (6)-(10) focus only on the sample of domestic firms becoming first-time suppliers to an MNC and use standard error clustering at event by province level. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Robustness Check: Domestic Firms Improve their Performance after First "Productive Linkages" Deal

|  | Employment (1) | Total Sales (2) | Productivity Index (3) | Sales to Others (4) | Number of Other Buyers (5) |
|---|---|---|---|---|---|
| **Losers ($\theta_k^L$)** | | | | | |
| *4 years before event* | -0.145 | -0.199 | -0.038 | -0.216 | -0.135 |
|  | (0.204) | (0.277) | (0.195) | (0.281) | (0.160) |
| *3 years before event* | -0.100 | -0.119 | -0.037 | -0.126 | -0.071 |
|  | (0.151) | (0.205) | (0.124) | (0.209) | (0.117) |
| *2 years before event* | -0.074 | -0.048 | 0.057 | -0.057 | -0.019 |
|  | (0.102) | (0.133) | (0.085) | (0.135) | (0.085) |
| *Years of event* | -0.040 | -0.010 | 0.018 | -0.005 | -0.007 |
|  | (0.103) | (0.123) | (0.066) | (0.124) | (0.080) |
| *1 year after event* | -0.038 | -0.038 | -0.010 | -0.039 | 0.017 |
|  | (0.127) | (0.179) | (0.114) | (0.181) | (0.103) |
| *2 years after event* | -0.116 | -0.101 | 0.025 | -0.097 | -0.011 |
|  | (0.183) | (0.250) | (0.168) | (0.254) | (0.144) |
| *3 years after event* | -0.137 | 0.018 | -0.017 | 0.020 | 0.020 |
|  | (0.238) | (0.323) | (0.224) | (0.329) | (0.185) |
| *4 years after event* | -0.074 | 0.041 | 0.005 | 0.041 | 0.043 |
|  | (0.286) | (0.386) | (0.273) | (0.393) | (0.219) |
| **Winners-Losers ($\theta_k^{Diff}$)** | | | | | |
| *4 years before event* | 0.077 | 0.133 | -0.107 | 0.151 | 0.004 |
|  | (0.161) | (0.212) | (0.173) | (0.218) | (0.147) |
| *3 years before event* | 0.043 | 0.128 | 0.144 | 0.139 | -0.012 |
|  | (0.152) | (0.172) | (0.111) | (0.178) | (0.128) |
| *2 years before event* | -0.040 | 0.019 | 0.009 | 0.004 | 0.011 |
|  | (0.148) | (0.150) | (0.113) | (0.156) | (0.117) |
| *Years of event* | 0.126 | 0.182 | 0.066 | 0.246 | -0.001 |
|  | (0.131) | (0.167) | (0.100) | (0.152) | (0.136) |
| *1 year after event* | 0.063 | 0.335** | 0.124 | 0.322** | 0.215* |
|  | (0.115) | (0.140) | (0.098) | (0.151) | (0.117) |
| *2 years after event* | 0.227* | 0.370** | 0.100 | 0.364** | 0.312*** |
|  | (0.118) | (0.159) | (0.102) | (0.166) | (0.117) |
| *3 years after event* | 0.249* | 0.358** | 0.194* | 0.326** | 0.280** |
|  | (0.130) | (0.153) | (0.103) | (0.161) | (0.118) |
| *4 years after event* | 0.169 | 0.389** | 0.234** | 0.355** | 0.265** |
|  | (0.123) | (0.165) | (0.104) | (0.171) | (0.132) |
| Firm FE | YES | YES | YES | YES | YES |
| Deal FE | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES |
| Adjusted R$^2$ | 0.88 | 0.83 | 0.37 | 0.83 | 0.90 |
| # Observations | 1,097 | 1,111 | 1,087 | 1,100 | 1,101 |
| # Winners | 31 | 31 | 31 | 31 | 31 |
| # Losers | 84 | 84 | 83 | 83 | 83 |

*Notes:* Table 5 shows the results of running the event-study specification (2) adapted to five dependent variables: log total sales, log employment, log TFP index, log sales to others, and log number of other corporate buyers. We report the estimates for both the $\theta_k^L$ and $\theta_k^{Diff}$ coefficients, which measure the effects of the event on the outcomes of losers and on the difference between the outcomes of the winner and losers' to a deal, respectively. The event is defined as the first time a domestic firm experiences a deal with an MNC buyer, mediated by the "Productive Linkages" program. These regressions are run on the sample of 31 "Productive Linkages" deals, involving 31 winners and 84 losers. $\theta_{-1}$, the coefficients of the year prior to a first sale to an MNC, are normalized to zero. All regressions include firm, deal, and year fixed effects. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively. This exercise is part of a robustness check to the baseline event-study results presented in Tables 1 to 4 and 6 to 8.

Table 6: Model-Based Estimates of Gains in Composite TFP and TFP Alone after Domestic Firms Start Supplying to MNCs

| Result | 1 | 1 | 2 | 1 | 1 | 2 |
|---|---|---|---|---|---|---|
| Source of Sales to Others | Bal. Sh. | Trans. | Trans. | Bal. Sh. | Trans. | Trans. |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *4 years before event* | 0.004 | 0.005 | 0.008 | -0.010 | -0.029 | -0.021 |
| | (0.009) | (0.019) | (0.014) | (0.025) | (0.031) | (0.028) |
| *3 years before event* | -0.003 | 0.003 | 0.004 | -0.008 | -0.021 | -0.018 |
| | (0.008) | (0.010) | (0.008) | (0.016) | (0.021) | (0.020) |
| *2 years before event* | -0.003 | 0.008 | 0.007 | -0.005 | -0.005 | -0.006 |
| | (0.006) | (0.007) | (0.006) | (0.008) | (0.010) | (0.010) |
| *Year of event* | -0.031*** | -0.136*** | -0.142*** | -0.016 | -0.113*** | -0.119*** |
| | (0.010) | (0.019) | (0.017) | (0.013) | (0.015) | (0.014) |
| *1 year after event* | 0.038*** | 0.052*** | 0.006 | 0.058*** | 0.080*** | 0.035* |
| | (0.011) | (0.013) | (0.011) | (0.019) | (0.020) | (0.018) |
| *2 years after event* | 0.056*** | 0.084*** | 0.027** | 0.082*** | 0.119*** | 0.063*** |
| | (0.010) | (0.015) | (0.013) | (0.024) | (0.026) | (0.023) |
| *3 years after event* | 0.054*** | 0.117*** | 0.056*** | 0.084** | 0.160*** | 0.098*** |
| | (0.010) | (0.015) | (0.012) | (0.031) | (0.034) | (0.033) |
| *4 years after event* | 0.055*** | 0.109*** | 0.047*** | 0.093** | 0.163*** | 0.099** |
| | (0.011) | (0.014) | (0.012) | (0.036) | (0.042) | (0.039) |
| Mean Dep. Var. | 1.27 | 0.98 | 0.63 | 1.32 | 1.03 | 0.60 |
| SD Dep. Var. | 0.31 | 0.50 | 0.40 | 0.44 | 0.68 | 0.56 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | No | No | No |
| Adjusted $R^2$ | 0.72 | 0.65 | 0.59 | 0.67 | 0.61 | 0.53 |
| # Observations | 116,536 | 63,078 | 63,078 | 23,801 | 20,491 | 20,491 |
| # Fixed Effects | 7,132 | 5,794 | 5,794 | 3,860 | 3,451 | 3,451 |
| # Firms | 18,024 | 10,895 | 10,895 | 3,468 | 3,291 | 3,291 |

*Notes:* Table 6 implements Results 1 and 2 for our preferred values of $\delta = -0.22$ and $\sigma = 6$. Results 1 and 2 propose model-based formulas for changes in composite TFP and TFP. The first line in the column title specifies the result whose empirical application we report in that column. The second line in the column title indicates the main data source used to construct the dependent variable. "Bal. Sh." stands for balance sheet and refers to the construction of sales to others as the total sales from balance sheet data (specifically, corporate income tax returns data), from which we subtract the amounts sold to the first MNC buyer. "Trans" refers to the firm-to-firm transaction data, which is used to construct the total sales to other corporate buyers. Note that Result 2 calls for the use of firm-to-firm transaction data, where we can observe the number of corporate buyers. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and four-digit sector $\times$ province $\times$ calendar year fixed effects. Columns (1)-(3) correspond to the full economy-wide sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017. Columns (4)-(6) focus only on the restricted sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Heterogeneity in Performance Gains Based on Domestic Firm (MNC) Sector and FTZ Status (MNCs only)

| | DOM Low-Tech (1) | DOM High-Tech (2) | DOM Low-Tech (3) | DOM High-Tech (4) | MNC Low-Tech (5) | MNC High-Tech (6) | MNC Not in FTZ (7) | MNC In FTZ (8) |
|---|---|---|---|---|---|---|---|---|
| 4 years before event | 0.03* | -0.07 | -0.00 | -0.08 | -0.00 | -0.02 | 0.02 | -0.06 |
| | (0.02) | (0.07) | (0.03) | (0.11) | (0.04) | (0.06) | (0.04) | (0.05) |
| 3 years before event | 0.02 | -0.05 | -0.01 | -0.03 | -0.01 | 0.00 | 0.01 | -0.03 |
| | (0.01) | (0.06) | (0.02) | (0.09) | (0.03) | (0.04) | (0.03) | (0.04) |
| 2 years before event | 0.01 | -0.02 | 0.00 | 0.03 | 0.00 | 0.01 | 0.02 | -0.01 |
| | (0.01) | (0.05) | (0.01) | (0.06) | (0.02) | (0.03) | (0.02) | (0.03) |
| | | | | | | | | |
| Year of event | 0.03*** | 0.03 | 0.04*** | 0.02 | 0.03* | 0.09*** | 0.02 | 0.09*** |
| | (0.01) | (0.04) | (0.01) | (0.05) | (0.02) | (0.03) | (0.02) | (0.03) |
| 1 year after event | 0.06*** | 0.05 | 0.08*** | 0.02 | 0.06** | 0.12*** | 0.04* | 0.11*** |
| | (0.01) | (0.04) | (0.02) | (0.08) | (0.02) | (0.04) | (0.03) | (0.04) |
| 2 years after event | 0.06*** | 0.04 | 0.08*** | 0.01 | 0.07** | 0.11** | 0.05 | 0.11** |
| | (0.01) | (0.04) | (0.03) | (0.11) | (0.03) | (0.05) | (0.04) | (0.05) |
| 3 years after event | 0.05*** | 0.07* | 0.09** | 0.03 | 0.08* | 0.14* | 0.03 | 0.16** |
| | (0.01) | (0.04) | (0.04) | (0.14) | (0.04) | (0.07) | (0.05) | (0.07) |
| 4 years after event | 0.05*** | 0.07 | 0.10** | 0.02 | 0.07 | 0.15* | 0.03 | 0.18** |
| | (0.01) | (0.04) | (0.05) | (0.17) | (0.05) | (0.09) | (0.06) | (0.08) |
| | | | | | | | | |
| Mean Dep. Var. (level) | 0.90 | 1.28 | 0.87 | 1.23 | 0.90 | 0.96 | 0.88 | 0.97 |
| SD Dep. Var. (level) | 0.53 | 0.69 | 0.51 | 0.65 | 0.55 | 0.50 | 0.53 | 0.54 |
| | | | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-2DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | No | No | No | No | No | No |
| | | | | | | | | |
| Adjusted $R^2$ | 0.69 | 0.73 | 0.71 | 0.72 | 0.73 | 0.77 | 0.74 | 0.70 |
| # Observations | 60,497 | 5,762 | 13,376 | 2,111 | 11,933 | 2,925 | 10,476 | 4,340 |
| # Fixed Effects | 11,024 | 1,813 | 3,009 | 792 | 3,020 | 993 | 2,678 | 1,408 |
| # Firms | 9,673 | 1,088 | 1,982 | 395 | 1,819 | 479 | 1,579 | 704 |

*Notes:* Table 7 shows the results of running the event-study specification (1) adapted to the TFP index (constructed under the assumption of a Cobb-Douglas production function) as the dependent variable. All regressions have the same dependent variable, but differ in the sample over which the regression is run. Columns (1) and (4) separate domestic firms (DOM) based on the sector of the domestic firm and whether the OECD classifies this sector as high- or low-tech. The OECD classifies manufacturing sectors as high-tech, medium high-tech, medium low-tech or low-tech, and service sectors as high- or low-knowledge intensive. Manufacturing sectors that are high-tech or medium high-tech, and service sectors that are high-knowledge intensive are labeled as *high-tech*, all others as *low-tech*. Columns (5)-(8) separate domestic firms based on characteristics of the first MNC buyer. This second separation can only be done in the restricted sample (as never-suppliers do not have a first MNC buyer). Columns (5) and (6) separate domestic firms based on whether the sector of their first MNC buyer is high- or low-tech, whereas columns (7) and (8) separate domestic firms based on whether their first MNC buyer was part of a Free Trade Zone (FTZ) or not. The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and two-digit sector × province × calendar year fixed effects. Columns (1) and (2) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017. Columns (3)-(8) use the restricted sample, including only first-time suppliers. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

# Table 8: Heterogeneity in Performance Gains Based on Domestic Firm (MNC) Sector

| | DOM MFG (1) | DOM RET (2) | DOM SER (3) | DOM AGR (4) | DOM MFG (5) | DOM RET (6) | DOM SER (7) | DOM AGR (8) | MNC MFG (9) | MNC RET (10) | MNC SER (11) | MNC AGR (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | -0.03 | 0.02 | 0.06 | 0.06 | -0.04 | -0.02 | 0.08 | -0.11 | -0.05 | -0.07 | -0.00 | 0.04 |
| | (0.04) | (0.02) | (0.04) | (0.09) | (0.08) | (0.03) | (0.09) | (0.15) | (0.05) | (0.08) | (0.06) | (0.10) |
| *3 years before event* | -0.03 | 0.01 | 0.04 | 0.04 | -0.02 | -0.01 | 0.04 | -0.11 | -0.08** | -0.01 | -0.00 | 0.05 |
| | (0.03) | (0.01) | (0.04) | (0.08) | (0.05) | (0.02) | (0.07) | (0.11) | (0.04) | (0.05) | (0.04) | (0.08) |
| *2 years before event* | -0.00 | 0.01 | -0.00 | 0.01 | 0.00 | 0.00 | 0.03 | -0.06 | -0.00 | -0.00 | -0.01 | 0.04 |
| | (0.03) | (0.01) | (0.03) | (0.06) | (0.04) | (0.01) | (0.04) | (0.08) | (0.02) | (0.03) | (0.03) | (0.05) |
| *Year of event* | 0.04** | 0.04*** | 0.04* | -0.06 | 0.06* | 0.05*** | 0.02 | 0.00 | 0.08*** | 0.01 | 0.03 | 0.02 |
| | (0.02) | (0.01) | (0.03) | (0.05) | (0.03) | (0.01) | (0.04) | (0.08) | (0.02) | (0.03) | (0.03) | (0.05) |
| *1 year after event* | 0.10*** | 0.05*** | 0.06** | -0.04 | 0.13** | 0.07*** | 0.02 | 0.08 | 0.12*** | 0.03 | 0.07* | -0.02 |
| | (0.02) | (0.01) | (0.02) | (0.06) | (0.05) | (0.02) | (0.06) | (0.11) | (0.03) | (0.05) | (0.04) | (0.08) |
| *2 years after event* | 0.09*** | 0.05*** | 0.06** | -0.03 | 0.13* | 0.08** | 0.01 | 0.15 | 0.13*** | 0.04 | 0.08 | 0.01 |
| | (0.02) | (0.01) | (0.03) | (0.06) | (0.07) | (0.03) | (0.08) | (0.15) | (0.05) | (0.07) | (0.05) | (0.10) |
| *3 years after event* | 0.07** | 0.05*** | 0.08*** | 0.03 | 0.12 | 0.08** | 0.01 | 0.23 | 0.16*** | 0.05 | 0.07 | -0.06 |
| | (0.03) | (0.01) | (0.03) | (0.07) | (0.09) | (0.04) | (0.11) | (0.20) | (0.06) | (0.09) | (0.07) | (0.12) |
| *4 years after event* | 0.11*** | 0.04*** | 0.06* | 0.02 | 0.18* | 0.08 | -0.02 | 0.24 | 0.17** | 0.04 | 0.07 | -0.03 |
| | (0.03) | (0.01) | (0.03) | (0.09) | (0.11) | (0.05) | (0.13) | (0.25) | (0.07) | (0.11) | (0.08) | (0.16) |
| Mean Dep. Var. (level) | 0.96 | 0.73 | 1.22 | 1.16 | 0.96 | 0.74 | 1.22 | 1.00 | 0.92 | 0.86 | 0.94 | 0.82 |
| SD Dep. Var. (level) | 0.41 | 0.34 | 0.67 | 0.91 | 0.44 | 0.33 | 0.72 | 0.73 | 0.54 | 0.44 | 0.54 | 0.64 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-2DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No | No | No | No | No |
| Adjusted R$^2$ | 0.60 | 0.57 | 0.71 | 0.67 | 0.60 | 0.57 | 0.75 | 0.68 | 0.73 | 0.69 | 0.77 | 0.79 |
| # Observations | 9,806 | 33,550 | 17,998 | 4,929 | 2,792 | 7,836 | 3,822 | 1,039 | 5,904 | 2,920 | 4,489 | 837 |
| # Fixed Effects | 2,076 | 5,374 | 4,498 | 894 | 910 | 1,306 | 1,340 | 246 | 1,797 | 957 | 1,407 | 314 |
| # Firms | 1,424 | 5,164 | 3,389 | 788 | 396 | 1,099 | 722 | 161 | 923 | 451 | 716 | 120 |

*Notes:* Table 8 shows the results of running the event-study specification (1) adapted to the TFP index (constructed under the assumption of a Cobb-Douglas production function) as the dependent variable. All regressions have the same dependent variable, but differ in the sample over which the regression is run. Columns (1)-(8) separate firms based on the sector of the domestic firm (DOM). The four largest sectoral groups are manufacturing (MFG), retail (including repair and maintenance, RET), services (SER), and agriculture (AGR). Columns (9)-(12) separate firms based on the sector of the first MNC buyer. The event is defined as a first time sale to an MNC. $\theta_{-1}$, the coefficient of the year prior to a first sale to an MNC, is normalized to zero. These regressions do not include the vector of firm-level time-varying characteristics, $X_{it}$, but include firm and two-digit sector $\times$ province $\times$ calendar year fixed effects. Columns (1)-(4) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC between 2008 and 2017. Columns (5)-(12) focus only on the restricted sample of first-time suppliers. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

# The Effects of Joining Multinational Supply Chains: New Evidence from Firm-to-Firm Linkages

Alonso Alfaro-Ureña, Isabela Manelici, and Jose Vasquez

## Appendices for Online Publication

These appendices supplement our paper "The Effects of Joining Multinational Supply Chains: New Evidence from Firm-to-Firm Linkages" with the following material:

- Online Appendix A includes additional pieces of evidence, some to further motivate our research setup, others bringing more insights on the wide-ranging effects of becoming a supplier to MNCs.

- Online Appendix B contains supplemental robustness checks on the main event-study methodology implemented on the economy-wide (full and restricted) samples of first-time suppliers to MNCs. It also brings evidence that our results are not driven by changes in the third-party reporting behavior of first-time suppliers to MNCs.

- Online Appendix C provides detailed derivations of the main equations and results of the model introduced in Section 5.

- Online Appendix D includes evidence in support of the robustness of our baseline model-based findings. For instance, we further motivate our IV strategy to estimate $\delta$. We also investigate the sensitivity of our model-based findings to different values of the two main parameters of the model ($\delta$ and $\sigma$).

- Online Appendix E includes summary statistics on the main economy-wide event-study sample: on the domestic firms that become suppliers to MNCs, on the MNCs triggering these events, and on the events themselves.

- Online Appendix F presents in detail our administrative data and Procomer "Productive Linkages" data and, in particular, the sample construction rules for each data source. The subsection on "Productive Linkages" also provides context on the program itself.

- Online Appendix G describes the survey design, implementation, response rate, representativeness, questions and answers received.

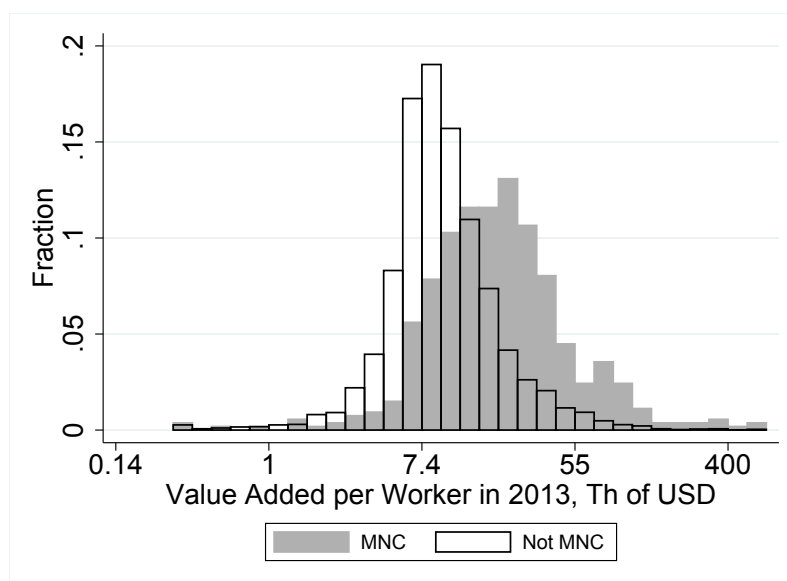# Online Appendix A   Additional Evidence



Figure A1: Distributions of Value Adder Per Worker for MNCs vs Non-MNCs in Costa Rica

*Notes:* Figure A1 plots two histograms of the value added per worker (in 2013, in thousands of U.S. dollars) for two types of firms in Costa Rica: all MNC affiliates and all firms that are not MNC affiliates. Both histograms contain only firms that hire more than ten workers that year.
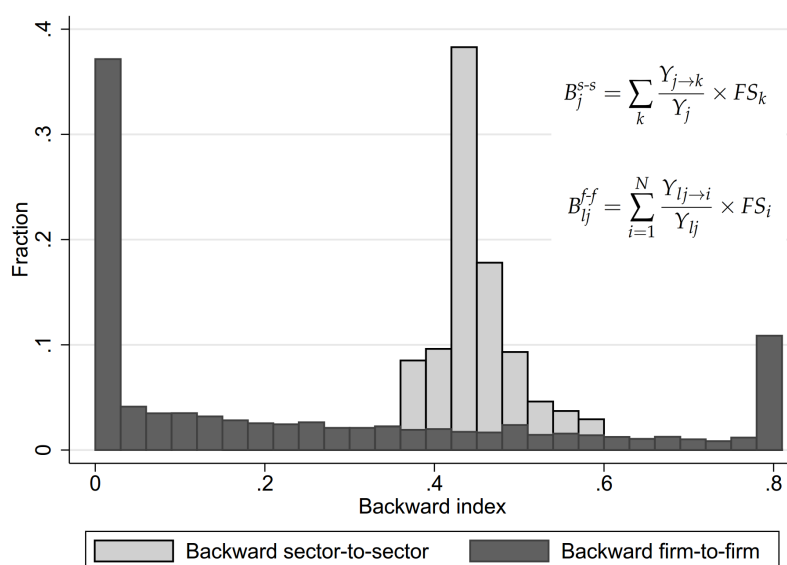


$$B_j^{s\text{-}s} = \sum_k \frac{Y_{j \to k}}{Y_j} \times FS_k$$

$$B_{lj}^{f\text{-}f} = \sum_{i=1}^{N} \frac{Y_{lj \to i}}{Y_{lj}} \times FS_i$$

Figure A2: Histograms of Two Firm-level Measures of Backward Linkages

*Notes:* Figure A2 plots two measures of firm-level backward linkages. Firms are not weighted by their size; histograms are based on firm counts. The "Backward sector-to-sector" measure is the typical one used in the FDI spillovers literature; all firms in a given sector $j$ are assigned the same value of the backward linkage measure, depending on the extent to which the sector $j$ of the firm sells to a given sector $k$ (from I-O table coefficients) and the share of foreign ownership in those sectors, $FS_k$ (overall foreign share of sector $k$). "Backward firm-to-firm" uses the actual firm-to-firm transaction data, and in particular the exact amounts sold by firm $l$ to buyer firm $i$ and the actual share of foreign ownership of buyer $i$ ($FS_i$). All linkage values above 0.8 are binned up at 0.8. When we run a regression over the entire sample of firms in Costa Rica of the firm-level "Backward firm-to-firm" measure on their sector-level "Backward sector-to-sector" measure, we obtain an $R^2$ of less than 1%.

Table A1: Domestic Firms Improve Their Performance after Starting to Supply to MNCs

| | VA (1) | Profits (2) | VA/L (3) | Profits/L (4) | Sales/L (5) | VA (6) | Profits (7) | VA/L (8) | Profits/L (9) | Sales/L (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.010 | -0.088* | 0.022 | -0.025 | 0.036* | -0.097 | -0.205*** | -0.016 | 0.000 | 0.033 |
| | (0.038) | (0.052) | (0.024) | (0.042) | (0.020) | (0.066) | (0.071) | (0.040) | (0.062) | (0.027) |
| *3 years before event* | -0.001 | 0.001 | 0.004 | 0.037 | 0.032* | -0.060 | -0.070 | -0.029 | 0.054 | 0.028 |
| | (0.031) | (0.037) | (0.023) | (0.031) | (0.018) | (0.042) | (0.047) | (0.030) | (0.039) | (0.022) |
| *2 years before event* | 0.021 | -0.029 | 0.016 | -0.001 | 0.021 | -0.021 | -0.065** | -0.006 | 0.012 | 0.016 |
| | (0.022) | (0.021) | (0.020) | (0.022) | (0.015) | (0.031) | (0.027) | (0.026) | (0.029) | (0.015) |
| *Year of event* | 0.058*** | 0.058** | 0.037** | 0.084*** | 0.096*** | 0.109*** | 0.095*** | 0.061*** | 0.056** | 0.103*** |
| | (0.020) | (0.026) | (0.017) | (0.024) | (0.012) | (0.022) | (0.028) | (0.021) | (0.027) | (0.016) |
| *1 year after event* | 0.215*** | 0.216*** | 0.011 | 0.096*** | 0.084*** | 0.307*** | 0.299*** | 0.056** | 0.061* | 0.091*** |
| | (0.031) | (0.029) | (0.017) | (0.025) | (0.012) | (0.034) | (0.041) | (0.026) | (0.034) | (0.019) |
| *2 years after event* | 0.261*** | 0.241*** | 0.020 | 0.108*** | 0.079*** | 0.365*** | 0.337*** | 0.071** | 0.047 | 0.091*** |
| | (0.035) | (0.030) | (0.019) | (0.032) | (0.012) | (0.050) | (0.054) | (0.031) | (0.042) | (0.026) |
| *3 years after event* | 0.260*** | 0.230*** | 0.017 | 0.105*** | 0.070*** | 0.383*** | 0.355*** | 0.088** | 0.026 | 0.076** |
| | (0.045) | (0.038) | (0.025) | (0.030) | (0.013) | (0.064) | (0.073) | (0.038) | (0.048) | (0.033) |
| *4 years after event* | 0.254*** | 0.220*** | 0.025 | 0.090*** | 0.078*** | 0.393*** | 0.371*** | 0.110** | -0.011 | 0.087** |
| | (0.044) | (0.045) | (0.024) | (0.032) | (0.014) | (0.083) | (0.084) | (0.054) | (0.056) | (0.041) |
| Mean Dep. Var. (level) | 0.18 | 0.26 | 0.017 | 0.024 | 0.081 | 0.22 | 0.45 | 0.015 | 0.031 | 0.10 |
| SD Dep. Var. (level) | 0.55 | 0.77 | 0.040 | 0.042 | 0.18 | 0.63 | 1.27 | 0.043 | 0.062 | 0.31 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | Yes | No | No | No | No | No |
| Adjusted $R^2$ | 0.71 | 0.71 | 0.67 | 0.60 | 0.78 | 0.71 | 0.74 | 0.52 | 0.61 | 0.80 |
| # Observations | 110,857 | 110,857 | 110,857 | 110,857 | 116,683 | 23,130 | 23,130 | 23,130 | 23,130 | 23,961 |
| # Fixed Effects | 24,591 | 24,591 | 24,591 | 24,591 | 25,174 | 7,252 | 7,252 | 7,252 | 7,252 | 7,366 |
| # Firms | 17,552 | 17,552 | 17,552 | 17,552 | 18,035 | 3,447 | 3,447 | 3,447 | 3,447 | 3,482 |

*Notes:* Table A1 shows the results of running the event-study specification (1) adapted to five dependent variables: log value added, log profits, log value added per worker, log profits per worker, and log sales per worker. The event is defined as a first time sale to an MNC. Reported are the coefficients for event-time −4 to +4, where the coefficients for the year prior to the event are normalized to zero. These regressions do not include firm-level time-varying controls, $x_{it}$, but only firm and four-digit sector × province × calendar year fixed effects. Columns (1)-(5) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC during our entire firm-to-firm transaction dataset. Clustering of standard errors is at the two-digit sector by province level. Columns (6)-(10) focus only on the restricted sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015 and use standard error clustering at event by province level. Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

## Table A2: Domestic Firms (Weakly) Reduce their Mark-ups after Starting to Supply to MNCs

| Outcome: Mark-up | (1) | (2) |
|---|---|---|
| *4 years before event* | 0.007 | 0.063* |
| | (0.032) | (0.036) |
| *3 years before event* | -0.007 | 0.027 |
| | (0.017) | (0.026) |
| *2 years before event* | 0.002 | 0.022 |
| | (0.009) | (0.015) |
| | | |
| *Year of event* | -0.008 | -0.031* |
| | (0.015) | (0.017) |
| *1 year after event* | -0.018 | -0.062** |
| | (0.012) | (0.024) |
| *2 years after event* | -0.022 | -0.087*** |
| | (0.015) | (0.029) |
| *3 years after event* | -0.029 | -0.118*** |
| | (0.020) | (0.034) |
| *4 years after event* | -0.034* | -0.143*** |
| | (0.017) | (0.043) |
| | | |
| Mean Dep. Var. (level) | 1.25 | 1.26 |
| SD Dep. Var. (level) | 0.52 | 0.52 |
| | | |
| Firm FE | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes |
| Never Suppliers | Yes | No |
| | | |
| Adjusted $R^2$ | 0.80 | 0.78 |
| # Observations | 50,062 | 10,803 |
| # Fixed Effects | 12,796 | 4,020 |
| # Firms | 8,658 | 1,868 |

*Notes:* Table A2 shows the results of running the event-study specification (1) using firm-level mark-ups as the dependent variable. Mark-ups are estimated using the methodology of De Loecker and Warzynski (2012) for a value-added Cobb-Douglas production function. The event is defined as a first time sale to an MNC. Reported are the coefficients for event-time $-4$ to $+4$, where the coefficients for the year prior to the event are normalized to zero. Column (1) reports event-study estimates for the sample including both domestic firms that become first-time suppliers to an MNC after 2010 and domestic firms never observed as supplying to an MNC during our entire firm-to-firm transaction data. Clustering of standard errors is at the two-digit sector by province level. Column (2) focuses only on the sample of domestic firms becoming first-time suppliers to an MNC after 2010 and use standard error clustering at event by province level. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.
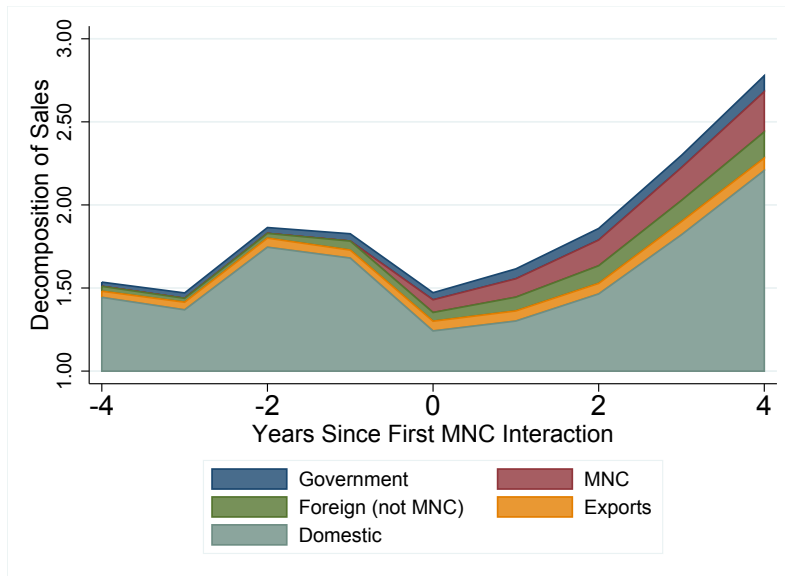
Figure A3: Decomposition of Sales for First-time Suppliers to MNCs

*Notes:* Figure A3 plots a decomposition of the sales of first-time suppliers to MNCs. The horizontal axis refers to event years and the vertical axis to total sales in millions of U.S. dollars (CPI-deflated to 2013 dollars). For each event-year, we calculate the average amount in each category of buyers across all suppliers. We exclude the top 1% largest transactions to avoid outliers driving these averages. We split transactions into five categories: sales to MNCs, sales to partially foreign-owned firms that are not MNCs, exports, sales to the government, and sales to domestically-owned firms. These averages are not demeaned through any fixed effect.
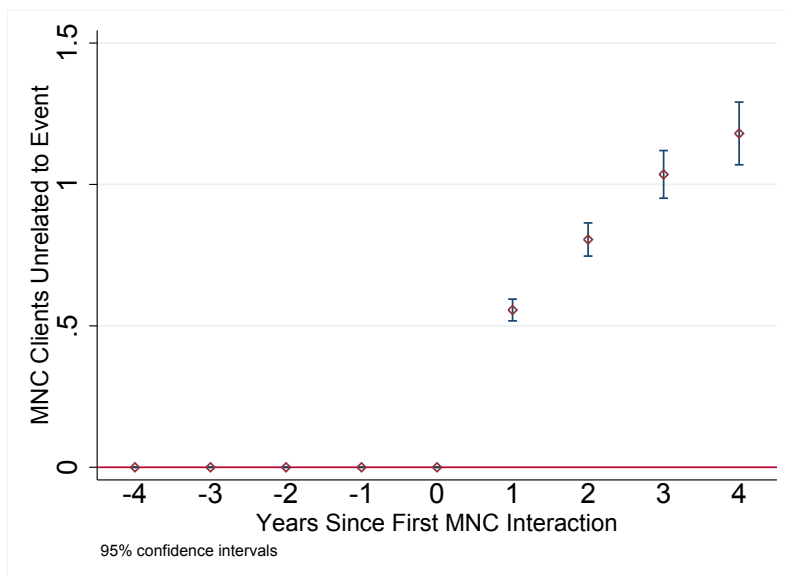


Figure A4: Average Number of MNC Buyers, Other Than First MNC Buyer

*Notes:* Figure A4 plots the average (across first-time suppliers to MNCs) number of MNC buyers in a given event year that are *different* from the initial MNC buyer triggering the event for each supplier. The horizontal axis refers to event years and the vertical axis to the average number of (other) MNC buyers. The vertical lines reflect the 95% confidence intervals. By construction, all averages for event years *-4* to *0* are zero.

Table A3: After Starting to Supply to MNCs, Sales to Non-Corporate Buyers Increase, but Their Share in Overall Sales to Others Falls

| | Sales to Others Non-Corp (1) | Sh. of Other Sales Non-Corp (2) | Sales to Others Non-Corp (3) | Sh. of Other Sales Non-Corp (4) |
|---|---|---|---|---|
| *4 years before event* | -0.005 | -0.015 | -0.146 | -0.019 |
| | (0.049) | (0.009) | (0.094) | (0.023) |
| *3 years before event* | -0.034 | -0.020** | -0.065 | -0.017 |
| | (0.047) | (0.008) | (0.067) | (0.012) |
| *2 years before event* | -0.022 | -0.013 | -0.035 | -0.006 |
| | (0.037) | (0.009) | (0.039) | (0.010) |
| | | | | |
| *Year of event* | -0.086** | -0.050*** | -0.031 | -0.051*** |
| | (0.041) | (0.009) | (0.042) | (0.010) |
| *1 year after event* | 0.129*** | -0.073*** | 0.203*** | -0.069*** |
| | (0.039) | (0.012) | (0.056) | (0.013) |
| *2 years after event* | 0.144*** | -0.072*** | 0.254*** | -0.062*** |
| | (0.047) | (0.012) | (0.079) | (0.018) |
| *3 years after event* | 0.101* | -0.075*** | 0.211* | -0.061** |
| | (0.060) | (0.012) | (0.106) | (0.023) |
| *4 years after event* | 0.164*** | -0.071*** | 0.317** | -0.051* |
| | (0.045) | (0.011) | (0.130) | (0.028) |
| | | | | |
| Mean Dep. Var. (level) | 0.68 | 0.74 | 1.01 | 0.55 |
| SD Dep. Var. (level) | 2.17 | 0.36 | 3.72 | 0.36 |
| | | | | |
| Firm FE | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | No | No |
| | | | | |
| Adjusted R$^2$ | 0.70 | 0.74 | 0.71 | 0.63 |
| # Observations | 108,844 | 116,683 | 21,448 | 23,961 |
| # Fixed Effects | 24,420 | 25,174 | 6,991 | 7,366 |
| # Firms | 17,565 | 18,035 | 3,364 | 3,482 |

*Notes:* Table A3 shows the results of running the event-study specification (1) adapted to two dependent variables: log total sales to all non-corporate buyers and the share of sales to non-corporate buyers out of all sales to others. The total sales to all non-corporate buyers are constructed starting from total sales in a given year (from corporate income tax returns data), from which we subtract all sales to (corporate) buyers (including the MNC triggering the event, from firm-to-firm transaction data). Total sales to all non-corporate buyers include all those sales to end consumers (general public) and firms that do not amount to 4,200 U.S. dollars in a given year. The share of non-corporate sales out of all sales to others is meant to capture potential reallocations of sales to others (sales excluding the MNC triggering the event) among buyers of different types. The event is defined as a first time sale to an MNC. Reported are the coefficients for event-time −4 to +4, where the coefficients for the year prior to the event are normalized to zero. These regressions do not include firm-level time-varying controls, $x_{it}$, only the fixed effects reported in each column. Robust standard errors in parentheses. Means (in levels) for columns (1) and (3) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). \*\*\*,\*\*,\* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A4: Domestic Firms See Their Transactions Increase after Starting to Supply to MNCs

| Outcome: (log) Value of Transaction | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *4 years before event* | 0.007 | 0.007 | 0.003 | -0.039* |
| | (0.018) | (0.015) | (0.015) | (0.020) |
| *3 years before event* | -0.003 | 0.011 | 0.011 | -0.014 |
| | (0.013) | (0.011) | (0.011) | (0.014) |
| *2 years before event* | 0.002 | 0.009 | 0.009 | 0.004 |
| | (0.009) | (0.007) | (0.007) | (0.010) |
| | | | | |
| *Year of event* | -0.002 | 0.016** | 0.018*** | 0.017* |
| | (0.009) | (0.007) | (0.007) | (0.009) |
| *1 year after event* | 0.018 | 0.038*** | 0.040*** | 0.051*** |
| | (0.012) | (0.010) | (0.010) | (0.013) |
| *2 years after event* | 0.022 | 0.039*** | 0.039*** | 0.055*** |
| | (0.015) | (0.013) | (0.013) | (0.017) |
| *3 years after event* | 0.027 | 0.044*** | 0.047*** | 0.085*** |
| | (0.020) | (0.016) | (0.017) | (0.022) |
| *4 years after event* | 0.043* | 0.046** | 0.047** | 0.089*** |
| | (0.024) | (0.020) | (0.020) | (0.027) |
| | | | | |
| Mean Dep. Var. (level) | 0.031 | 0.036 | 0.036 | 0.035 |
| SD Dep. Var. (level) | 0.071 | 0.078 | 0.078 | 0.078 |
| | | | | |
| Supplier FE | Yes | No | No | No |
| Supplier-Buyer FE | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | No | No |
| Year-Prov FE | No | No | Yes | No |
| Year-4DSect-Prov FE | No | No | No | Yes |
| | | | | |
| Adjusted R$^2$ | 0.20 | 0.71 | 0.71 | 0.72 |
| # Observations | 412,420 | 305,005 | 305,005 | 304,400 |
| # Fixed Effects | 3,537 | 83,338 | 83,398 | 88,708 |
| # Suppliers | 3,527 | 3,382 | 3,382 | 3,341 |
| # Buyers | 99,111 | 44,951 | 44,951 | 44,917 |

*Notes:* Table A4 shows the results of running the event-study specification (1) adapted to one dependent variable: log value of the transaction made by a given supplier - buyer pair, in a given year. The unit of observation is at the seller-buyer-year level. The event is defined as a first time sale to an MNC. Reported are the coefficients for event-time −4 to +4, where the coefficients for the year prior to the event are normalized to zero. All four regressions have the same dependent variable, but differ in which fixed effects we activate (hence the variation that we exploit). To construct the dependent variable we use the firm-to-firm transaction data (from D-151 tax forms). These regressions do not include firm-level time-varying controls, $x_{it}$, only the fixed effects reported in each column. In years when there is no transaction between a given supplier-buyer pair, that triad is dropped. For brevity, the table only contains domestic firms that become first-time suppliers to an MNC (the restricted economy-wide sample). All means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

## Table A5: Domestic Firms Start Selling to (Buying from) More Sectors After Event

| | # 2D-Sect Buyers (1) | # 4D-Sect Buyers (2) | # 2D-Sect Suppliers (3) | # 4D-Sect Suppliers (4) | # 2D-Sect Buyers (5) | # 4D-Sect Buyers (6) | # 2D-Sect Suppliers (7) | # 4D-Sect Suppliers (8) |
|---|---|---|---|---|---|---|---|---|
| *log total sales* | 0.169*** | 0.191*** | 0.265*** | 0.308*** | 0.308*** | 0.352*** | 0.322*** | 0.366*** |
| | (0.012) | (0.015) | (0.004) | (0.005) | (0.008) | (0.008) | (0.007) | (0.009) |
| *4 years before event* | -0.018 | -0.019 | -0.006 | -0.010 | -0.024 | -0.033 | 0.023 | 0.010 |
| | (0.014) | (0.016) | (0.020) | (0.022) | (0.038) | (0.037) | (0.026) | (0.027) |
| *3 years before event* | -0.007 | -0.002 | -0.015 | -0.015 | -0.011 | -0.009 | 0.009 | 0.003 |
| | (0.011) | (0.013) | (0.013) | (0.013) | (0.022) | (0.022) | (0.018) | (0.019) |
| *2 years before event* | -0.018 | -0.014 | -0.003 | -0.007 | -0.020 | -0.017 | 0.011 | 0.003 |
| | (0.014) | (0.014) | (0.010) | (0.011) | (0.016) | (0.016) | (0.013) | (0.013) |
| *Year of event* | -0.197*** | -0.155*** | 0.023** | 0.024** | -0.229*** | -0.187*** | 0.005 | 0.004 |
| | (0.014) | (0.013) | (0.010) | (0.010) | (0.017) | (0.019) | (0.009) | (0.009) |
| *1 year after event* | 0.190*** | 0.218*** | 0.037*** | 0.040*** | 0.128*** | 0.157*** | 0.009 | 0.010 |
| | (0.016) | (0.017) | (0.011) | (0.012) | (0.026) | (0.026) | (0.013) | (0.015) |
| *2 years after event* | 0.226*** | 0.260*** | 0.052*** | 0.055*** | 0.146*** | 0.183*** | 0.011 | 0.015 |
| | (0.018) | (0.019) | (0.014) | (0.014) | (0.032) | (0.032) | (0.017) | (0.020) |
| *3 years after event* | 0.250*** | 0.285*** | 0.051*** | 0.055*** | 0.173*** | 0.213*** | 0.010 | 0.015 |
| | (0.017) | (0.020) | (0.012) | (0.013) | (0.046) | (0.043) | (0.022) | (0.026) |
| *4 years after event* | 0.250*** | 0.288*** | 0.063*** | 0.066*** | 0.174*** | 0.220*** | 0.023 | 0.030 |
| | (0.020) | (0.023) | (0.015) | (0.016) | (0.052) | (0.052) | (0.027) | (0.032) |
| Mean Dep. Var. (level) | 2.57 | 3.04 | 4.26 | 5.48 | 4.60 | 6.00 | 5.44 | 5.44 |
| SD Dep. Var. (level) | 2.66 | 3.94 | 3.43 | 5.50 | 4.06 | 6.45 | 4.62 | 4.62 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| Adjusted $R^2$ | 0.82 | 0.84 | 0.81 | 0.84 | 0.79 | 0.82 | 0.82 | 0.85 |
| # Observations | 115,800 | 115,800 | 115,800 | 115,800 | 23,092 | 23,092 | 23,092 | 23,092 |
| # Fixed Effects | 25,101 | 25,101 | 25,101 | 25,101 | 7,234 | 7,234 | 7,234 | 7,234 |
| # Firms | 17,996 | 17,996 | 17,996 | 17,996 | 3,442 | 3,442 | 3,442 | 3,442 |

*Notes:* Table A5 shows the results of running the event-study specification (1) adapted to four dependent variables: the number of two-digit sectors of buyers in a given year, the number of four-digit sectors of buyers in a given year, the number of two-digit sectors of suppliers (of the supplier) in a given year, and the number of four-digit sectors of suppliers (of the supplier) in a given year. For a given domestic supplier and regression, there is only one observation per year that is an unweighted count of the number of sectors of its buyers (or suppliers) that event year. To avoid mechanical results, the MNC buyer triggering the event is excluded from the set of buyers described in this table. The event is defined as a first time sale to an MNC. Reported are the coefficients for event-time $-4$ to $+4$, where the coefficients for the year prior to the event are normalized to zero. These regressions control for the contemporaneous log total sales of the domestic firm, in addition to firm and four-digit sector $\times$ province $\times$ calendar year fixed effects. Columns (1)-(4) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC during our entire firm-to-firm transaction dataset. Clustering of standard errors is at the two-digit sector by province level. Columns (5)-(8) focus only on the restricted sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015 and use standard error clustering at event by province level. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A6: Buyer Characteristics Change After Domestic Firms Start Supplying to MNCs

| | Sh Buyers in HT-sect (1) | Ave Empl of Buyers (2) | Ave Sales of Buyers (3) | Ave Exp Sh of Buyers (4) | Sh Buyers in HT-sect (5) | Ave Empl of Buyers (6) | Ave Sales of Buyers (7) | Ave Exp Sh of Buyers (8) |
|---|---|---|---|---|---|---|---|---|
| *log total sales* | -0.001 | 0.132*** | 0.159*** | 0.002 | 0.003 | 0.224*** | 0.245*** | 0.005** |
| | (0.001) | (0.021) | (0.024) | (0.001) | (0.002) | (0.044) | (0.046) | (0.002) |
| *4 years before event* | -0.004 | -0.003 | -0.004 | -0.008 | -0.002 | 0.190 | 0.068 | -0.007 |
| | (0.004) | (0.073) | (0.077) | (0.005) | (0.008) | (0.125) | (0.123) | (0.008) |
| *3 years before event* | -0.006** | -0.077 | -0.122** | -0.005 | -0.004 | 0.023 | -0.091 | -0.004 |
| | (0.003) | (0.055) | (0.050) | (0.004) | (0.006) | (0.097) | (0.099) | (0.005) |
| *2 years before event* | -0.003 | -0.034 | -0.049 | 0.001 | -0.005 | -0.011 | -0.053 | -0.000 |
| | (0.002) | (0.032) | (0.038) | (0.002) | (0.003) | (0.056) | (0.053) | (0.003) |
| *Year of event* | -0.007*** | -0.210*** | -0.213*** | -0.010*** | -0.007** | -0.302*** | -0.253*** | -0.011*** |
| | (0.002) | (0.052) | (0.052) | (0.002) | (0.003) | (0.055) | (0.063) | (0.003) |
| *1 year after event* | -0.004** | 0.184*** | 0.224*** | 0.002 | -0.006 | 0.018 | 0.161** | 0.001 |
| | (0.002) | (0.052) | (0.056) | (0.003) | (0.004) | (0.073) | (0.078) | (0.005) |
| *2 years after event* | -0.002 | 0.328*** | 0.382*** | 0.008*** | -0.004 | 0.079 | 0.275*** | 0.007 |
| | (0.003) | (0.042) | (0.044) | (0.003) | (0.006) | (0.095) | (0.090) | (0.006) |
| *3 years after event* | -0.001 | 0.374*** | 0.441*** | 0.012*** | -0.003 | 0.045 | 0.294** | 0.011 |
| | (0.003) | (0.050) | (0.052) | (0.003) | (0.008) | (0.123) | (0.125) | (0.008) |
| *4 years after event* | 0.000 | 0.411*** | 0.459*** | 0.011*** | -0.001 | 0.027 | 0.301* | 0.009 |
| | (0.003) | (0.052) | (0.055) | (0.004) | (0.010) | (0.164) | (0.159) | (0.010) |
| Mean Dep. Var. (level) | 0.014 | 431.5 | 70.8 | 0.045 | 0.018 | 409.6 | 61.2 | 0.048 |
| SD Dep. Var. (level) | 0.088 | 1386.4 | 263.1 | 0.14 | 0.078 | 1168.0 | 210.7 | 0.13 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| Adjusted R$^2$ | 0.64 | 0.72 | 0.73 | 0.77 | 0.46 | 0.62 | 0.64 | 0.67 |
| # Observations | 54,363 | 54,363 | 54,363 | 54,363 | 18,830 | 18,830 | 18,830 | 18,830 |
| # Fixed Effects | 14,998 | 14,998 | 14,998 | 14,998 | 6,315 | 6,315 | 6,315 | 6,315 |
| # Firms | 9,652 | 9,652 | 9,652 | 9,652 | 3,086 | 3,086 | 3,086 | 3,086 |

*Notes:* Table A6 shows the results of running the event-study specification (1) adapted to three dependent variables: the share of buyers in high-tech sectors, the average number of workers of buyers, the average total sales of buyers, and the share of exports in the total sales of the buyers (averaged across all years for a given buyer). For a given domestic firm and regression, there is only one observation per year that is a weighted average of the characteristics of its buyers that year (weighted by their importance to that supplier). To avoid mechanical results, the MNC buyer triggering the event is excluded from the set of buyers described in this table. The event is defined as a first time sale to an MNC. Reported are the coefficients for event-time $-4$ to $+4$, where the coefficients for the year prior to the event are normalized to zero. These regressions do not include firm-level time-varying controls, $x_{it}$, but only firm and four-digit sector × province × calendar year fixed effects. Columns (1)-(4) pertain to the full sample including both domestic firms that become first-time suppliers to an MNC between 2010 and 2015 and domestic firms never observed as supplying to an MNC during our entire firm-to-firm transaction dataset. Clustering of standard errors is at the two-digit sector by province level. Columns (5)-(8) focus only on the restricted sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015 and use standard error clustering at event by province level. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

# Online Appendix B  Robustness of Event-Study Results

## Online Appendix B.1  Robustness to Different Sets of Fixed Effects

We investigate the stability of our economy-wide event-study coefficients to four combinations of fixed-effects (FEs). We start with only ten calendar year FEs to control for year-specific shocks. We then add firm FEs, to also control for firm-specific time-invariant characteristics. Next, we replace the calendar year FEs with four-digit sector $\times$ calendar year FEs to control for industry-specific time-varying shocks. Our preferred combination of FEs (firm and four-digit sector $\times$ province $\times$ calendar year FEs) allows for a spatial dimension to shocks. We report the event-study coefficients for three outcome variables: log total sales (Table B1), translog TFP (Table B2), and log sales to others (Table B3).

There are three main patterns that come out of these results. First, the largest jump in $R^2$ occurs upon including firm FEs, especially when the outcome is a measure of firm size and when we do not include firm-specific time-varying controls.[64] Second, adding firm FEs is most consequential for the full sample, in particular for resolving the differential trends before the event. This highlights the differences in levels between first-time suppliers and never-suppliers. Even without firm FEs, in the restricted sample (including only firms that become first-time suppliers to MNCs) there is clear evidence of the lack of trends before the event and the sharp upward trend after. Third, for any combination of FEs (from the parsimonious ten FEs in regressions (1) and (5), to tens of thousands of FEs in all other regressions) all outcomes take off the year of the event.[65] All in all, we conclude that firm FEs are important to control for differences in levels, but do not drive our results.

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[64]In Table B2, we already control for second-order Taylor polynomial terms in $K_{it}$, $L_{it}$, and $M_{it}$. Even without firm FEs, the $R^2$ of the regressions in columns (1) and (5) are already above 0.90.

[65]Also, notice that allowing for potential spatial disparities in four-digit sector shocks barely affects the results. We keep the additional interaction with the province of the supplier to (modestly) raise the explanatory power.

Table B1: Robustness of Baseline Event-Study Results for Total Sales to Different Sets of Fixed Effects

| Outcome: (log) Total Sales | (1) | (2) | (3) | (4) Baseline | (5) | (6) | (7) | (8) Baseline |
|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.414*** | 0.072*** | 0.043 | 0.044 | 0.067 | -0.021 | -0.022 | -0.022 |
| | (0.069) | (0.027) | (0.027) | (0.028) | (0.077) | (0.059) | (0.043) | (0.053) |
| *3 years before event* | 0.406*** | 0.067*** | 0.038* | 0.029 | 0.104** | 0.011 | -0.000 | 0.001 |
| | (0.058) | (0.020) | (0.021) | (0.023) | (0.048) | (0.041) | (0.035) | (0.041) |
| *2 years before event* | 0.348*** | 0.045** | 0.031* | 0.026 | 0.071** | 0.023 | 0.014 | 0.007 |
| | (0.060) | (0.019) | (0.018) | (0.018) | (0.035) | (0.030) | (0.024) | (0.023) |
| | | | | | | | | |
| *Year of event* | 0.281*** | 0.158*** | 0.167*** | 0.159*** | 0.132*** | 0.200*** | 0.190*** | 0.191*** |
| | (0.049) | (0.021) | (0.019) | (0.019) | (0.025) | (0.020) | (0.019) | (0.021) |
| *1 year after event* | 0.476*** | 0.338*** | 0.337*** | 0.325*** | 0.384*** | 0.406*** | 0.375*** | 0.377*** |
| | (0.040) | (0.029) | (0.027) | (0.028) | (0.041) | (0.033) | (0.027) | (0.035) |
| *2 years after event* | 0.537*** | 0.370*** | 0.361*** | 0.351*** | 0.496*** | 0.457*** | 0.404*** | 0.408*** |
| | (0.039) | (0.035) | (0.031) | (0.032) | (0.051) | (0.045) | (0.041) | (0.054) |
| *3 years after event* | 0.586*** | 0.365*** | 0.351*** | 0.342*** | 0.561*** | 0.462*** | 0.390*** | 0.389*** |
| | (0.042) | (0.039) | (0.033) | (0.035) | (0.062) | (0.056) | (0.054) | (0.072) |
| *4 years after event* | 0.648*** | 0.358*** | 0.345*** | 0.334*** | 0.639*** | 0.462*** | 0.382*** | 0.382*** |
| | (0.043) | (0.040) | (0.035) | (0.037) | (0.075) | (0.066) | (0.064) | (0.089) |
| | | | | | | | | |
| Mean Dep. Var. (level) | 0.85 | 0.85 | 0.85 | 0.85 | 1.45 | 1.45 | 1.45 | 1.45 |
| SD Dep. Var. (level) | 2.54 | 2.54 | 2.54 | 2.54 | 4.50 | 4.50 | 4.50 | 4.50 |
| | | | | | | | | |
| Firm FE | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | No | No | Yes | Yes | No | No |
| Year-4DSect FE | No | No | Yes | No | No | No | Yes | No |
| Year-4DSect-Prov FE | No | No | No | Yes | No | No | No | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| | | | | | | | | |
| Adjusted $R^2$ | 0.037 | 0.76 | 0.77 | 0.77 | 0.024 | 0.79 | 0.80 | 0.80 |
| # Observations | 116,683 | 116,683 | 116,683 | 116,683 | 23,961 | 23,961 | 23,961 | 23,961 |
| # Fixed Effects | 10 | 18,045 | 19,942 | 25,174 | 10 | 3,492 | 4,919 | 7,366 |
| # Firms | 18,035 | 18,035 | 18,035 | 18,035 | 3,482 | 3,482 | 3,482 | 3,482 |

*Notes:* Table B1 shows the results of running four variants of the event-study specification (1) for one dependent variable: log total sales. The event is still defined as a first time sale to an MNC. Reported are the coefficients for event-time $-4$ to $+4$, where the coefficients for the year prior to the event are normalized to zero. Columns (1)-(4) correspond to the full economy-wide sample (including first-time suppliers to MNCs and never-suppliers), columns (5)-(8) correspond to the restricted economy-wide sample (including only first-time suppliers to MNCs). These regressions do not include firm-level time-varying controls, $x_{it}$. The only difference between columns (1)-(4) and between columns (5)-(8) comes from the combination of fixed effects used in each column. Columns (4) and (8) use our preferred combination of fixed effects. Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B2: Robustness of Baseline Event-Study Results for Translog TFP to Different Sets of Fixed Effects

| Outcome: TL TFPR | (1) | (2) | (3) | (4) Baseline | (5) | (6) | (7) | (8) Baseline |
|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.051*** | 0.019 | 0.017 | 0.015 | 0.023 | 0.026 | 0.023 | 0.017 |
| | (0.018) | (0.013) | (0.013) | (0.013) | (0.021) | (0.025) | (0.024) | (0.018) |
| *3 years before event* | 0.044*** | 0.020** | 0.018* | 0.019** | 0.021 | 0.026 | 0.019 | 0.020 |
| | (0.014) | (0.009) | (0.010) | (0.009) | (0.019) | (0.016) | (0.016) | (0.015) |
| *2 years before event* | 0.033*** | 0.005 | 0.004 | 0.007 | 0.011 | 0.013 | 0.010 | 0.010 |
| | (0.012) | (0.009) | (0.009) | (0.008) | (0.010) | (0.012) | (0.011) | (0.011) |
| | | | | | | | | |
| *Year of event* | 0.091*** | 0.038*** | 0.042*** | 0.044*** | 0.069*** | 0.042*** | 0.043*** | 0.041*** |
| | (0.013) | (0.009) | (0.008) | (0.008) | (0.009) | (0.008) | (0.008) | (0.007) |
| *1 year after event* | 0.096*** | 0.050*** | 0.055*** | 0.057*** | 0.075*** | 0.051*** | 0.051*** | 0.051*** |
| | (0.012) | (0.010) | (0.011) | (0.012) | (0.011) | (0.014) | (0.013) | (0.012) |
| *2 years after event* | 0.100*** | 0.057*** | 0.064*** | 0.067*** | 0.081*** | 0.056*** | 0.059*** | 0.054*** |
| | (0.013) | (0.011) | (0.012) | (0.012) | (0.016) | (0.018) | (0.017) | (0.017) |
| *3 years after event* | 0.091*** | 0.051*** | 0.062*** | 0.064*** | 0.074*** | 0.048** | 0.053** | 0.049** |
| | (0.012) | (0.012) | (0.013) | (0.013) | (0.023) | (0.023) | (0.020) | (0.020) |
| *4 years after event* | 0.089*** | 0.050*** | 0.064*** | 0.066*** | 0.072*** | 0.041 | 0.049* | 0.043* |
| | (0.011) | (0.013) | (0.015) | (0.015) | (0.025) | (0.030) | (0.026) | (0.025) |
| | | | | | | | | |
| Mean Dep. Var. (level) | 1.12 | 1.12 | 1.12 | 1.12 | 2.00 | 2.00 | 2.00 | 2.00 |
| SD Dep. Var. (level) | 3.17 | 3.17 | 3.17 | 3.17 | 5.74 | 5.74 | 5.74 | 5.74 |
| | | | | | | | | |
| Firm FE | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | No | No | Yes | Yes | No | No |
| Year-4DSect FE | No | No | Yes | No | No | No | Yes | No |
| Year-4DSect-Prov FE | No | No | No | Yes | No | No | No | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| | | | | | | | | |
| Adjusted $R^2$ | 0.90 | 0.96 | 0.96 | 0.97 | 0.93 | 0.97 | 0.97 | 0.97 |
| # Observations | 64,419 | 64,419 | 64,419 | 64,419 | 13,706 | 13,706 | 13,706 | 13,706 |
| # Fixed Effects | 10 | 10,502 | 12,079 | 15,464 | 10 | 2,154 | 3,238 | 4,774 |
| # Firms | 10,492 | 10,492 | 10,492 | 10,492 | 2,144 | 2,144 | 2,144 | 2,144 |

*Notes:* Table B2 shows the results of running four variants of the event-study specification (1) for one dependent variable: a measure of TFP based on a translog production function (OLS regression). The event is still defined as a first time sale to an MNC. Reported are the coefficients for event-time −4 to +4, where the coefficients for the year prior to the event are normalized to zero. Columns (1)-(4) correspond to the full economy-wide sample (including first-time suppliers to MNCs and never-suppliers), columns (5)-(8) correspond to the restricted economy-wide sample (including only first-time suppliers to MNCs). The only difference between columns (1)-(4) and between columns (5)-(8) comes from the combination of fixed effects used in each column. Columns (4) and (8) use our preferred combination of fixed effects. Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B3: Robustness of Baseline Event-Study Results for Sales to Others to Different Sets of Fixed Effects

| Outcome: (log) Sales to Others | (1) | (2) | (3) | (4) Baseline | (5) | (6) | (7) | (8) Baseline |
|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.411*** | 0.018 | -0.014 | 0.011 | 0.050 | -0.113 | -0.033 | -0.047 |
| | (0.070) | (0.042) | (0.044) | (0.042) | (0.075) | (0.096) | (0.103) | (0.119) |
| *3 years before event* | 0.401*** | -0.004 | -0.029 | -0.022 | 0.082* | -0.087 | -0.042 | -0.041 |
| | (0.059) | (0.034) | (0.036) | (0.035) | (0.048) | (0.069) | (0.072) | (0.076) |
| *2 years before event* | 0.343*** | -0.021 | -0.030 | -0.020 | 0.058 | -0.053 | -0.026 | -0.028 |
| | (0.060) | (0.030) | (0.029) | (0.028) | (0.035) | (0.039) | (0.039) | (0.036) |
| *Year of event* | -0.242** | -0.218*** | -0.201*** | -0.193*** | -0.356*** | -0.140*** | -0.151*** | -0.122* |
| | (0.106) | (0.053) | (0.053) | (0.052) | (0.060) | (0.049) | (0.056) | (0.062) |
| *1 year after event* | 0.108 | 0.114** | 0.124** | 0.118** | 0.055 | 0.217*** | 0.169** | 0.205** |
| | (0.095) | (0.053) | (0.052) | (0.053) | (0.072) | (0.070) | (0.078) | (0.090) |
| *2 years after event* | 0.227*** | 0.203*** | 0.200*** | 0.201*** | 0.251*** | 0.343*** | 0.257** | 0.320*** |
| | (0.080) | (0.047) | (0.044) | (0.045) | (0.083) | (0.092) | (0.099) | (0.115) |
| *3 years after event* | 0.292*** | 0.204*** | 0.202*** | 0.196*** | 0.358*** | 0.388*** | 0.268** | 0.333** |
| | (0.082) | (0.051) | (0.045) | (0.046) | (0.108) | (0.111) | (0.126) | (0.147) |
| *4 years after event* | 0.406*** | 0.193*** | 0.196*** | 0.203*** | 0.507*** | 0.401*** | 0.275* | 0.380** |
| | (0.082) | (0.058) | (0.050) | (0.049) | (0.111) | (0.139) | (0.146) | (0.171) |
| Mean Dep. Var. (level) | 0.84 | 0.84 | 0.84 | 0.84 | 1.42 | 1.42 | 1.42 | 1.42 |
| SD Dep. Var. (level) | 2.54 | 2.54 | 2.54 | 2.54 | 4.51 | 4.51 | 4.51 | 4.51 |
| Firm FE | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | No | No | Yes | Yes | No | No |
| Year-4DSect FE | No | No | Yes | No | No | No | Yes | No |
| Year-4DSect-Prov FE | No | No | No | Yes | No | No | No | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | No | No | No | No |
| Adjusted R$^2$ | 0.012 | 0.69 | 0.69 | 0.70 | 0.016 | 0.64 | 0.64 | 0.64 |
| # Observations | 116,536 | 116,536 | 116,536 | 116,536 | 23,801 | 23,801 | 23,801 | 23,801 |
| # Fixed Effects | 10 | 18,034 | 19,931 | 25,156 | 10 | 3,478 | 4,903 | 7,328 |
| # Firms | 18,024 | 18,024 | 18,024 | 18,024 | 3,468 | 3,468 | 3,468 | 3,468 |

*Notes:* Table B3 shows the results of running four variants of the event-study specification (1) for one dependent variable: log total sales except those to first MNC buyer. The event is still defined as a first time sale to an MNC. Reported are the coefficients for event-time $-4$ to $+4$, where the coefficients for the year prior to the event are normalized to zero. Columns (1)-(4) correspond to the full economy-wide sample (including first-time suppliers to MNCs and never-suppliers), columns (5)-(8) correspond to the restricted economy-wide sample (including only first-time suppliers to MNCs). These regressions do not include firm-level time-varying controls, $x_{it}$. The only difference between columns (1)-(4) and between columns (5)-(8) comes from the combination of fixed effects used in each column. Columns (4) and (8) use our preferred combination of fixed effects. Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

# Online Appendix B.2 Robustness to Excluding First-time Suppliers Hiring New Managers

Table B4: Robustness of Baseline Event-Study Results for Total Sales to Excluding First-time Suppliers Hiring New Managers

| Outcome: (log) Total Sales | Baseline (1) | No ΔT1 Event (2) | No ΔT2 Event (3) | No ΔT1 Event-1 (4) | No ΔT2 Event-1 (5) | Baseline (6) | No ΔT1 Event (7) | No ΔT2 Event (8) | No ΔT1 Event-1 (9) | No ΔT2 Event-1 (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.044 | 0.032 | 0.018 | 0.060** | 0.047 | -0.022 | -0.053 | -0.023 | -0.008 | -0.009 |
| | (0.028) | (0.029) | (0.031) | (0.027) | (0.031) | (0.053) | (0.056) | (0.057) | (0.055) | (0.052) |
| *3 years before event* | 0.029 | 0.021 | 0.014 | 0.053** | 0.043* | 0.001 | -0.014 | 0.017 | 0.029 | 0.015 |
| | (0.023) | (0.025) | (0.026) | (0.025) | (0.022) | (0.041) | (0.044) | (0.041) | (0.045) | (0.043) |
| *2 years before event* | 0.026 | 0.012 | 0.014 | 0.057*** | 0.044** | 0.007 | -0.007 | 0.008 | 0.042* | 0.029 |
| | (0.018) | (0.019) | (0.019) | (0.017) | (0.017) | (0.023) | (0.022) | (0.023) | (0.023) | (0.024) |
| | | | | | | | | | | |
| *Year of event* | 0.159*** | 0.118*** | 0.123*** | 0.143*** | 0.130*** | 0.191*** | 0.158*** | 0.142*** | 0.181*** | 0.160*** |
| | (0.019) | (0.016) | (0.021) | (0.019) | (0.018) | (0.021) | (0.025) | (0.024) | (0.022) | (0.020) |
| *1 year after event* | 0.325*** | 0.278*** | 0.274*** | 0.312*** | 0.303*** | 0.377*** | 0.345*** | 0.301*** | 0.374*** | 0.356*** |
| | (0.028) | (0.023) | (0.025) | (0.027) | (0.028) | (0.035) | (0.040) | (0.042) | (0.036) | (0.035) |
| *2 years after event* | 0.351*** | 0.300*** | 0.283*** | 0.339*** | 0.325*** | 0.408*** | 0.374*** | 0.303*** | 0.411*** | 0.385*** |
| | (0.032) | (0.027) | (0.028) | (0.033) | (0.032) | (0.054) | (0.063) | (0.061) | (0.055) | (0.053) |
| *3 years after event* | 0.342*** | 0.284*** | 0.279*** | 0.331*** | 0.320*** | 0.389*** | 0.360*** | 0.281*** | 0.402*** | 0.373*** |
| | (0.035) | (0.029) | (0.031) | (0.035) | (0.033) | (0.072) | (0.086) | (0.083) | (0.075) | (0.070) |
| *4 years after event* | 0.334*** | 0.280*** | 0.272*** | 0.325*** | 0.315*** | 0.382*** | 0.362*** | 0.267** | 0.402*** | 0.371*** |
| | (0.037) | (0.034) | (0.034) | (0.037) | (0.036) | (0.089) | (0.108) | (0.100) | (0.094) | (0.087) |
| | | | | | | | | | | |
| Mean Dep. Var. (level) | 0.85 | 0.84 | 0.84 | 0.85 | 0.85 | 1.45 | 1.44 | 1.46 | 1.45 | 1.46 |
| SD Dep. Var. (level) | 2.54 | 2.47 | 2.35 | 2.50 | 2.44 | 4.50 | 4.28 | 4.01 | 4.33 | 4.20 |
| | | | | | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | Yes | Yes | No | No | No | No | No |
| | | | | | | | | | | |
| Adjusted $R^2$ | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.80 | 0.81 | 0.81 | 0.81 | 0.80 |
| # Observations | 116,683 | 114,541 | 113,172 | 115,045 | 114,381 | 23,961 | 21,793 | 20,482 | 22,305 | 21,698 |
| # Fixed Effects | 25,174 | 24,769 | 24,488 | 24,895 | 24,761 | 7,366 | 6,816 | 6,507 | 6,948 | 6,832 |
| # Firms | 18,035 | 17,681 | 17,443 | 17,807 | 17,699 | 3,482 | 3,118 | 2,902 | 3,253 | 3,154 |

*Notes:* Table B4 shows the results of running the event-study specification (1) for one dependent variable: log total sales. The event is still defined as a first time sale to an MNC. Reported are the coefficients for event-time −4 to +4, where the coefficients for the year prior to the event are normalized to zero. Columns (1)-(5) correspond to the full economy-wide sample (including first-time suppliers to MNCs and never-suppliers), columns (6)-(10) correspond to the restricted economy-wide sample (including only first-time suppliers to MNCs). Columns (1) and (6) report our baseline results from Columns (1) and (5) in Table 1. Columns (2)-(5) differ from Column (1) (columns (7)-(10) differ from Column (6)) in their excluding first-time suppliers who have hired new managers either in the event year ("Event") or in the year prior to the event ("Event-1"). In this exercise, we identify managers as the top earners that year. In columns (2), (4), (7), and (9) we only drop first-time suppliers that hire a new worker that becomes the top earner in the firm (presumably the top manager or "T1"), whereas in columns (3), (5), (8), and (10) we also drop first-time suppliers that hire a new worker that becomes the top two earner in the firm (presumably the top two manager or "T2"). Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

# Online Appendix B.3 Robustness to Balancing the Sample in Event Time

In Table B5, we replicate the main economy-wide event-study analysis on a version of the restricted sample balanced in event time from *-1* to *+1*. This new sample allow us to rule out compositional confounds around the event year. However, it also carries the obvious drawbacks of omitting young firms and of imposing survival after the event. Adding this requirement of balancing delivers qualitatively similar results.

Table B5: Robustness of Baseline Event-Study Results to Using a Balanced Sample in Event Time

| | CD K,L,M (1) | TL K,L,M (2) | CD Index (3) | Y (4) | L (5) | K (6) | VA (7) | Sales to Others (8) | Total Trans (9) | Trans w/ Others (10) | Number Buyers (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.01 | 0.03 | -0.01 | 0.05 | 0.00 | -0.08 | -0.02 | -0.01 | 0.04 | 0.03 | 0.02 |
| | (0.03) | (0.03) | (0.04) | (0.07) | (0.06) | (0.10) | (0.08) | (0.10) | (0.11) | (0.18) | (0.05) |
| *3 years before event* | 0.01 | 0.03 | -0.01 | 0.05 | 0.01 | -0.05 | -0.02 | -0.02 | 0.04 | 0.03 | 0.03 |
| | (0.02) | (0.02) | (0.02) | (0.05) | (0.04) | (0.07) | (0.06) | (0.07) | (0.06) | (0.12) | (0.04) |
| *2 years before event* | 0.02 | 0.01 | -0.00 | 0.03 | 0.01 | -0.00 | 0.00 | -0.03 | 0.04 | 0.06 | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.03) | (0.03) | (0.04) | (0.04) | (0.04) | (0.04) | (0.07) | (0.02) |
| *Year of event* | 0.05*** | 0.03*** | 0.04** | 0.29*** | 0.24*** | 0.20*** | 0.21*** | 0.05 | 0.38*** | -0.42*** | 0.08*** |
| | (0.01) | (0.01) | (0.02) | (0.03) | (0.02) | (0.04) | (0.03) | (0.05) | (0.04) | (0.14) | (0.03) |
| *1 year after event* | 0.07*** | 0.04** | 0.07*** | 0.30*** | 0.24*** | 0.21*** | 0.22*** | 0.14* | 0.40*** | 0.18 | 0.19*** |
| | (0.02) | (0.02) | (0.02) | (0.05) | (0.04) | (0.06) | (0.04) | (0.08) | (0.07) | (0.14) | (0.04) |
| *2 years after event* | 0.07** | 0.04* | 0.08*** | 0.29*** | 0.23*** | 0.28*** | 0.24*** | 0.18* | 0.39*** | 0.31* | 0.22*** |
| | (0.03) | (0.02) | (0.03) | (0.07) | (0.05) | (0.07) | (0.06) | (0.10) | (0.10) | (0.18) | (0.05) |
| *3 years after event* | 0.08** | 0.04 | 0.10** | 0.24*** | 0.21*** | 0.30*** | 0.25*** | 0.16 | 0.39*** | 0.45** | 0.21*** |
| | (0.04) | (0.03) | (0.04) | (0.09) | (0.07) | (0.10) | (0.08) | (0.12) | (0.12) | (0.23) | (0.06) |
| *4 years after event* | 0.07 | 0.03 | 0.09* | 0.22** | 0.16* | 0.31** | 0.23** | 0.18 | 0.36** | 0.41 | 0.20** |
| | (0.05) | (0.04) | (0.05) | (0.11) | (0.09) | (0.12) | (0.09) | (0.14) | (0.15) | (0.28) | (0.08) |
| Mean Dep. Var. (level) | 2.20 | 2.20 | 0.86 | 1.64 | 21.7 | 1.07 | 0.25 | 1.61 | 0.62 | 0.60 | 17.3 |
| SD Dep. Var. (level) | 5.99 | 5.99 | 0.49 | 4.84 | 50.4 | 3.27 | 0.66 | 4.85 | 1.92 | 1.93 | 50.8 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | No | No | No | No | No | No | No | No | No | No | No |
| Balanced Only | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.97 | 0.98 | 0.75 | 0.81 | 0.80 | 0.82 | 0.74 | 0.67 | 0.75 | 0.57 | 0.84 |
| # Observations | 10,295 | 10,295 | 10,295 | 17,203 | 17,203 | 17,203 | 17,203 | 17,203 | 17,203 | 17,203 | 17,203 |
| # Fixed Effects | 3,655 | 3,655 | 3,655 | 5,437 | 5,437 | 5,437 | 5,437 | 5,437 | 5,437 | 5,437 | 5,437 |
| # Firms | 1,416 | 1,416 | 1,416 | 2,145 | 2,145 | 2,145 | 2,145 | 2,145 | 2,145 | 2,145 | 2,145 |

*Notes:* Table B5 shows the results of running the event-study specification (1) adapted to eleven dependent variables. All columns correspond to a balanced version of the restricted economy-wide sample (including only first-time suppliers to MNCs), where the imposed balancing is between event years *-1* and *+1*. The event is still defined as a first time sale to an MNC. Reported are the coefficients for event-time −4 to +4, where the coefficients for the year prior to the event are normalized to zero. Except for employment and the number of buyers, means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

## Online Appendix B.4    Robustness to the Definition of the Event Year

One pattern that is potentially puzzling is the onset of treatment effects from event year *0*. While increases in firm size might to some degree be mechanical (if firms do not shed domestic buyers when becoming suppliers to an MNC), increases in performance may be expected with delay. To shed light on this pattern, one would ideally observe both the moment when the domestic firm starts its collaboration with its first MNC buyer and the moment when the first payment is made. Unfortunately, in the firm-to-firm transaction dataset, we cannot observe the starting date for the collaboration. What this dataset can offer is the *year of the first transaction* of a domestic firm with an MNC, which we label as event year *0*. This dataset also does not record when during a year transactions occur, only the cumulative value transacted in a year between two firms.

To make progress, we use the data from Procomer described in Online Appendix F.2. We first find that in the full sample of 1,985 deals mediated by Procomer between 2001 and 2016, the dates when deals are agreed upon are evenly distributed across months. While the dates recorded by Procomer as the dates of the agreement are not necessarily those when the transaction is made, we assume there is no reason for transactions to be more concentrated in certain months of the year. Second, from the email archive shared with us, we found that around 65% of deals go from first contact to agreeing on the deal in the same calendar year. Another 27% of deals have the date of the first contact and the sealing of the deal one calendar year apart. In our surveys to domestic firms we asked a slightly different question: "How quickly did your firm find a first MNC buyer after deciding that it wanted to have such buyers?" 55% of firms responded that it took less than a year, 9% between one and two years, and 8.5% over two years (see Online Appendix G). Jointly, these findings suggest that most transactions are likely to occur within a year of the first contact.

Given the information available in firm-to-firm transaction data, one cannot disentangle the following two scenarios (or combinations thereof). In one scenario, effects in event year *0* reflect adjustment and learning in the new role as a supplier to an MNC. These processes may be onset as soon as the collaboration starts, most likely in the preceding months to the transaction. In the other scenario, the smaller year *0* effects are simply "partial year effects" (Bernard, Boler, Massari, Reyes, and Taglioni, 2017). If the lag between the first contact and the first transaction is short, this would suggest fast learning in the new role of supplier to MNCs. As we cannot distinguish between these scenarios, we recommend caution on the interpretation of year *0* effects. That said, a potentially-imprecise measure of the exact year *0* does not affect the causal interpretation of our results or their general pattern of growth.

As a robustness check, instead of defining the event year as the first year when we observe domestic firm *i* having a transaction with an MNC buyer, we define it as the year *prior* to that of the first transaction. With this definition of the event year, we are focusing on what is likely to be the year of the first contact with an MNC (for contacts that materialize in a transaction a year later). Table B6 shows that, with this new definition of the event year, results are almost mechanically delayed by a year, with the first gains in TFP manifesting themselves a

year after the presumable first contact. While our preferred definition of the event year is the year when they first transact with an MNC, we are reassured that results are only changed in their timing as we shift the event year one year backwards.

Table B6: Robustness of Baseline Event-Study Results to Different Definition of Event Year

|  | Prod Index (1) | CD K,L,M (2) | TL K,L,M (3) | Prod Index (4) | CD K,L,M (5) | TL K,L,M (6) |
|---|---|---|---|---|---|---|
| *4 years before "event"* | -0.008 | 0.001 | -0.002 | -0.064** | -0.057* | -0.051* |
|  | (0.019) | (0.017) | (0.014) | (0.029) | (0.030) | (0.025) |
| *3 years before "event"* | 0.019 | 0.001 | 0.007 | -0.023 | -0.039* | -0.025 |
|  | (0.024) | (0.017) | (0.016) | (0.023) | (0.021) | (0.016) |
| *2 years before "event"* | 0.019 | 0.005 | 0.011 | -0.012 | -0.025 | -0.009 |
|  | (0.013) | (0.012) | (0.010) | (0.014) | (0.015) | (0.012) |
| *Year of "event"* | -0.006 | -0.015 | -0.008 | 0.013 | -0.001 | 0.007 |
|  | (0.011) | (0.010) | (0.009) | (0.011) | (0.012) | (0.010) |
| *1 year after "event"* | 0.030** | 0.043*** | 0.036*** | 0.060*** | 0.062*** | 0.062*** |
|  | (0.014) | (0.012) | (0.010) | (0.020) | (0.022) | (0.014) |
| *2 years after "event"* | 0.053*** | 0.067*** | 0.049*** | 0.103*** | 0.099*** | 0.088*** |
|  | (0.014) | (0.014) | (0.012) | (0.021) | (0.025) | (0.016) |
| *3 years after "event"* | 0.053*** | 0.073*** | 0.060*** | 0.125*** | 0.118*** | 0.112*** |
|  | (0.016) | (0.014) | (0.013) | (0.024) | (0.028) | (0.020) |
| *4 years after "event"* | 0.055** | 0.073*** | 0.057*** | 0.148*** | 0.140*** | 0.130*** |
|  | (0.022) | (0.017) | (0.016) | (0.031) | (0.034) | (0.025) |
| Mean Dep. Var. (level) | 0.93 | 559.5 | 559.5 | 0.86 | 1100.8 | 1100.8 |
| SD Dep. Var. (level) | 0.56 | 1584.7 | 1584.7 | 0.49 | 2994.4 | 2994.4 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | No | No | No |
| Adjusted $R^2$ | 0.72 | 0.95 | 0.97 | 0.75 | 0.97 | 0.98 |
| # Observations | 64,419 | 64,419 | 64,419 | 10,295 | 10,295 | 10,295 |
| # Fixed Effects | 15,464 | 15,464 | 15,464 | 3,655 | 3,655 | 3,655 |
| # Firms | 10,492 | 10,492 | 10,492 | 1,416 | 1,416 | 1,416 |

*Notes:* Table B6 shows the results of running specification (1) adapted to the same three measures of TFP defined for Table 4. There is only one difference with respect to specification (1): in this table, instead of defining the event year as the first year when we observe domestic firm *i* having a transaction with an MNC buyer, we define the event year as the year *prior* to that of the first transaction. With this definition of the event year, we are focusing on what may be the year of the first contact with an MNC (for contacts that materialize in a transaction a year later). Results for *4 years before "event"* are particularly noisy as they use data only for firms we observe four years before their first year transacting with an MNC. Columns (1)-(3) report event study estimates for the sample including both domestic firms that become first-time suppliers to an MNC after 2010 and domestic firms never observed as supplying to an MNC during our entire firm-to-firm transaction data. Clustering of standard errors is at the two-digit sector by province level. Columns (4)-(6) focus only on the sample of domestic firms becoming first-time suppliers to an MNC after 2010 and use standard error clustering at event by province level. Means (in levels) are reported in millions of U.S. dollars (CPI-deflated to 2013 dollars). Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

# Online Appendix B.5 No Evidence of Changes in Third-Party Reporting

Table B7: Similar Compliance in Third Party Reporting After Supplying to an MNC

|  | Seller-Diff (1) | Buyer-Diff (2) | Mis-Seller (3) | Seller-Diff (4) | Buyer-Diff (5) | Mis-Seller (6) |
|---|---|---|---|---|---|---|
| *4 years before event* | 0.002 | 0.003 | 0.002 | 0.012 | 0.008 | -0.002 |
|  | (0.006) | (0.008) | (0.003) | (0.017) | (0.013) | (0.005) |
| *3 years before event* | 0.002 | 0.001 | 0.001 | 0.010 | 0.007 | -0.004 |
|  | (0.007) | (0.007) | (0.002) | (0.013) | (0.010) | (0.004) |
| *2 years before event* | -0.002 | -0.004 | -0.002 | 0.005 | -0.003 | -0.000 |
|  | (0.004) | (0.005) | (0.003) | (0.009) | (0.007) | (0.003) |
| *Year of event* | 0.000 | 0.001 | 0.000 | -0.003 | -0.003 | 0.002 |
|  | (0.005) | (0.005) | (0.002) | (0.007) | (0.006) | (0.002) |
| *1 year after event* | 0.007* | 0.006 | -0.001 | -0.002 | -0.004 | 0.005 |
|  | (0.004) | (0.007) | (0.002) | (0.011) | (0.010) | (0.004) |
| *2 years after event* | 0.008* | 0.005 | -0.001 | -0.006 | -0.010 | 0.006 |
|  | (0.005) | (0.006) | (0.002) | (0.015) | (0.015) | (0.006) |
| *3 years after event* | 0.004 | 0.000 | -0.002 | -0.015 | -0.018 | 0.006 |
|  | (0.005) | (0.006) | (0.002) | (0.020) | (0.018) | (0.007) |
| *4 years after event* | 0.014** | 0.009 | -0.003 | -0.012 | -0.014 | 0.008 |
|  | (0.006) | (0.006) | (0.003) | (0.024) | (0.023) | (0.009) |
| Mean Dep. Var. (level) | 0.038 | 0.048 | 0.012 | 0.074 | 0.061 | 0.013 |
| SD Dep. Var. (level) | 0.15 | 0.15 | 0.073 | 0.20 | 0.17 | 0.058 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | No | No | No |
| Adjusted $R^2$ | 0.19 | 0.12 | 0.15 | 0.15 | 0.10 | 0.045 |
| # Observations | 109,438 | 109,438 | 109,438 | 23,677 | 23,677 | 23,677 |
| # Fixed Effects | 24,115 | 24,115 | 24,115 | 7,323 | 7,323 | 7,323 |
| # Firms | 17,129 | 17,129 | 17,129 | 3,472 | 3,472 | 3,472 |

*Notes:* Table B7 shows the results of running specification (1) adapted to three measures of quality in third-party reporting. For this exercise, we use the raw version of D-151, as opposed to the clean version used in the main analysis (see Online Appendix F.1.2). "Seller-diff" is a weighted average of the percentage difference in values reported, across all transactions in a year for which a firm is the seller. The percentage difference is computed as the (maximum value reported-minimum value reported)/(minimum value reported). "Seller-diff" uses as weights the importance of the transaction in that year for the seller. "Buyer-diff" is analogously constructed, this time keeping only transactions for which a firm is the buyer. "Mis-Seller" is defined as (the total number of buyers that reported a given firm as a seller and that are not reported back by the seller)/(the total number of buyers of the seller that are reported by either side). The event is defined as a first time sale to an MNC. Columns (1)-(3) report event study estimates for the sample including both domestic firms that become first-time suppliers to an MNC after 2010 and domestic firms never observed as supplying to an MNC during our entire firm-to-firm transaction data. Clustering of standard errors is at the two-digit sector by province level. Columns (4)-(6) focus only on the sample of domestic firms becoming first-time suppliers to an MNC between 2010 and 2015 and use standard error clustering at event by province level. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

In addition to the discussion in Section 4.2.3 (based on the results in Table B7), note that we find marked increases in measures of firm performance that either do not have a direct link to firms' tax liability or imply an opposite behavior to that predicted by a mere reduction in tax-evasive behaviors (see Section 4.1). For instance, had costs been artificially high prior to a first deal with an MNC, a higher scrutiny on firms dealing with MNCs would imply a lowering of their previously-inflated costs. The marked boost in input costs (see columns (4) and (8) of Table 1) suggests a legitimate expansion in operations. Moreover, persistent boosts in proxies of TFP (e.g., sales/worker, OLS production function estimation) are implausible behavioral responses to what may be a heightened scrutiny on one's tax compliance. It is therefore unlikely that tax compliance effects can reproduce our baseline results.

# Online Appendix C   Additional Model Derivations

In this section we present the derivations of the main results of the model. In the environment introduced in Section 5, we have that (i) $Q = Bp^{-\sigma}$ (demand equation) and (ii) $p = c_0 Q^{\frac{1}{\gamma}-1}\phi^{\frac{-1}{\gamma}}$ (price equal constant mark-up times marginal cost), where $Q = \sum_i q_i$ and $B \equiv \sum_i n_i b_i$.

## Online Appendix C.1   Derivation of Equation (3)

Combining (i) and (ii) from above we have that $Q = B\left(c_0 Q^{\frac{1}{\gamma}-1}\phi^{\frac{-1}{\gamma}}\right)^{-\sigma}$, which implies:

$$Q = \left(c_0^{-\sigma\gamma}B^\gamma\phi^\sigma\right)^{\frac{1}{\gamma+\sigma-\sigma\gamma}}. \tag{C1}$$

$$\Rightarrow pQ = c_0 Q^{\frac{1}{\gamma}-1}\phi^{\frac{-1}{\gamma}}\left(Bc_0^{-\sigma\gamma}\phi^\sigma\right)^{\frac{1}{\gamma+\sigma-\sigma\gamma}}$$

$$= c_1 B^{\frac{1}{\gamma+\sigma-\sigma\gamma}}\phi^{\frac{\sigma-1}{\gamma+\sigma-\sigma\gamma}}, \tag{C2}$$

where $c_1 = c_0^{\frac{\gamma+\sigma-2\sigma\gamma}{\gamma+\sigma-\sigma\gamma}}$. Equation (C2) is useful because it allows us to write $B$ (which is not observable) as a function of total sales (which we observe), the constant $c_1$, and $\phi$ (the most relevant variable in our context). Let us invert equation (C2) as follows (the usefulness of this will become clear soon):

$$B^{\frac{1}{\gamma+\sigma-\sigma\gamma}} = c_1^{-1}(pQ)\phi^{-\frac{(\sigma-1)}{\gamma+\sigma-\sigma\gamma}}. \tag{C3}$$

Define the quantity sold to others as $\widetilde{Q} = \sum_{i\neq MNC_0} q_i = \tilde{B}p^{-\sigma}$. We can write total sales to others as:

$$p\tilde{Q} = p\tilde{B}p^{-\sigma} = \tilde{B}\left(c_0 Q^{\frac{1}{\gamma}-1}\phi^{\frac{-1}{\gamma}}\right)^{1-\sigma} = \tilde{B}c_0^{1-\sigma}\phi^{\frac{\sigma-1}{\gamma}}Q^{\frac{(\gamma-1)(\sigma-1)}{\gamma}}$$

$$= \tilde{B}c_0^{1-\sigma}\phi^{\frac{\sigma-1}{\gamma}}\left(c_0^{-\frac{\sigma\gamma}{\gamma+\sigma-\sigma\gamma}}B^{\frac{\gamma}{\gamma+\sigma-\sigma\gamma}}\phi^{\frac{\sigma}{\gamma+\sigma-\sigma\gamma}}\right)^{\frac{(\gamma-1)(\sigma-1)}{\gamma}}$$

$$= c_2 \tilde{B} \phi^{\frac{\sigma-1}{\gamma+\sigma-\sigma\gamma}} \left[ B^{\frac{1}{\gamma+\sigma-\sigma\gamma}} \right]^{(\gamma-1)(\sigma-1)}, \tag{C4}$$

where we use equation (C1) to go from the second to the third line and $c_2 = c_0^{\frac{\gamma(1-\sigma)}{\gamma+\sigma-\sigma\gamma}}$.

When $\gamma \neq 1$ (the supplier does not have constant returns to scale), the equilibrium sales to others depend not only on the demand shifter of those other buyers ($\tilde{B}$), but also on the aggregate demand shifter ($B$) that includes the first MNC buyer, $MNC_0$. This happens because the demand from $MNC_0$ may affect the scale of the firm and thus its price, even if $\tilde{B}$ and $\phi$ remain constant. When $\gamma = 1$, equation (C4) collapses to an analogous of equation (C2). We now make use of equation (C3). Substituting equation (C3) into (C4) gives us:

$$\begin{aligned} p\tilde{Q} &= c_2 \tilde{B} \phi^{\frac{\sigma-1}{\gamma+\sigma-\sigma\gamma}} \left[ c_1^{-1} (pQ) \phi^{-\frac{(\sigma-1)}{\gamma+\sigma-\sigma\gamma}} \right]^{(\gamma-1)(\sigma-1)} \\ &= c_2 c_1^{-(\gamma-1)(\sigma-1)} \tilde{B} \phi^{\sigma-1} (pQ)^{(\gamma-1)(\sigma-1)}. \end{aligned}$$

Defining $\delta \equiv \delta(\gamma, \sigma) = (\gamma - 1)(\sigma - 1)$ and substituting in the previous equation we find:

$$p\tilde{Q} = c_3 \tilde{B} \phi^{(\sigma-1)} (pQ)^\delta, \tag{C5}$$

where $c_3 = c_2 c_1^{-(\gamma-1)(\sigma-1)}$. Using $1 - \frac{1}{\gamma} < \frac{1}{\sigma}$ from the second order condition for profit maximization we get $0 < \gamma + \sigma - \sigma\gamma = -(\gamma-1)(\sigma-1) + 1 = -\delta + 1$, and conclude that $\delta < 1$. Since $\gamma > 0$ then $\gamma - 1 > -1$. Finally, $\delta > -(\sigma - 1)$. Thus $\delta \in (1 - \sigma, 1)$. Taking logs of both sides of equation (C5) and defining $\kappa' = \ln(c_3)$ we arrive to equation (3) in the paper.

## Online Appendix C.2   Derivation of Result 1

We start from the equilibrium relation in equation (3) and take the total derivative of both sides of the equation. We then rearrange terms such that the left-hand side depends only on variables that are observable in firm-to-firm transaction data and $\delta$. Last, we take expectations over all domestic firms that experience an event and find:

$$\begin{aligned} \mathbb{E}\left[ \text{dln}(p\tilde{Q}) \right] - \delta \mathbb{E}\left[ \text{dln}(pQ) \right] &= \mathbb{E}\left[ \text{dln}(\tilde{B}) \right] + (\sigma-1)\varepsilon_\phi \\ \Rightarrow \mathbb{E}\left[ \text{dln}\left( \frac{p\tilde{Q}}{(pQ)^\delta} \right) \right] &= \mathbb{E}\left[ \text{dln}(\tilde{B}) \right] + (\sigma-1)\varepsilon_\phi, \end{aligned} \tag{C6}$$

where $\varepsilon_\phi = \mathbb{E}\left[ \text{dln}(\phi) \right]$.

Let us focus on the term $\mathbb{E}\left[ \text{dln}(\tilde{B}) \right]$. Recall that $\tilde{B}$ depends on $n_i(\phi, r), \forall i \neq MNC_0$.

A change in firm TFP ($\phi$) or reputation ($r$) triggered by the event induces a new demand shock (a change in $\tilde{B}$) coming from an increase in the probability to sell to new buyers. The total derivative of $\ln(\tilde{B})$ can thus be split into a part that accounts for changes in probabilities

$(n_i)$ for a constant demand shifter $(b_i)$ and one that accounts for changes in $b_i$ for a constant $n_i$.

$$
\begin{aligned}
\mathbb{E}\left[\mathrm{dln}(\widetilde{B})\right] =&\mathbb{E}\left[\frac{1}{\widetilde{B}}\mathrm{d}\widetilde{B}\right] = \mathbb{E}\left[\frac{1}{\widetilde{B}}\sum_{i\neq MNC_0}^{N} b_i\mathrm{d}(n_i) + n_i\mathrm{d}(b_i)\right] = \mathbb{E}\left[\frac{1}{\widetilde{B}}\sum_{i\neq MNC_0}^{N} n_ib_i\mathrm{dln}(n_i) + n_ib_i\mathrm{dln}(b_i)\right]\\
=&\mathbb{E}\left[\sum_{i\neq MNC_0}^{N} \mathrm{dln}(n_i)\frac{n_ib_i}{\sum_{k\neq MNC_0}^{N} n_kb_k} + \mathrm{dln}(b_i)\frac{n_ib_i}{\sum_{k\neq MNC_0}^{N} n_kb_k}\right]\\
=&\mathbb{E}\left[\sum_{i\neq MNC_0}^{N} \mathrm{dln}(n_i)\frac{n_ib_i}{\sum_{k\neq MNC_0}^{N} n_kb_k}\right] + \mathbb{E}\left[\sum_{i\neq MNC_0}^{N} \mathrm{dln}(b_i)\frac{n_ib_i}{\sum_{k\neq MNC_0}^{N} n_kb_k}\right]\\
=&\varepsilon_{\widetilde{n}} + \varepsilon_{\widetilde{b}},
\end{aligned}
\tag{C7}
$$

where $\varepsilon_{\widetilde{n}}$ and $\varepsilon_{\widetilde{b}}$ are expectations of weighted averages of $\mathrm{dln}(n_i)$ and $\mathrm{dln}(b_i)$, respectively, $\forall i \neq MNC_0$. The weights are equal to $\frac{n_ib_i}{\sum_{k\neq MNC_0}^{N} n_kb_k}$. Note that these weights sum up to one.

We assume that the demand shifters $(b_i = y_i/P_i^{1-\sigma})$ of other buyers do not change systematically as a consequence of the event. This assumption (which implies $\varepsilon_{\widetilde{b}} = 0$) in combination with our result in equation (C7) allow us to simplify equation (C6) to:

$$
\mathbb{E}\left[\mathrm{dln}\left(\frac{p\widetilde{Q}}{(pQ)^\delta}\right)\right] = (\sigma - 1)\varepsilon_\phi + \varepsilon_{\widetilde{n}}.
\tag{C8}
$$

Note that through the lens of our model, the left-hand side of equation (C8) informs us about changes in either $\phi$ or $n_i$ (owed to changes in either $\phi$, $r$, or both). Equation (C8) is the same as equation (4) in the paper. The interpretation of this equation leads to Result 1.

## Online Appendix C.3   Derivation of Result 2

To estimate the change in TFP alone $(\varepsilon_\phi)$, we rely on two additional assumptions: (a-i) there is a large number of potential buyers in the country and (a-ii) for any changes in $\phi$ and/or $r$, all buyers $i$ equally adjust their probability to source from the supplier, i.e., $\mathrm{dln}(n_i) = \mathrm{dln}(n)$, $\forall i \neq MNC_0$. We discuss assumption (a-ii) in detail in Online Appendix D.5.

Under assumption (a-i), the total number of other buyers of the supplier $(\widetilde{N})$ is given by the sum of the probabilities of buying from the supplier: $\widetilde{N} = \sum_{i\neq MNC_0}^{N} n_i$. This allows us to exploit the change in the number of buyers after the event. Assumption (a-ii) in combination with our definition of $\varepsilon_{\widetilde{n}}$ (see equation (C7)) implies that $\varepsilon_{\widetilde{n}} = \mathbb{E}\left[\mathrm{dln}(n)\right]$.

We can then write the expected derivative of the log number of other buyers as:

$$
\mathbb{E}\left[\mathrm{dln}(\widetilde{N})\right] =\mathbb{E}\left[\frac{1}{\widetilde{N}}\mathrm{d}\widetilde{N}\right] = \mathbb{E}\left[\frac{1}{\widetilde{N}}\sum_{i\neq MNC_0}^{N} \mathrm{d}(n_i)\right] = \mathbb{E}\left[\sum_{i\neq MNC_0}^{N} \frac{\mathrm{d}(n_i)}{n_i}\frac{n_i}{\widetilde{N}}\right]
$$

$$= \mathbb{E}\left[\sum_{i \neq MNC_0}^{N} \text{dln}(n_i)\frac{n_i}{\sum_{k \neq MNC_0}^{N} n_k}\right] = \mathbb{E}\left[\text{dln}(n)\sum_{i \neq MNC_0}^{N}\frac{n_i}{\sum_{k \neq MNC_0}^{N} n_k}\right]$$

$$= \mathbb{E}\left[\text{dln}(n)\right] = \varepsilon_{\widetilde{n}}.$$

We can then write equation (C8) as:

$$\mathbb{E}\left[\text{dln}\left(\frac{p\widetilde{Q}}{(pQ)^\delta}\right)\right] = (\sigma - 1)\varepsilon_\phi + \mathbb{E}\left[\text{dln}(\widetilde{N})\right]$$

$$\Rightarrow \mathbb{E}\left[\text{dln}\left(\frac{p\widetilde{Q}/(pQ)^\delta}{\widetilde{N}}\right)\right] = (\sigma - 1)\varepsilon_\phi, \tag{C9}$$

where we refer to the left-hand side of the equation as the *average adjusted sales to others*. Finally, dividing both sides of this equation by $(\sigma - 1)$ leads to Result 2.

# Online Appendix D  Additional Model-Relevant Evidence

## Online Appendix D.1  Motivating the Use of Public Demand Shocks

MNC buyers may differ from domestic buyers not only in their potential for knowledge transfers (that may help improve the efficiency, quality, or product mix of suppliers), but also in features of their contracts that are themselves attractive to domestic suppliers. According to our survey answers (see Question 2 in Online Appendix G.3), reliable payment, the potential for future scaling of the collaboration, transparent decision-making are attractive features of supplying to MNC. An indirect way to check whether these features are the main drivers of our results is to study the effects of other types of demand shocks that share these relevant features with demand shocks from MNCs. For this reason, we study the effects of starting to procure the government on the performance of domestic firms.

Government procurement accounted for approximately 15% of the 2014 Costa Rican GDP (excluding oil revenues) (OECD, 2015). Typically, over 90% of government purchases are carried out by five autonomous institutions: the Costa Rican Electricity Institute (*Instituto Costarricense de Electricidad*), the National Road Council, the Costa Rican Department of Social Security (*Caja Costarricense de Seguro Social*), the Costa Rican Oil Refinery (*Refinadora Costarricense de Petróleo*) and the National Bank of Costa Rica (OECD, 2015). Hence, government purchases share with MNC purchases features of reliability and scale.[i] Once a firm is already pre-registered and pre–qualified, future contracts with the government are also more likely to occur. Surprisingly, when we go to the data and study the features of first-time sales to the government, we find to be very similar to those of first-time sales to an MNC. The average

---

[i]The same argument is made in Ferraz, Finan, and Szerman (2016): the government is a more reliable payer than most private parties. This reliability gives vendors security that the terms of the contract will be respected, which encourages them to make the investments necessary to fulfill the contract.

(median) first transaction with the government is of 59,8K U.S. dollars (17.7K), whereas the average (median) first transaction with an MNC is of 56,7K U.S. dollars (11.9K). The lengths of these relationships are also very similar.

Table D1: TFP Estimation After Starting to Supply to the Government

|  | Prod Index (1) | CD K,L,M (2) | TL K,L,M (3) | Prod Index (4) | CD K,L,M (5) | TL K,L,M (6) |
|---|---|---|---|---|---|---|
| 4 years before event | -0.011 | 0.002 | -0.016 | -0.084* | -0.061* | -0.063* |
|  | (0.024) | (0.020) | (0.019) | (0.049) | (0.035) | (0.032) |
| 3 years before event | 0.012 | 0.022 | 0.013 | -0.018 | -0.018 | -0.023 |
|  | (0.022) | (0.016) | (0.014) | (0.038) | (0.023) | (0.025) |
| 2 years before event | 0.004 | 0.030*** | 0.012 | -0.019 | -0.007 | -0.012 |
|  | (0.013) | (0.010) | (0.009) | (0.024) | (0.015) | (0.015) |
|  |  |  |  |  |  |  |
| Year of event | -0.020 | 0.024** | 0.013 | -0.002 | -0.001 | 0.009 |
|  | (0.013) | (0.012) | (0.009) | (0.024) | (0.012) | (0.012) |
| 1 year after event | -0.021 | 0.028** | 0.021** | 0.017 | 0.006 | 0.027 |
|  | (0.015) | (0.013) | (0.009) | (0.042) | (0.019) | (0.018) |
| 2 years after event | -0.018 | 0.026** | 0.015 | 0.038 | 0.021 | 0.045* |
|  | (0.017) | (0.013) | (0.011) | (0.049) | (0.026) | (0.024) |
| 3 years after event | -0.026 | 0.011 | 0.002 | 0.045 | 0.018 | 0.043 |
|  | (0.018) | (0.012) | (0.010) | (0.059) | (0.031) | (0.029) |
| 4 years after event | -0.017 | 0.007 | 0.012 | 0.065 | 0.015 | 0.065 |
|  | (0.022) | (0.018) | (0.014) | (0.076) | (0.037) | (0.041) |
|  |  |  |  |  |  |  |
| Mean Dep. Var. (level) | 0.92 | 1.66 | 1.66 | 0.86 | 4.26 | 4.26 |
| SD Dep. Var. (level) | 0.56 | 6.47 | 6.47 | 0.52 | 17.7 | 17.7 |
|  |  |  |  |  |  |  |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | Yes | Yes | No | No | No |
|  |  |  |  |  |  |  |
| Adjusted $R^2$ | 0.70 | 0.96 | 0.97 | 0.62 | 0.97 | 0.98 |
| # Observations | 86,232 | 86,232 | 86,232 | 7,122 | 7,122 | 7,122 |
| # Fixed Effects | 19,377 | 19,377 | 19,377 | 2,353 | 2,353 | 2,353 |
| # Firms | 13,304 | 13,304 | 13,304 | 895 | 895 | 895 |

*Notes:* Table D1 shows the results of running specification of equation (1) adapted to the same three measures of TFP defined for Table 4. The event is defined as a first time sale to the government. Columns (1)-(4) report event study estimates for the sample including both domestic firms that become first-time suppliers to the government after 2010 and domestic firms never observed as supplying to the government during our entire firm-to-firm transaction data. Clustering of standard errors is at the two-digit sector by province level. Columns (5)-(8) focus only on the sample of domestic firms becoming first-time suppliers to an MNC after 2010 and use standard error clustering at event by province level. Means (in levels) of sales (residualized in columns (1) and (4)) are reported in millions of U.S. dollars (CPI-deflated to 2013 U.S. dollars). Clustered standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

In terms of process, government entities generally acquire their goods and services through public tenders, which are advertised in the official legal bulletin, *La Gaceta*, and other major newspapers. In 2010, the Costa Rican government created an electronic platform for

public procurement called Mer-Link.[ii] Mer-Link allows for a transparent search of both open and closed public tenders, with a detailed description of the product or service procured. All firms are evaluated in their ability to fulfill a given contract, with the details of the evaluation available for public consultation. This evaluation process has similar learning benefits to the evaluations carried out by Procomer in its "Productive Linkages" program and to audits carried out independently by MNCs prior to contracting a new supplier.

We propose here a new event-study, with the event defined as a first sale to the government. As before, data constraints require such a sale to occur between 2010 and 2015. To avoid overlapping treatments, we only preserve domestic firms that never supply to an MNC. We continue to use the event-study design described in Section 3, altered only in the event of interest. We repeat for the restricted set of first-time suppliers to the government all regressions conducted for the restricted sample of first-time suppliers to an MNC. Those exercises using the full sample of first-time suppliers and never-suppliers to an MNC are replicated with the full sample of first-time suppliers and never-suppliers to the government.

Table D1 is analogous to Table 4, with the event and samples adapted to the current exercise. The new table exhibits significantly smaller and shorter-lived improvements in measures of TFP, which are not robust across samples and definitions of the dependent variable. These event-study findings motivate our exclusion restriction in the IV exercise described in Section 5.3, useful to estimate $\delta$. See Section 5.2 for more details.

## Online Appendix D.2  Instrumental Variable Strategy to Estimate $\delta$

Table D2: Instrumental Variable Strategy for Estimation of $\delta$

|  | (1) $\delta$ / (SE) | (2) First-Stage F | (3) # Observations |
|---|---|---|---|
| Full Sample | -0.217* | 49.52 | 78,603 |
|  | (0.126) | – | – |
| Restricted Sample | -0.080 | 109.60 | 10,483 |
|  | (0.087) | – | – |

*Notes:* Table D2 shows the results of the instrumental variable strategy described in Section 5.3. We estimate equation (5) by instrumenting the change in log total sales of supplier $i$ at time $t$ with a dummy variable indicating whether supplier $i$ is awarded a procurement contract at time $t-1$ or not. We estimate this equation over two samples that both exclude suppliers to MNCs, in order to isolate the effect of starting to sell to the government. The "Restricted Sample" focuses on firms that start supplying to the government in the period of our sample. The "Full Sample" also includes firms that never sell to the government over this period. Both regressions include firm fixed effects, as well as four-digit sector×province×year fixed effects. Robust standard errors are clustered at the two-digit sector×province level. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

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[ii]To access the Mer-Link website, see here. Mer-Link coexists with another purchasing system, called CompraRed, but Mer-Link has grown into the dominating platform.

Table D3: Robustness of the Empirical Application of Result 1 to Different Values of $\delta$

| | $\delta = -0.22$ (1) | $\delta = -0.22$ (2) | $\delta = -1.2$ (3) | $\delta = -0.9$ (4) | $\delta = -0.6$ (5) | $\delta = -0.3$ (6) | $\delta = 0$ (7) | $\delta = 0.3$ (8) | $\delta = -1.2$ (9) | $\delta = -0.9$ (10) | $\delta = -0.6$ (11) | $\delta = -0.3$ (12) | $\delta = 0$ (13) | $\delta = 0.3$ (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.004 (0.009) | -0.010 (0.025) | 0.013 (0.014) | 0.010 (0.013) | 0.007 (0.011) | 0.005 (0.010) | 0.002 (0.008) | -0.000 (0.007) | -0.015 (0.032) | -0.014 (0.029) | -0.012 (0.027) | -0.011 (0.025) | -0.009 (0.024) | -0.008 (0.023) |
| *3 years before event* | -0.003 (0.008) | -0.008 (0.016) | 0.003 (0.012) | 0.001 (0.011) | -0.001 (0.009) | -0.003 (0.008) | -0.004 (0.007) | -0.006 (0.006) | -0.008 (0.022) | -0.008 (0.020) | -0.008 (0.018) | -0.008 (0.016) | -0.008 (0.015) | -0.008 (0.014) |
| *2 years before event* | -0.003 (0.006) | -0.005 (0.008) | 0.002 (0.009) | 0.001 (0.008) | -0.001 (0.007) | -0.002 (0.006) | -0.004 (0.006) | -0.006 (0.005) | -0.004 (0.010) | -0.004 (0.009) | -0.005 (0.008) | -0.005 (0.008) | -0.006 (0.007) | -0.006 (0.007) |
| *Year of event* | -0.031*** (0.010) | -0.016 (0.013) | 0.001 (0.010) | -0.009 (0.010) | -0.019* (0.010) | -0.029*** (0.010) | -0.039*** (0.010) | -0.048*** (0.011) | 0.022 (0.016) | 0.011 (0.015) | -0.001 (0.014) | -0.013 (0.013) | -0.024* (0.012) | -0.036*** (0.012) |
| *1 year after event* | 0.038*** (0.011) | 0.058*** (0.019) | 0.101*** (0.014) | 0.082*** (0.013) | 0.062*** (0.012) | 0.043*** (0.011) | 0.024** (0.011) | 0.004 (0.010) | 0.131*** (0.024) | 0.108*** (0.022) | 0.086*** (0.021) | 0.063*** (0.019) | 0.041** (0.018) | 0.019 (0.017) |
| *2 years after event* | 0.056*** (0.010) | 0.082*** (0.024) | 0.124*** (0.015) | 0.103*** (0.013) | 0.082*** (0.011) | 0.061*** (0.010) | 0.040*** (0.009) | 0.019** (0.008) | 0.161*** (0.032) | 0.137*** (0.029) | 0.113*** (0.027) | 0.088*** (0.025) | 0.064*** (0.023) | 0.040* (0.022) |
| *3 years after event* | 0.054*** (0.010) | 0.084** (0.031) | 0.121*** (0.016) | 0.101*** (0.014) | 0.080*** (0.012) | 0.060*** (0.011) | 0.039*** (0.009) | 0.019*** (0.008) | 0.159*** (0.041) | 0.136*** (0.038) | 0.113*** (0.035) | 0.090*** (0.032) | 0.067*** (0.029) | 0.044 (0.027) |
| *4 years after event* | 0.055*** (0.011) | 0.093** (0.036) | 0.120*** (0.017) | 0.101*** (0.015) | 0.081*** (0.013) | 0.061*** (0.011) | 0.041*** (0.010) | 0.021** (0.009) | 0.167*** (0.047) | 0.144*** (0.043) | 0.122*** (0.040) | 0.099** (0.037) | 0.076** (0.034) | 0.053 (0.032) |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | No | No | No |
| # Observations | 116,536 | 23,801 | 116,536 | 116,536 | 116,536 | 116,536 | 116,536 | 116,536 | 23,801 | 23,801 | 23,801 | 23,801 | 23,801 | 23,801 |

*Notes:* Table D3 shows the results of running specification (1) with the measure of *adjusted sales to others* as the dependent variable. For this table, total sales and sales to others use total sales values from corporate income tax returns data. For sales to others, we subtract from total sales those sales made to the first MNC buyer. Each column implements Result 1 for a different value of $\delta$, as indicated above the column number. Columns (1) and (2) show our baseline findings for $\delta = -0.217$ and for the two samples (full and restricted) - this estimate of $\delta$ comes from the instrumental variable strategy described in Section 5.3 and implemented in Table D2. The rest of the columns show the robustness of our baseline findings to values of $\delta \in [-1.2, 0.3]$. For $\sigma = 6$, the corresponding values of $\gamma \in [0.76, 1.06]$. Columns (3)-(8) report event-study estimates for the full sample including both domestic firms that become first-time suppliers to an MNC and never-suppliers. Clustering of standard errors is at the two-digit sector by province level. Columns (9)-(14) focus only on the restricted sample of domestic firms that become first-time suppliers to an MNC and use standard error clustering at event by province level. ***, **, * denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

25

Table D4: Robustness of the Empirical Application of Result 1 to Different Values of $\delta$ - Transaction Data Only

| | $\delta = -0.22$ (1) | $\delta = -0.22$ (2) | $\delta = -1.2$ (3) | $\delta = -0.9$ (4) | $\delta = -0.6$ (5) | $\delta = -0.3$ (6) | $\delta = 0$ (7) | $\delta = 0.3$ (8) | $\delta = -1.2$ (9) | $\delta = -0.9$ (10) | $\delta = -0.6$ (11) | $\delta = -0.3$ (12) | $\delta = 0$ (13) | $\delta = 0.3$ (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 years before event | 0.005 | -0.029 | 0.012 | 0.010 | 0.008 | 0.005 | 0.003 | 0.001 | -0.037 | -0.035 | -0.032 | -0.030 | -0.028 | -0.025 |
| | (0.019) | (0.031) | (0.033) | (0.029) | (0.025) | (0.020) | (0.016) | (0.013) | (0.041) | (0.037) | (0.034) | (0.032) | (0.030) | (0.028) |
| 3 years before event | 0.003 | -0.021 | 0.008 | 0.006 | 0.005 | 0.003 | 0.002 | 0.001 | -0.023 | -0.023 | -0.022 | -0.021 | -0.021 | -0.020 |
| | (0.010) | (0.021) | (0.016) | (0.014) | (0.012) | (0.011) | (0.009) | (0.008) | (0.029) | (0.026) | (0.024) | (0.022) | (0.020) | (0.019) |
| 2 years before event | 0.008 | -0.005 | 0.017 | 0.014 | 0.012 | 0.009 | 0.006 | 0.004 | -0.004 | -0.004 | -0.005 | -0.005 | -0.006 | -0.006 |
| | (0.007) | (0.010) | (0.011) | (0.010) | (0.009) | (0.008) | (0.007) | (0.006) | (0.015) | (0.013) | (0.012) | (0.010) | (0.009) | (0.008) |
| Year of event | -0.136*** | -0.113*** | -0.075*** | -0.093*** | -0.112*** | -0.131*** | -0.149*** | -0.168*** | -0.048*** | -0.068*** | -0.088*** | -0.107*** | -0.127*** | -0.147*** |
| | (0.019) | (0.015) | (0.022) | (0.021) | (0.020) | (0.019) | (0.018) | (0.018) | (0.018) | (0.017) | (0.016) | (0.015) | (0.015) | (0.015) |
| 1 year after event | 0.052*** | 0.080*** | 0.140*** | 0.113*** | 0.086*** | 0.059*** | 0.032*** | 0.005 | 0.176*** | 0.146*** | 0.117*** | 0.088*** | 0.059*** | 0.030 |
| | (0.013) | (0.020) | (0.020) | (0.018) | (0.015) | (0.013) | (0.011) | (0.009) | (0.026) | (0.024) | (0.022) | (0.020) | (0.019) | (0.018) |
| 2 years after event | 0.084*** | 0.119*** | 0.174*** | 0.147*** | 0.119*** | 0.091*** | 0.064*** | 0.036*** | 0.219*** | 0.189*** | 0.158*** | 0.128*** | 0.097*** | 0.066*** |
| | (0.015) | (0.026) | (0.021) | (0.019) | (0.017) | (0.015) | (0.013) | (0.011) | (0.034) | (0.031) | (0.028) | (0.026) | (0.024) | (0.023) |
| 3 years after event | 0.117*** | 0.160*** | 0.211*** | 0.182*** | 0.153*** | 0.125*** | 0.096*** | 0.068*** | 0.264*** | 0.232*** | 0.201*** | 0.169*** | 0.137*** | 0.105*** |
| | (0.015) | (0.034) | (0.021) | (0.019) | (0.017) | (0.015) | (0.013) | (0.012) | (0.043) | (0.040) | (0.037) | (0.035) | (0.033) | (0.031) |
| 4 years after event | 0.109*** | 0.163*** | 0.195*** | 0.168*** | 0.142*** | 0.116*** | 0.090*** | 0.063*** | 0.263*** | 0.232*** | 0.202*** | 0.171*** | 0.141*** | 0.110*** |
| | (0.014) | (0.042) | (0.019) | (0.017) | (0.016) | (0.014) | (0.013) | (0.012) | (0.053) | (0.049) | (0.046) | (0.043) | (0.040) | (0.038) |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | No | No | No |
| # Observations | 63,078 | 20,491 | 63,078 | 63,078 | 63,078 | 63,078 | 63,078 | 63,078 | 20,491 | 20,491 | 20,491 | 20,491 | 20,491 | 20,491 |

*Notes:* Table D4 shows the results of running specification (1) with the measure of *adjusted sales to others* as the dependent variable. For this table, total sales and sales to others are based only on the firm-to-firm transaction data. Here, total sales are replaced by total corporate sales, i.e., the sum of all sales recorded by the firm-to-firm transaction data in a year. Also, sales to others are replaced by the sum of all sales recorded by the firm-to-firm transaction data, made to buyers other than the first MNC buyer. Each column implements Result 1 for a different value of $\delta$, as indicated above the column number. Columns (1) and (2) show our baseline findings for $\delta = -0.217$ and for the two samples (full and restricted) - this estimate of $\delta$ comes from the instrumental variable strategy described in Section 5.3 and implemented in Table D2. The rest of the columns show the robustness of our baseline findings to values of $\delta \in [-1.2, 0.3]$. For $\sigma = 6$, the corresponding values of $\gamma \in [0.76, 1.06]$. Columns (3)-(8) report event-study estimates for the full sample including both domestic firms that become first-time suppliers to an MNC and never-suppliers. Columns (9)-(14) focus only on the restricted sample of domestic firms that become first-time suppliers to an MNC and use standard error clustering at event by province level. Clustering of standard errors is at the two-digit sector by province level. ***, **, * denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table D5: Robustness of the Empirical Application of Result 2 to Different Values of δ - Transaction Data Only

| | $\delta = -0.22$ (1) | $\delta = -0.22$ (2) | $\delta = -1.2$ (3) | $\delta = -0.9$ (4) | $\delta = -0.6$ (5) | $\delta = -0.3$ (6) | $\delta = 0$ (7) | $\delta = 0.3$ (8) | $\delta = -1.2$ (9) | $\delta = -0.9$ (10) | $\delta = -0.6$ (11) | $\delta = -0.3$ (12) | $\delta = 0$ (13) | $\delta = 0.3$ (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *4 years before event* | 0.008 | -0.021 | 0.016 | 0.014 | 0.011 | 0.009 | 0.007 | 0.005 | -0.028 | -0.026 | -0.024 | -0.022 | -0.019 | -0.017 |
| | (0.014) | (0.028) | (0.027) | (0.023) | (0.019) | (0.015) | (0.012) | (0.009) | (0.036) | (0.033) | (0.031) | (0.029) | (0.027) | (0.027) |
| *3 years before event* | 0.004 | -0.018 | 0.009 | 0.007 | 0.006 | 0.004 | 0.003 | 0.001 | -0.020 | -0.020 | -0.019 | -0.018 | -0.018 | -0.017 |
| | (0.008) | (0.020) | (0.013) | (0.011) | (0.009) | (0.008) | (0.007) | (0.007) | (0.026) | (0.024) | (0.022) | (0.020) | (0.019) | (0.018) |
| *2 years before event* | 0.007 | -0.006 | 0.015 | 0.013 | 0.010 | 0.007 | 0.005 | 0.002 | -0.004 | -0.005 | -0.005 | -0.006 | -0.006 | -0.007 |
| | (0.006) | (0.010) | (0.009) | (0.008) | (0.007) | (0.006) | (0.005) | (0.005) | (0.013) | (0.012) | (0.011) | (0.010) | (0.010) | (0.010) |
| *Year of event* | -0.142*** | -0.119*** | -0.081*** | -0.100*** | -0.118*** | -0.137*** | -0.156*** | -0.174*** | -0.055*** | -0.074*** | -0.094*** | -0.114*** | -0.133*** | -0.153*** |
| | (0.017) | (0.014) | (0.020) | (0.019) | (0.018) | (0.017) | (0.017) | (0.016) | (0.016) | (0.015) | (0.015) | (0.014) | (0.014) | (0.014) |
| *1 year after event* | 0.006 | 0.035* | 0.095*** | 0.068*** | 0.040*** | 0.013 | -0.014 | -0.041*** | 0.130*** | 0.101*** | 0.072*** | 0.043*** | 0.014 | -0.015 |
| | (0.011) | (0.018) | (0.018) | (0.016) | (0.013) | (0.011) | (0.009) | (0.008) | (0.022) | (0.021) | (0.019) | (0.018) | (0.018) | (0.018) |
| *2 years after event* | 0.027** | 0.063*** | 0.118*** | 0.090*** | 0.062*** | 0.035*** | 0.007 | -0.021** | 0.163*** | 0.132*** | 0.102*** | 0.071*** | 0.040* | 0.010 |
| | (0.013) | (0.023) | (0.019) | (0.017) | (0.015) | (0.013) | (0.011) | (0.010) | (0.030) | (0.027) | (0.025) | (0.024) | (0.022) | (0.022) |
| *3 years after event* | 0.056*** | 0.098*** | 0.149*** | 0.120*** | 0.092*** | 0.063*** | 0.035*** | 0.006 | 0.202*** | 0.170*** | 0.138*** | 0.106*** | 0.074** | 0.042 |
| | (0.012) | (0.033) | (0.019) | (0.017) | (0.015) | (0.013) | (0.011) | (0.010) | (0.039) | (0.037) | (0.035) | (0.033) | (0.032) | (0.032) |
| *4 years after event* | 0.047*** | 0.099** | 0.133*** | 0.107*** | 0.081*** | 0.054*** | 0.028** | 0.002 | 0.199*** | 0.168*** | 0.138*** | 0.107*** | 0.077* | 0.046 |
| | (0.012) | (0.039) | (0.016) | (0.015) | (0.013) | (0.012) | (0.011) | (0.011) | (0.047) | (0.044) | (0.042) | (0.040) | (0.038) | (0.038) |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year-4DSect-Prov FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Never Suppliers | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | No | No | No |
| # Observations | 63,078 | 20,491 | 63,078 | 63,078 | 63,078 | 63,078 | 63,078 | 63,078 | 20,491 | 20,491 | 20,491 | 20,491 | 20,491 | 20,491 |

*Notes:* Table D5 shows the results of running specification (1) with the measure of *average adjusted sales to others* as the dependent variable. For this table, total sales and sales to others are based only on the firm-to-firm transaction data. Here, total sales are replaced by total corporate sales, i.e., the sum of all sales recorded by the firm-to-firm transaction data in a year. Also, sales to others are replaced by the sum of all sales recorded by the firm-to-firm transaction data, made to buyers other than the first MNC buyer. The number of other buyers is the number of buyers recorded by the firm-to-firm transaction data, other than the first MNC buyer. Each column implements Result 2 for a different value of δ, as indicated above the column number. Columns (1) and (2) show our baseline findings for $\delta = -0.217$ and for the two samples (full and restricted) - this estimate of δ comes from the instrumental variable strategy described in Section 5.3 and implemented in Table D2. The rest of the columns show the robustness of our baseline findings to values of $\delta \in [-1.2, 0.3]$. For $\sigma = 6$, the corresponding values of $\gamma \in [0.76, 1.06]$. Columns (3)–(8) report event-study estimates for the full sample including both domestic firms that become first-time suppliers to an MNC and never-suppliers. Columns (9)–(14) focus only on the restricted sample of domestic firms that become first-time suppliers to an MNC and use standard error clustering at event by province level. *** , ** , * denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

27

# Online Appendix D.3   Inferring $\gamma$ and $\sigma$ from DLW (2012)

One concern with our preferred values of $\sigma$ and $\gamma$ is that $\sigma$ is taken from the literature, whereas $\gamma$ is inferred from the sample of first-time suppliers to the government (and not to MNCs). Using the method of De Loecker and Warzynski (2012), we can infer both $\sigma$ and $\gamma$ from the same baseline sample of first-time suppliers to MNCs. By assuming a Cobb-Douglas production function specification, we estimate the returns to scale parameter ($\gamma$) and the mark-up of firms ($\mu$). Under our CES assumption for the demand system, we then infer the elasticity of demand ($\sigma$) from the mark-up, since the mark-up is given by $\mu = \frac{\sigma}{\sigma-1}$.

Table D6: Inferred $\gamma$ and $\sigma$ from the Method of De Loecker and Warzynski (2012)

|  | Labor (1) | Capital (2) | $\mu$ (3) | $\gamma$ (4) | $\sigma$ (5) | $\delta$ (6) | Obs (7) |
|---|---|---|---|---|---|---|---|
| All sectors (pooled) | 0.84 | 0.08 | 1.25 | 0.92 | 5.03 | -0.32 | 82,094 |
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.08) | (0.02) |  |
| Agriculture, forestry and fishing | 0.68 | 0.09 | 1.12 | 0.77 | 9.20 | -1.87 | 5,229 |
|  | (0.01) | (0.01) | (0.02) | (0.01) | (1.38) | (0.41) |  |
| Manufacturing | 0.88 | 0.08 | 1.19 | 0.96 | 6.21 | -0.21 | 14,922 |
|  | (0.02) | (0.00) | (0.03) | (0.02) | (0.83) | (0.15) |  |
| Wholesale and Retail Trade | 0.81 | 0.08 | 1.25 | 0.88 | 4.98 | -0.46 | 42,033 |
|  | (0.00) | (0.01) | (0.01) | (0.01) | (0.11) | (0.04) |  |
| Transportation and Storage | 1.00 | 0.04 | 1.57 | 1.03 | 2.74 | 0.06 | 1,375 |
|  | (0.11) | (0.06) | (0.18) | (0.12) | (1.98) | (0.43) |  |
| Accommodation and Food Services | 0.77 | 0.07 | 1.05 | 0.84 | 20.88 | -3.23 | 9,280 |
|  | (0.04) | (0.01) | (0.05) | (0.03) | (8.46) | (1.53) |  |
| Information and Communication | 0.82 | 0.08 | 1.21 | 0.90 | 5.87 | -0.48 | 896 |
|  | (0.16) | (0.06) | (0.25) | (0.14) | (24.62) | (5.24) |  |
| Professional, Scientific and Technical | 0.88 | 0.09 | 1.29 | 0.98 | 4.44 | -0.08 | 3,432 |
|  | (0.01) | (0.01) | (0.02) | (0.02) | (0.30) | (0.06) |  |
| Administrative and Support Service | 0.88 | 0.05 | 1.21 | 0.93 | 5.80 | -0.32 | 1,998 |
|  | (0.03) | (0.02) | (0.04) | (0.03) | (1.51) | (0.31) |  |
| Human Health and Social Work | 0.86 | 0.09 | 1.36 | 0.95 | 3.81 | -0.14 | 861 |
|  | (0.18) | (0.06) | (0.29) | (0.16) | (7.61) | (1.79) |  |
| Other Services | 0.85 | 0.02 | 1.26 | 0.83 | 4.92 | -0.68 | 1,275 |
|  | (0.18) | (0.08) | (0.31) | (0.17) | (13.84) | (4.17) |  |

*Notes:* Table D6 shows results from the De Loecker and Warzynski (2012) methodology for the economy-wide sample, pooled across all sectors and separately by sector. Column (1) and (2) show the estimated input elasticities for labor and capital in a Cobb-Douglas value-added production function. Column (3) shows the mark-up ($\mu$). Column (4) corresponds to the returns to scale parameter ($\gamma$), which is calculated as the sum of columns (1) and (2). Column (5) corresponds to the inferred elasticity of demand ($\sigma$). Our assumption of CES demand for buyers implies a constant mark-up over marginal cost given by $\mu = \frac{\sigma}{\sigma-1}$, which allows us to infer $\sigma$ from our estimated $\mu$. Column (6) computes the resulting value for $\delta = (\gamma - 1)(\sigma - 1)$. Finally, column (7) reports the number of observations. This methodology implies values of $\delta \in [-1.87, 0.06]$ across sectors. The estimation based on all sectors implies $\delta = -0.33$, which is close to $\delta = -0.22$ estimated with our IV strategy. Bootstrap standard errors are shown in parenthesis.

Using this approach we estimate an average mark-up across sectors of 1.25 (25% over marginal cost). This implies $\sigma = 5$, which is close to the value of 6 from Broda and Weinstein (2006) that we use in our baseline findings. We also find returns to scale of the production function $\gamma = 0.92$. With these estimates in hand, we obtain $\delta = (\gamma - 1)(\sigma - 1) = -0.33$. This estimate of $\delta$ is close to the one obtained from the full sample using the IV methodology (see Table D2, Online Appendix D.2). Reassuringly, the findings from this approach are similar to our baseline findings. That said, this approach is not our first choice, since we aim to provide an alternative to the standard approach of production function estimation.

## Online Appendix D.4    Robustness of Model-Based Results to $\gamma$ and $\sigma$

Instead of estimating $\gamma$ and $\sigma$ ourselves (or taking a value of $\sigma$ from the literature), we investigate here the sensitivity of our baseline model-based results to reasonable ranges of values for these parameters. Figure D5 presents the estimates of the model-based composite TFP and TFP alone according to either Result 1 or Result 2 for different calibrations of $\gamma$ and $\sigma$. The two ranges considered include both of our preferred values of $\gamma$ and $\sigma$ (0.96 and 6, respectively, for $\delta = -0.22$) that deliver our baseline results in Table 6.
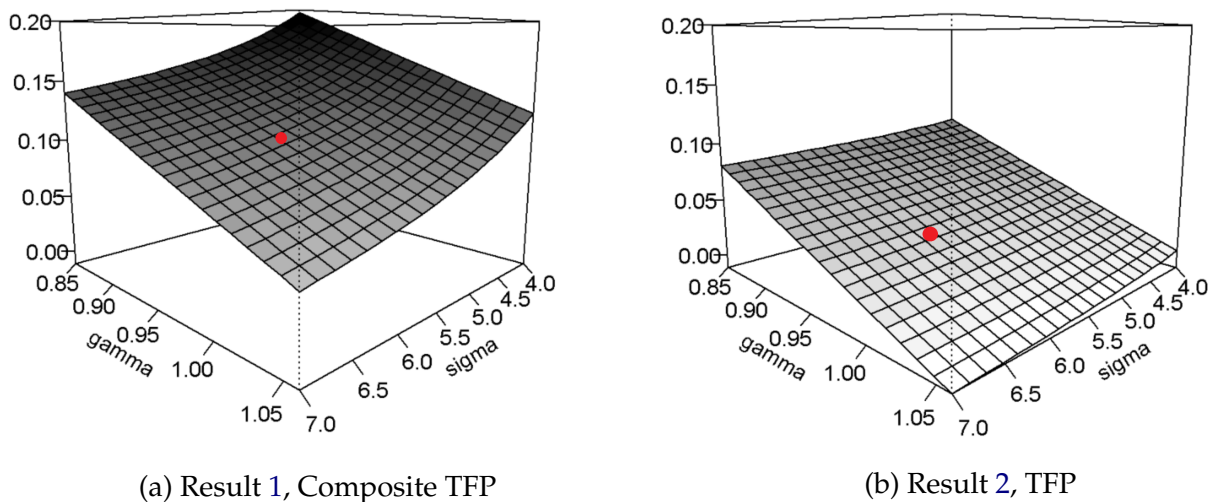


(a) Result 1, Composite TFP                    (b) Result 2, TFP

Figure D5: Estimates of Composite TFP and TFP Alone for Different Values of $\sigma$ and $\gamma$

*Notes:* Figure D5 presents the estimated changes in two measures of TFP (vertical axis): composite TFP (Panel D5a) and true TFP (Panel D5b), for different calibrations of the relevant parameters $\gamma$ (returns to scale) and $\sigma$ (elasticity of demand). These graphs are the empirical applications of Results 1 and 2. For comparability, they are both constructed using only sales to corporate buyers, from the firm-to-firm transaction data. The axis on the left considers values of $\gamma$ between 0.85 and 1.05. The axis on the right considers values of $\sigma$ between 4 and 7. The red dots correspond to our baselines estimates obtained from $\gamma = 0.96$ and $\sigma = 6$ (associated with $\delta = -0.22$).

## Online Appendix D.5    Discussion of Assumption (a-ii)

In Section 5.2, we assume that for any changes in $\phi$ and/or $r$, all buyers $i$ equally adjust their probability to source from the supplier, i.e., $\mathrm{dln}(n_i) = \mathrm{dln}(n)$, $\forall i \neq MNC_0$. This assumption (labeled as assumption (a-ii) in Online Appendix C.3) is instrumental to reaching Result

2.

Let us now relax this assumption. Define $\omega_i = \frac{n_i b_i}{\sum_{k \neq MNC_0}^{N} n_k b_k}$ and $\omega'_i = \frac{n_i}{\sum_{k \neq MNC_0}^{N} n_k}$. Using the definition of $\varepsilon_{\widetilde{n}}$ (see equation (C7)) and taking the total derivative of $\ln(\widetilde{N})$, we obtain:

$$
\varepsilon_{\widetilde{n}} = \mathbb{E}\left[ \sum_{i \neq MNC_0}^{N} d\ln(n_i)\omega_i \right]
$$

$$
\mathbb{E}\left[ d\ln(\widetilde{N}) \right] = \mathbb{E}\left[ \sum_{i \neq MNC_0}^{N} d\ln(n_i)\omega'_i \right]
$$

$$
\Rightarrow \varepsilon_{\widetilde{n}} = \mathbb{E}\left[ d\ln(\widetilde{N}) \right] + \mathbb{E}\left[ \sum_{i \neq MNC_0}^{N} d\ln(n_i) \times (\omega_i - \omega'_i) \right]. \tag{D10}
$$

Equation (D10) tells us that, in the general case where $d\ln(n_i)$ depends on the buyer $i$, $\varepsilon_{\widetilde{n}}$ and $\mathbb{E}\left[ d\ln(\widetilde{N}) \right]$ need not be equal. Without assumption (a-ii) equation (C9) can be written as:

$$
\mathbb{E}\left[ d\ln\left( \frac{p\widetilde{Q}/(pQ)^{\delta}}{\widetilde{N}} \right) \right] = (\sigma - 1)\varepsilon_{\phi} + \mathbb{E}\left[ \sum_{i \neq MNC_0}^{N} d\ln(n_i) \times (\omega_i - \omega'_i) \right] = (\sigma - 1)\varepsilon_{\phi} + \tilde{\varepsilon}.
$$

Whenever assumption (a-ii) does not hold, $\tilde{\varepsilon}$ is likely to add a bias to Result 2. The sign of $\tilde{\varepsilon}$ depends on the covariance between $d\ln(n_i)$ and $(\omega_i - \omega'_i)$. Given the definitions of $\omega_i$ and $\omega'_i$, we have that $(\omega_i - \omega'_i) > 0$ if and only if $\sum_k (b_i - b_k)n_k > 0$. Thus, the sign of $\tilde{\varepsilon}$ would ultimately depend on the covariance between $d\ln(n_i)$ and $\sum_k (b_i - b_k)n_k$. This covariance would be positive (negative) if the change in the probability of matching with a given buyer ($d\ln(n_i)$) would be higher for buyers with bigger (smaller) demand shifters ($b_i$) than that of the average buyer. In summary:

$$
\mathbb{E}\left[ d\ln\left( \frac{p\widetilde{Q}/(pQ)^{\delta}}{\widetilde{N}} \right) \right] \begin{cases} > (\sigma - 1)\varepsilon_{\phi} & \text{if Cov}\left[ d\ln(n_i), \sum_k (b_i - b_k)n_k \right] > 0 \\ < (\sigma - 1)\varepsilon_{\phi} & \text{if Cov}\left[ d\ln(n_i), \sum_k (b_i - b_k)n_k \right] < 0 \end{cases} \tag{D11}
$$

Result 2 would provide an upper (lower) bound of the importance of $\varepsilon_{\phi}$ in $\varepsilon_{\phi'}$ if the first (second) case of equation (D11) were the relevant one to our context. We are now interested in investigating whether indeed all buyers $i$ equally adjust their probability to source from the supplier, i.e., $d\ln(n_i) = d\ln(n)$, $\forall i \neq MNC_0$. In our model, the only characteristic of buyers that differentiates them is their demand shifter $b_i$. We now ask whether $d\ln(n_i)$ may be correlated with $b_i$. As we do not observe $b_i$ directly, we use firm size as a proxy. Table A6 (Online Appendix A) shows that the average size of buyers increases after the event (column (2) for average employment and column (3) for average sales). This suggests that the probability of selling to buyers with higher than average demand shifters increased relatively more than the one of selling to buyers with lower than average demand shifters. The first case of equation (D11) is therefore more likely to apply to our setup. Hence, the importance of $\varepsilon_{\phi}$ in $\varepsilon_{\phi'}$ might be smaller than our baseline model-based estimates suggest.

# Online Appendix E   Summary Statistics for Main Sample

Table E1: Summary Statistics for the Firms in the Main Economy-Wide Sample

| | N | Mean | S.D. | Median |
|---|---|---|---|---|
| **Never Suppliers in 2009** | | | | |
| Total Sales | 8,389 | 676.7 | 1,740.0 | 292.2 |
| Number of Workers | 8,389 | 11.6 | 28.7 | 6.0 |
| Wage bill | 8,389 | 79.0 | 299.7 | 31.8 |
| Exports | 201 | 891.1 | 1,430.5 | 246.4 |
| Imports | 1,268 | 207.2 | 619.9 | 48.4 |
| Value Added | 7,940 | 154.9 | 462.9 | 58.7 |
| Input Costs | 4,938 | 601.2 | 1,477.8 | 232.2 |
| Total Net Assets | 6,641 | 448.2 | 1,673.6 | 134.1 |
| | | | | |
| **First-Time Suppliers in 2009** (Unbalanced) | | | | |
| Total Sales | 1,555 | 1,495.8 | 4,321.4 | 477.5 |
| Number of Workers | 1,555 | 19.5 | 45.1 | 7.8 |
| Wage bill | 1,555 | 131.5 | 311.6 | 47.3 |
| Exports | 111 | 742.8 | 2,131.0 | 57.0 |
| Imports | 454 | 567.9 | 1,863.2 | 111.3 |
| Value Added | 1,475 | 203.1 | 471.3 | 69.4 |
| Input Costs | 1,040 | 1,431.7 | 4,259.9 | 379.3 |
| Total Net Assets | 1,442 | 926.9 | 2,519.6 | 254.1 |
| | | | | |
| **First-Time Suppliers in 2009** (Balanced) | | | | |
| Total Sales | 1,520 | 1,516.5 | 4,367.4 | 483.6 |
| Number of Workers | 1,520 | 19.6 | 45.3 | 7.9 |
| Wage bill | 1,520 | 132.7 | 314.4 | 47.5 |
| Exports | 110 | 749.5 | 2,139.5 | 57.8 |
| Imports | 446 | 574.4 | 1,878.5 | 113.7 |
| Value Added | 1,443 | 205.0 | 475.3 | 70.8 |
| Input Costs | 1,016 | 1,456.4 | 4,306.0 | 396.9 |
| Total Net Assets | 1,411 | 938.5 | 2,542.9 | 257.4 |

*Notes:* Except for the number of employees, all means, standard deviations, and medians are in thousands of CPI-deflated 2013 U.S. dollars. Statistics for each variable are calculated only across the firms with non-missing values for that variable that year. All values correspond to 2009, a year that is by construction prior to all events in the main economy-wide sample. Part of the firms in the overall main sample were not yet active in 2009, which explains the difference in the number of firms described in this table and the overall number of firms in the main economy-wide sample. The upper panel presents raw summary statistics for the sample of firms active in 2009 and never observed as supplying to an MNC in our 2008 to 2017 firm-to-firm transaction data. The middle panel presents raw summary statistics for the sample of firms active in 2009 and observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015. In 2009, there were 15,788 firms that satisfy our minimal size restrictions and that are split in three disjoint sets: 8,389 are never-suppliers (upper panel), 1,555 will become first-time suppliers sometime between 2010 and 2015, 5,844 are observed as already supplying to an MNC in either 2008 or 2009. Firms observed as supplying for the first time to an MNC after 2016 are dropped altogether from this calculation. The lower panel presents raw summary statistics for the sample of firms active in 2009, observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015, and observed at least one year before and after their event.

Table E2: Number of Events (First-Time Suppliers to MNCs) and MNCs Triggering Them

|  | Suppliers (Events) | MNCs (New, unique) | MNCs (Total, unique) |
|---|---|---|---|
| 2010 | 761 | 263 | 263 |
| 2011 | 665 | 71 | 332 |
| 2012 | 646 | 43 | 372 |
| 2013 | 539 | 31 | 400 |
| 2014 | 517 | 19 | 421 |
| 2015 | 569 | 17 | 436 |
| Total | 3,697 | 444 | |

*Notes:* Table E2 describes the main economy-wide sample of firms observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015. The second column reports the number of events that occur in each calendar year, or alternatively, the number of domestic firms that become first-time suppliers to an MNC that year. The third column reports the total number of new and unique MNCs that trigger an event in each calendar year, with the total showing the number of unique MNCs that we observe in the baseline sample. The fourth column shows the number of unique MNCs that trigger an event in each calendar year. Since MNCs may trigger events in multiple years, a total is not presented for this column. By definition, the values in the first row of the third and fourth columns are identical. The interpretation of the number 71 in the third column is the following: of the 332 unique MNCs that trigger the 665 events of 2011, 71 MNCs are new with respect to the 263 MNCs triggering events in 2010.

Table E3: Country of Global Ultimate Ownership for the MNCs Triggering the Event

| Country of GUO | Frequency | Percentage |
|---|---|---|
| United States | 209 | 47.1 |
| Panama | 28 | 6.3 |
| Great Britain | 18 | 4.1 |
| Spain | 17 | 3.8 |
| Mexico | 17 | 3.8 |
| Switzerland | 13 | 2.9 |
| Colombia | 13 | 2.9 |
| Germany | 11 | 2.5 |
| France | 11 | 2.5 |
| Canada | 10 | 2.3 |
| … | … | … |
| Total | 444 | 100 |

*Notes:* Table E3 documents the ten most frequent countries of global ultimate ownership (GUO) for the MNCs triggering the events in our main economy-wide sample. Other origin countries are as follows: Japan (9 MNCs), Guatemala (8), Netherlands (8), El Salvador (8), Ireland (6), Venezuela (5), Belgium (4), China (4), and Nicaragua (4). Together they cover 403 of the 444 distinct MNCs. Each observation is a unique MNC. Since one MNC can trigger multiple events, the frequency of each country in the sample of unique MNCs is likely to differ from the frequency of each country in the sample of events (triggered by these MNCs).

Table E4: Sectoral Composition of the Sample of First-Time Suppliers and MNCs

| | Suppliers | MNCs |
|---|---|---|
| Agriculture, Forestry and Fishing | 7.91 | 7.82 |
| Manufacturing | 9.47 | 39.92 |
| Wholesale and Retail Trade | 35.11 | 19.31 |
| Transportation and Storage | 5.91 | 3.49 |
| Accommodation and Food Services | 15.93 | 6.22 |
| Information and Communication | 2.63 | 3.76 |
| Professional, Scientific and Technical | 8.56 | 3.52 |
| Administrative and Support Service | 6.85 | 7.68 |
| Human Health and Social Work | 2.93 | 0.73 |
| Art, Entertainment and Recreation | 1.50 | 0.46 |
| Other Services | 3.06 | 0.05 |
| Mining and Quarrying | 0.15 | 0.03 |
| Water Supply, Sewerage and Waste Management | - | 0.24 |
| Construction | - | 0.87 |
| Real Estate | - | 4.00 |
| Education | - | 1.89 |

*Notes:* Table E4 presents the share of firms in a given sector of the 3,697 first-time suppliers to an MNC in the first column, and of their first 444 MNC buyers in the second column. Both types of firms pertain to the main economy-wide sample.

Table E5: Characteristics of Amount and Length of Relationship with First MNC Buyer

| Variable | N | Mean | Median | S.D. |
|---|---|---|---|---|
| First transaction with MNC ($\times$ 1,000 U.S. dollars) | 3,697 | 62.40 | 18.59 | 110.31 |
| Length of relationship with first MNC buyer | 3,697 | 2.76 | 2.00 | 1.91 |
| Length of relationship with all MNC buyers | 3,697 | 3.69 | 3.00 | 2.11 |

*Notes:* Table E5 refers to all economy-wide domestic firms observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015. The first line presents descriptive statistics of the first transaction with an MNC buyer. The second line describe the length of that relationship with the first MNC buyer, while the third line describes the length of relationships with all MNC buyers (including both the first MNC buyer and subsequent ones). Note that both of the duration variables are top censored, hence underestimated. For instance, for firms first supplying to an MNC in 2015 we can observe only two years more of their firm-to-firm transactions.

Table E6: Number of Firms Still Supplying to at Least One MNC Buyer in a Given Event Year

| Calendar Year / Event Year | 0 | +1 | +2 | +3 | +4 | +5 | +6 | +7 |
|---|---|---|---|---|---|---|---|---|
| 2010 | 761 | 636 | 563 | 480 | 414 | 332 | 266 | 197 |
| 2011 | 665 | 549 | 453 | 383 | 335 | 273 | 211 | |
| 2012 | 646 | 525 | 430 | 353 | 290 | 223 | | |
| 2013 | 539 | 446 | 360 | 304 | 235 | | | |
| 2014 | 517 | 397 | 327 | 252 | | | | |
| 2015 | 569 | 407 | 316 | | | | | |
| Total | 3,697 | 2,960 | 2,449 | 1,772 | 1,274 | 828 | 477 | 197 |

*Notes:* Table E6 refers to all economy-wide domestic firms observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015. The second column reports the distribution, by calendar year, of our events. By construction, in event year *0*, all firms that become a first-time supplier to an MNC have to appear in the calendar year row of their event year. Thus, by construction, the total number of firms in the column of event year *0* has to be 3,697. In the column of event year *+1*, we can trace how many of the firms who experience the event in a given calendar year are still selling to at least one MNC buyer one year after their event. The last column describes the number of firms that still supply to MNCs seven years after their first sale to an MNC. As one can note, by construction, some cells are empty. For instance, we cannot observe firms that are first supplying to an MNC in 2013 (hence have event year *0* as 2013) in event year *+5*, as our firm-to-firm does not allow us to observe those firms in 2018 (as our firm-to-firm dataset spans 2008 to 2017).

Table E7: Number of MNC Buyers in a Given Event Year

| Event Year | Number of Suppliers (1) | Number of MNC Buyers | | |
|---|---|---|---|---|
| | | Mean (2) | Median (3) | S.D. (4) |
| 0 | 3,697 | 1.44 | 1.00 | 1.34 |
| +1 | 2,960 | 1.92 | 1.00 | 2.02 |
| +2 | 2,449 | 2.25 | 1.00 | 2.66 |
| +3 | 1,772 | 2.62 | 1.00 | 3.32 |
| +4 | 1,274 | 2.89 | 2.00 | 3.90 |
| +5 | 828 | 3.15 | 2.00 | 4.38 |
| +6 | 477 | 3.64 | 2.00 | 5.73 |
| +7 | 197 | 4.02 | 2.00 | 7.02 |

*Notes:* Table E7 refers to all economy-wide domestic firms observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015. For each event year *+k*, we show summary statistics of the number of MNC buyers (columns (2)-(4)) for domestic firms still supplying to an MNC *+k* years later, as opposed to all firms still active *+k* years later (column (1)).

Table E8: Share of Total Sales Going to MNC Buyers in a Given Event Year

| Event Year | N | Mean | Median | S.D. |
|---|---|---|---|---|
| *0* | 3,697 | 0.19 | 0.06 | 0.27 |
| *+1* | 2,960 | 0.22 | 0.08 | 0.29 |
| *+2* | 2,449 | 0.23 | 0.10 | 0.29 |
| *+3* | 1,772 | 0.25 | 0.11 | 0.29 |
| *+4* | 1,274 | 0.25 | 0.11 | 0.29 |
| *+5* | 828 | 0.25 | 0.13 | 0.29 |
| *+6* | 477 | 0.26 | 0.14 | 0.29 |
| *+7* | 197 | 0.26 | 0.12 | 0.30 |

*Notes:* Table E8 refers to all economy-wide domestic firms observed as supplying for the first time to an MNC in Costa Rica sometime between 2010 and 2015. For each event year *+k*, we show summary statistics of the share of total sales directed to MNC buyers for domestic firms still supplying to an MNC *+k* years later (as opposed to all firms still active *+k* years later).

# Online Appendix F   Data Construction and Statistics

## Online Appendix F.1   Administrative Data

All the administrative data described hereafter is confidential and could only be stored and accessed in person in a fully-secured location at the Central Bank of Costa Rica (BCCR).

### Online Appendix F.1.1   Corporate Income Tax Returns and Social Security Data

Our first administrative dataset contains the universe of corporate income tax returns of active firms over the 2008 to 2017 period. Firms are corporations or individuals conducting business in Costa Rica. Every firm must file yearly tax declarations called D-101 (*"Declaracion Jurada del Impuesto Sobre la Renta"* or the "Affidavit of Income Tax") to the Ministry of Finance (*Ministerio de Hacienda*). This form contains information on profits, revenues, costs, assets, among others. Costs are broken down into several components such as administrative costs, material inputs, capital depreciation, interest payments, and other costs. Not filing the D-101 leads to payments of fines of up to 385 U.S. dollars, plus 11 to 12% annual interest on the firm's income tax liability. At this point, we refer to firms and tax identifiers (IDs) interchangeably.

We use the tax ID to merge the corporate income tax returns data with data from the Costa Rican Social Security Fund (*"Caja Costarricense del Seguro Social"*). This adds two new variables: the number of employees and the total wage bill. Tax IDs that report data to the Social Security at some point between 2008 and 2017 are considered active and kept for analysis.

The challenge going forward is that a given firm may have several tax IDs, most frequently due to accounting or tax reasons. Given that our paper is centered on trade between

firms, we need to aggregate all data up to the firm level.

Hence, we add to the information from the two datasets above information on firm own-ership and management from BCCR and other sources. BCCR identifies groups of tax identi-fiers (IDs) that have common owners using data from the National Registry of firms, domestic and foreign surveys, and other public and private information. These groups of tax IDs are called "grupo corporativo" or *corporate group*. A "grupo empresarial" or *firm group* is a set of tax IDs who not only share ownership, but also behave as one firm, meaning that one can-not consider them as separate business ventures.[iii] This information is complemented with information on corporate groups from Orbis, a product of Bureau Van Dijk.[iv]

We add to the same firm group those tax IDs that belong to the same corporate group and also operate in the same sector as the tax IDs in the firm group. We expand our dataset with the tax returns of tax IDs that lack social security data, if we learn that these tax IDs are part of a corporate group.[v]

For the purpose of our empirical analysis, we collapse the data and treat firm groups as one individual firm. We keep track of business relationships of all tax IDs in the group with all other tax IDs in the economy, but keep only one identifier for the group. We keep the fixed characteristics (identifier, sector, location) of the most relevant tax IDs in terms of sales within the group. For all other variables, values are summed across all tax identifiers under the same firm group identifier.

We want to keep the universe of domestic private firms that are part of the non-financial market economy. Therefore, we drop non-governmental organizations (NGOs), public entities (including utilities), and those observations that are registered as households. We drop data from the education sector and the construction / real estate sector,[vi] as well as firms related to the financial sector. We drop firms for which we do not know either the sector or the province, as both are necessary in our event-study design. We do not keep firms for which there is less than one worker reported during all years of activity. These criteria leave us with 78,137 firms.

We impose minimal size restrictions for the sample considered in our empirical exercise. Firms have to report both workers and sales with no gaps in the data, and we consider only firms that, over the years, have a median of at least three workers. Finally, we drop firms with median sales of less than 50,000 U.S. dollars (CPI-deflated to 2013 dollars). These restrictions leave us with 24,370 firms. Note that these 24,370 domestic firms include four types of firms: the never-suppliers (never supplying to an MNC between 2008 and 2017), the first-time sup-pliers to an MNC sometime between 2010 and 2015, the always-suppliers (already supplying

---

[iii]In a hypothetical example, tax IDs A, B, and C belong to the same "grupo empresarial" or "firm group". While these tax IDs are distinct, they operate as a single business unit whose objective is to sell product *z* in Costa Rica. Assume that all sales are reported by tax ID A, all workers are hired by tax ID B, and tax ID C owns all the assets. Not aggregating the information of these three tax IDs up to the firm group level but treating tax IDs as distinct firms would lead to an overestimation of the number of firms in the economy and misleading conclusions on the behavior of each tax ID.

[iv]This dataset is discussed in more detail in Online Appendix F.1.3.

[v]For instance, this can include firms that report large revenues, but do not report any employees.

[vi]Most of these firms are active for one construction project only, disappearing immediately after.

to an MNC in either 2008 or 2009), and the first-time suppliers in either 2016 or 2017. Of these 24,370 firms, in the main economy-wide event-study, we only use the firms in the first two categories. In Table F1 we present descriptive statistics of the same eight variables from Table E1 for all firms in the non-financial market economy (upper panel) and for all 24,370 firms surpassing our minimal size restrictions (lower panel).

Table F1: Descriptive Statistics, All Domestic Firms Vs. Domestic Firms Kept After Minimal Size Restrictions

|  | # Firms | Mean | S.D. | Median |
|---|---|---|---|---|
| **Domestic non-financial market economy** | | | | |
| Total Sales | 78,137 | 495.1 | 3,114.9 | 118.3 |
| Number of Workers | 76,372 | 7.2 | 32.2 | 2.4 |
| Wage Bill | 76,650 | 53.4 | 300.7 | 12.6 |
| Exports | 4,487 | 451.7 | 2,804.2 | 23.6 |
| Imports | 21,521 | 224.1 | 1,579.7 | 13.8 |
| Value Added | 74,985 | 113.8 | 590.2 | 34.9 |
| Input Costs | 67,739 | 320.8 | 2,542.3 | 24.6 |
| Total Net Assets | 69,098 | 407.1 | 5,825.3 | 55.7 |
| **Domestic firms kept after min. size restr.** | | | | |
| Total Sales | 24,370 | 1,242.1 | 5,345.5 | 380.1 |
| Number of Workers | 24,370 | 17.1 | 53.0 | 6.7 |
| Wage Bill | 24,370 | 135.6 | 497.3 | 42.3 |
| Exports | 2,846 | 546.5 | 3,361.0 | 13.7 |
| Imports | 9,195 | 439.3 | 2,333.3 | 22.0 |
| Value Added | 24,233 | 243.8 | 962.4 | 86.2 |
| Input Costs | 16,881 | 1,091.3 | 4,930.1 | 264.4 |
| Total Net Assets | 21,654 | 952.2 | 7,940.9 | 193.1 |

*Notes:* Table F1 reports summary statistics across 2008 to 2017 across eight variables for all firms in the non-financial market economy (upper panel) and for all firms kept in our sample of analysis (lower panel). With the exception of employment, the mean, standard deviation, and median are in thousands of U.S. dollars (CPI-deflated to 2013 dollars).

Table F2: Coverage of Data After Minimal Size Restrictions

| | |
|---|---|
| Total Sales | 78.6% |
| Number of Workers | 81.7% |
| Wage Bill | 84.2% |
| Exports | 83.1% |
| Imports | 89.3% |
| Value Added | 76.2% |
| Input Costs | 82.0% |
| Total Net Assets | 73.5% |

*Notes:* Table F2 presents the average coverage between 2008 to 2017 of the values for all firms kept after implementing our minimal size restrictions out the values for all firms in the non-financial market economy (across eight variables).

Despite losing more than two thirds of the firms, Table F2 shows that we keep those that employ most of the labor force and represent the largest share of sales, exports, income, costs and assets. For most variables, the firms we keep cover over 80% of the value across all firms in the non-financial market economy.

**Online Appendix F.1.2    Firm-to-Firm Transaction Data**
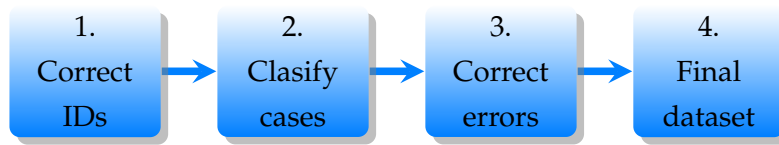
Our most important dataset allows us tracks all firm-to-firm relationships in Costa Rica between 2008 and 2017. This data is collected by the Ministry of Finance through the tax form D-151, the *"Declaración anual resumen de clientes, proveedores y gastos específicos"* (Declaration of the yearly summary of buyers, suppliers and specific expenses). This declaration is compulsory not only to private businesses, but to all actors in the economy (e.g. individuals providing professional services, public entities, NGOs, embassies etc.), irrespective of being subject to the corporate income tax or not. A late filing of this fee is heavily penalized, e.g. in 2016 the late filing fee could go from 7,040 to 70,400 U.S. dollars.

To help enforce taxes, each firm has to report all of its corporate suppliers and buyers with a yearly accumulated amount of transactions above 2.5 million Costa Rican colones (approximately 4,200 U.S. dollars).[vii] Third-party reporting, of the type D-151 ensures, is used by the tax authority to identify firms that have not complied with their filing obligations, e.g. firms that have over-reported their costs or under-reported their revenues to reduce their profit tax liability. The tax authority uses different communication interventions, namely emails, phone calls, or personal visits, to follow up with non-filers (Brockmeyer, Hernandez, Kettle, and Smith, 2016). As D-151 forms contain the yearly amount sold to or bought from each partner, this dataset allows us not just to track buyer-supplier relationships in a given year, but also to measure the intensity of those relationships.

A sequence of steps was followed to ensure that several coding or reporting errors were

[vii]For the sale of professional services by individuals, the threshold is less than 100 U.S. dollars.

corrected in the raw D-151 database, and that the IDs of firms identified as buyers and sellers are coherent with the rest of our data. The steps can be summarized as follows:



The first step relates to the fact that the Ministry of Finance usually assigns extra characters to the IDs of corporations or individuals, which need to be removed before the data can be linked to the tax returns and social security microdata. The presence of foreign IDs require additional steps to ensure data quality: it is not unusual that the initial transactions of a foreign firm are recorded using passport or foreign ID numbers, whereas, later on, those transactions are recorded using a Costa Rican tax ID. BCCR tracks those changes to ensure that the transactions are imputed to the correct tax ID when building the dataset.

The second step involves identifying different reporting inconsistencies. The ideal case is one in which the transaction between two firms is reported by both firms, given the same description, and has the exact same reported amount in both filings. In such case, the duplication is taken into consideration to keep it as one observation, and there is no need to perform any additional corrections. However, inconsistencies arise when transactions appear only once, the amount shown is different within a pair, submissions that were rejected by the Ministry of Finance cause duplicates of correct lines, or there is a lack of data. Also, whenever individuals buy from firms, individuals are not required to report that purchase, so around one fifth of the reports by firms have no counterpart but cannot be classified as an error or misreporting.

The corrections that were done to the dataset are summarized herafter:

1. Whenever the transaction was reported by both parts but with amounts appearing to differ because of an error in the position of the decimal point, historical data was used to identify the correct amount among the two options.

2. Whenever a pair of transactions had one of the partners reporting a transaction with an amount of zero, the amount from the partner reporting a positive value was assumed to be correct. The same solution was used whenever one partner filled in either its own tax ID or the tax ID of its partner, instead of the value of their transaction.

3. Whenever the difference in the amount of a pair of transactions was more than 20% or more than 50 million colones (close to 100 thousand U.S. dollars), and one of the partners of the transaction reported a value of more than 500 million colones (close to 1 million U.S. dollars) careful manual checks were completed (using historical data to identify the correct value).[viii]

4. Whenever a transaction appeared more than once because of a resubmission (usually for corrections), we only kept the most recent observation.

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[viii]This last criterion was added to prioritize which transactions would be manually checked.

Tables F3 and F4 summarize the number of transactions and the corresponding value of the transactions that were analyzed, for three different years (as examples, the same analysis was carried out for all years between 2008 and 2017). For the empirical exercise we can use two sets of transactions: first, those showing up in pairs that were either matched perfectly in the raw data or with inconsistencies that were solved by the corrections explained beforehand. The second set of transactions that we can use are the cases where transactions had no partner, either because there was a reason for not having it as explained above, or because there is missing information.

Unsolved cases include those that could eventually be corrected but for which the value of the transaction is below our chosen threshold for manual checks. The second category of data that we cannot use are cases where transactions had no duplicate, but they are classified as rejected by the Ministry of Finance in the revision of the tax declaration submissions. There is a small set of transactions that we were able to identify as duplicates of others that are already considered in the data. Finally, the smallest set of transactions includes those that were excluded due to being mistakenly reported.[ix]

Table F3: Number of Cases, Firm-to-firm Transaction Data

| Type of case | 2008 | | 2012 | | 2015 | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |
| Data in pairs | 535,863 | 41.9% | 998,355 | 40.5% | 1,383,820 | 42.2% |
| No partner and accepted | 493,769 | 38.7% | 1,256,978 | 51.0% | 1,626,907 | 49.6% |
| **Subtotal of used data** | **1,029,632** | **80.6%** | **2,255,333** | **91.5%** | **3,010,727** | **91.9%** |
| Unsolved | 128,599 | 10.1% | 202,710 | 8.2% | 251,499 | 7.7% |
| No partner and rejected | 108,969 | 8.5% | - | 0.0% | - | 0.0% |
| Duplicate | 4,904 | 0.4% | 5,936 | 0.2% | 14,652 | 0.4% |
| Excluded | 5,414 | 0.4% | 34 | 0.0% | 32 | 0.0% |
| **Total** | **1,277,518** | **100.0%** | **2,464,013** | **100.0%** | **3,276,910** | **100.0%** |

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[ix]For example, the Ministry of Finance is aware that accounting firms sometimes mix up the forms of different buyer firms when submitting them to the tax authority, which are later rectified.

Table F4: Value of Transactions, Firm-to-firm Transaction Data

| Type of case | 2008 | | 2012 | | 2015 | |
|---|---|---|---|---|---|---|
| | Value | % | Value | % | Value | % |
| Data in pairs | 45,812 | 63.6% | 55,489 | 67.5% | 69,450 | 69.1% |
| No partner and accepted | 11,808 | 16.4% | 16,637 | 20.2% | 18,496 | 18.4% |
| **Subtotal of used data** | **57,620** | **80.0%** | **72,126** | **87.7%** | **87,946** | **87.6%** |
| Unsolved | 7,766 | 10.8% | 10,002 | 12.2% | 12,324 | 12.3% |
| No partner and rejected | 6,145 | 8.5% | - | 0.0% | - | 0.0% |
| Duplicate | 170 | 0.2% | 71 | 0.1% | 172 | 0.2% |
| Excluded | 359 | 0.5% | 1 | 0.0% | 2 | 0.0% |
| **Total** | **72,060** | **100.0%** | **82,200** | **100.0%** | **100,444** | **100.0%** |

*Notes:* Values in millions of CPI-deflated 2013 U.S. dollars.

At the end of all these efforts of data-checking and cleaning, we manage to use more than 80% of the transactions and value of the transactions coming from the raw D-151 forms. For the second half of the sample period, we manage to use over 90% of the data, which is consistent with firms learning how to file the D-151 form without mistakes. Moreover, the transactions that we lose are either rejected, duplicated, or excluded (especially during the first years of our sample). Hence, the dropped transactions relate to reporting errors, not real transactions. Additionally, the transactions that are not used because they are categorized as "unsolved" are usually less than 10% of the total. It should be noted that their value represents a slightly larger percentage; that is because some of their mistakes involve ignoring the decimal point, which can overestimate the values of the transaction by several orders of magnitude.

Moreover, in a related paper, we show that the behavior of the Costa Rican production network is similar to that of the production networks of Japan and Belgium (see Alfaro-Ureña, Fuentes, Manelici, and Vasquez, 2018). This is reassuring as to quality of the firm-to-firm transaction data from Costa Rica.

As mentioned at the beginning of Section 3.1, we only consider "first-time supplying to an MNC" events occurring between 2010 and 2015. We choose 2010 as the starting year because we aim for a reliable measure of the year when a domestic firm sells to its first MNC buyer. 2008 was the first year when the D-151 tax form (the base for the firm-to-firm transaction dataset) could be filed electronically. However, as 2008 was the year of transition to the digitized form, firms were still allowed to file the form on paper. We therefore suspect that the 2008 dataset is incomplete.[x] Even if a firm is observed as selling to an MNC in 2009 but not in 2008, we cannot rule out that this firm was selling to MNCs in 2008 as well (filing the form on paper in 2008). To improve the measurement of the first year of supplying to an MNC, we

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[x]This is likely to explain the lower data coverage for 2008 that we report in Tables F3 and F4.

treat as first matches only those occurring after 2010 for domestic firms that had not sold to an MNC in both 2008 (the year of transition to electronic filing) and 2009 (the first year mandatory electronic filing). We stop with 2015 to be able to observe each firm at least two years after its event.

**Online Appendix F.1.3  Foreign Ownership Data**

In Costa Rica, there is no centralized and complete reporting of the country of origin of firms' capital. To overcome this data limitation, we combine information from various sources.

Our first source is the reporting of firms that are active under the Free Trade Zone (FTZ) regime. Costa Rica has followed a strategy of pursuing FDI investment by offering benefits to firms established in FTZ regimes. As summarized in OECD (2017), the FTZ regime exempts beneficiary firm from custom duties on imports and exports, the withholding tax (on royalties, fees, dividends), interest income, the sales tax on local purchases of goods and services and the stamp duty. In addition, the FTZ regime exempts profits from corporate income tax for eight years and provides a 50% corporate income tax reduction during the following four years, but differences exist depending on the types of activities and the location of the FTZ. Profits from sales to the domestic market are taxed under separate tax rules. Firms that may apply for the FTZ regime must be either (i) export service firms (at least 50% of services must be exported), (ii) scientific research firms (firms or organizations), (iii) "strategic firms" or part of "strategic sectors" or (iv) "significant suppliers" (at least 40% of their sales are made to FTZ firms). Due to those benefits, firms have to comply with full reporting of their sources of capital. This information is collected by Procomer and made available to BCCR for statistical purposes.

A complementary source of information is the Costa Rican Investment Promotion Agency (CINDE), which is a a private, non-profit organization that started its operations in 1982. CINDE has mediated the entry of more than 300 foreign-owned firms in Costa Rica, such as Intel, Procter&Gamble, Hewlett Packard, or St. Jude Medical.[xi] CINDE shared with us information on the foreign ownership of firms they attracted. This set of foreign-owned firms contains both firms in the FTZ regime and firms that did not qualify for this regime.

Beyond the foreign-owned firms in FTZs and foreign-owned firms attracted by CINDE, there are limitations to the knowledge of foreign ownership of the remaining firms in the economy. BCCR carries out three surveys that serve as sources of complementary information on flows and sources of capital for foreign-owned firms.

1. *Encuesta Trimestral de Balanza de Pagos*, or the "Quarterly Balance of Payments Survey": collects information on a sample of large firms (currently 250 to 300 firms) about their country of origin and percentage of foreign ownership.

2. *Encuesta Anual*, or the "Annual Survey": similar to the quarterly survey, but administered on a yearly basis. It contains a sample of 50 to 100 firms.

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[xi]CINDE was awarded in 2018 for the fourth consecutive year as the "Best Investment Promotion Agency" of Latin America and the Caribbean in a ranking compiled by the *Site Selection* magazine.

3. *Estudio Economico*, or the "Economic Study": when Costa Rica updated the system of national accounts, BCCR surveyed thousands of firms. Out of those, it identified and started tracking close to 944 firms having received foreign capital. For those firms, the "Economy Study" tracks the percentage of foreign ownership.

Our last source of information is Orbis, a commercial product belonging to Bureau Van Dijk.[xii] We queried Orbis for all MNCs (*Global Ultimate Owners* in Orbis nomenclature) that have a presence (affiliate or branch) in Costa Rica, identifying the names and IDs of firms in Costa Rica and abroad, including intermediate ownership. As mentioned in Online Appendix F.1.1, Orbis allowed us to expand our knowledge of firm and corporate groups in Costa Rica. Orbis was also used to identify which of the foreign-owned firms in Costa Rica are actually part of an MNC group and which ones are single location firms. For foreign firms for which this information was not available in Orbis, we carried out extensive manual searches.

After cross-checking all sources, we have identified 3,855 tax IDs that are part of a corporate group in which there are tax IDs with partial or full foreign ownership. To obtain a sample comparable to that of our domestic firms, we apply the same criteria used in Online Appendix F.1.1. We exclude NGOs, governmental entities (e.g., embassies) and households, so as to focus on private firms alone. After adding the information on the different layers of shared ownership, we arrive to 2,171 firm groups that are part of a corporate group with at least partial foreign ownership (see Online Appendix F.1.1 for details on the difference between firm groups and corporate groups).

As motivated in Section 2.2, not all of these 2,171 firm groups are suitable for our analysis. Out of these 2,171 firm groups we create three mutually exclusive sets: (i) firm groups that are entirely domestically-owned (despite being part of corporate groups where another firm group is partially foreign-owned), (ii) firm groups that are themselves at least partially foreign-owned but whose median of workers is under 100 workers (across all years of activity in the country), and (iii) firm groups that are themselves at least partially foreign-owned and whose median of workers is over 100 workers.

Given our interest in measuring the performance gains of joining MNC supply chains, we focus on the 622 firm groups in category (iii), that are actual MNC affiliates and that have a substantial economic presence in the country. The fully domestically-owned firm groups in category (i) operate in different sectors than those of firm groups that are partially-owned and part of their same corporate group. Given the loose connection between firm groups part of the same corporate group, particularly when not in the same sector, we do not consider them for analysis. The typical firm in category (ii) is not an MNC affiliate (but a single-location firm with partial foreign-ownership) and serves local demand, either in service sectors (e.g., hotels) or in sectors with low domestic input requirements (e.g., import/export retail or real estate agencies). For these reasons, we also do not consider firms in the category (ii) for analysis.

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[xii]The financial and balance sheet information in ORBIS comes from business registers collected by the local Chambers of Commerce to fulfill legal and administrative requirements (Kalemli-Özcan, Sørensen, Villegas-Sanchez, Volosovych, and Yeşiltaş, 2015).

Another important advantage of focusing only on firms in category (iii) is that it allows us to circumvent issues related to FDI statistics, such as the rising use of shell companies. Shell companies, or "special purpose entities (SPEs) are companies that do not have substantial economic activity in a country but are used by companies as devices to raise capital or to hold assets and liabilities. SPEs can lead to the inflation of FDI statistics" and obscure the ultimate purpose of FDI (OECD, 2017).

In Table F5 we present descriptive statistics for three types of firms (firm groups): (a) the sample of domestic private firms that are part of the non-financial market economy (if part of a corporate group, this group is fully domestically-owned), (b) firms that are part of a corporate group with partial foreign ownership that are not large MNC affiliates and not considered for analysis (puts together categories (i) and (ii) defined in the previous paragraph), or (c) the sample of MNC affiliates considered for analysis (category (iii) above). Category (a) is the same one described in Table F1. The firms that are part of corporate groups with partial foreign ownership and that are excluded from the analysis are significantly larger than domestic firms, while (large) MNCs are themselves an order of magnitude larger than the excluded firms part of corporate groups with partial foreign ownership.

While restrictions on the MNC status and median number of workers might seem costly for the number of firms kept – out to the respective totals for the full sample of 2,171 firms part of a corporate group with partial foreign ownership – these 622 MNCs are actually responsible for most of the foreign activity in Costa Rica. Table F6 presents totals adding up values for all firms part of the non-financial market economy, domestic- and foreign-owned alike. Columns (B) and (C) present the percentage of those values that are accounted for by firms part of a corporate group with partial foreign ownership and (large) MNCs, respectively. The last column shows that for most of the variables, the MNCs that we use for our empirical exercises account for over 75% of the totals across all firms part of a corporate group with partial foreign ownership. Hence, the criteria leading to the sample of 622 MNCs are not restrictive in terms of their coverage of the full sample of firms associated with foreign ownership.

## Table F5: Descriptive Statistics by Firm Ownership

|  | # Firms | Mean | S.D. | Median |
|---|---|---|---|---|
| **Fully domestic firms** | | | | |
| Total Sales | 78,137 | 495.1 | 3,114.9 | 118.3 |
| Employment | 76,372 | 7.2 | 32.2 | 2.4 |
| Wage bill | 76,650 | 53.4 | 300.7 | 12.6 |
| Exports | 4,487 | 451.7 | 2,804.2 | 23.6 |
| Imports | 21,521 | 224.1 | 1,579.7 | 13.8 |
| Value Added | 74,985 | 113.8 | 590.2 | 34.9 |
| Input Costs | 67,739 | 320.8 | 2,542.3 | 24.6 |
| Total Net Assets | 69,098 | 407.1 | 5,825.3 | 55.7 |
| **Firms part of corporate groups with partial foreign ownership** *Excluding (Large) MNCs* | | | | |
| Total Sales | 1,549 | 7,863.3 | 65,002.5 | 1,042.5 |
| Employment | 1,538 | 51.6 | 353.5 | 13.2 |
| Wage bill | 1,539 | 634.2 | 3,905.0 | 158.8 |
| Exports | 544 | 1,933.1 | 9,343.1 | 73.8 |
| Imports | 1,037 | 1,936.1 | 7,151.8 | 117.1 |
| Value Added | 1,527 | 1,778.3 | 12,939.6 | 298.8 |
| Input Costs | 1,453 | 5,477.5 | 52,538.1 | 236.1 |
| Total Net Assets | 1,533 | 8,222.8 | 45,932.0 | 969.1 |
| **(Large) MNCs** | | | | |
| Total Sales | 622 | 42,746.4 | 10,3204.9 | 12,205.1 |
| Employment | 622 | 380.7 | 882.3 | 170.0 |
| Wage bill | 622 | 5,093.2 | 10,282.1 | 2,228.8 |
| Exports | 473 | 19,458.7 | 88,196.7 | 1,689.2 |
| Imports | 606 | 14,738.3 | 70,525.4 | 1,522.7 |
| Value Added | 621 | 12,561.7 | 52,734.4 | 3,956.0 |
| Input Costs | 601 | 24,510.0 | 59,848.6 | 4,084.2 |
| Total Net Assets | 619 | 40,518.1 | 81,037.5 | 10,450.4 |

*Notes:* With the exception of the number of workers, the mean, standard deviation, and median are in thousands of CPI-deflated 2013 U.S. dollars. These statistics are averages across 2008 to 2017.

## Table F6: MNC Sample Coverage

| | (A) Total | (B) All firms part of corporate groups w/ partial foreign owner. | (C) (Large) MNCs | (C)/(B) |
|---|---|---|---|---|
| Total Sales | 77,450.5 | 50.1% | 34.3% | 68.6% |
| Number of Workers | 868.5 | 36.4% | 27.3% | 74.9% |
| Wage Bill | 8,236.4 | 50.3% | 38.5% | 76.4% |
| Exports | 12,282.4 | 83.5% | 74.9% | 89.7% |
| Imports | 15,762.3 | 69.4% | 56.7% | 81.6% |
| Value Added | 19,050.5 | 55.2% | 40.9% | 74.2% |
| Input Costs | 44,417.2 | 51.1% | 33.2% | 64.9% |
| Total Net Assets | 65,819.0 | 57.3% | 38.1% | 66.6% |

*Notes:* Number of workers in thousands. All other variables are in millions of CPI-deflated 2013 U.S. dollars. These statistics are averages across 2008 to 2017.

## Table F7: Country of Global Ultimate Ownership

| Country of GUO | Frequency | Percent | Cumulative |
|---|---|---|---|
| United States | 328 | 52.73 | 52.73 |
| Panama | 35 | 5.63 | 58.36 |
| Great Britain | 23 | 3.70 | 62.06 |
| Mexico | 21 | 3.38 | 65.43 |
| Spain | 20 | 3.22 | 68.65 |
| Colombia | 16 | 2.57 | 71.22 |
| Chile | 15 | 2.41 | 73.63 |
| Netherlands | 15 | 2.41 | 76.05 |
| Germany | 14 | 2.25 | 78.30 |
| France | 14 | 2.25 | 80.55 |
| Canada | 13 | 2.09 | 82.64 |
| Japan | 10 | 1.61 | 84.24 |
| Guatemala | 9 | 1.45 | 85.69 |
| El Salvador | 9 | 1.45 | 87.14 |
| Ireland | 7 | 1.13 | 88.26 |
| … | … | … | |
| Total | 622 | 100 | |

*Notes:* Table F7 reports the countries of global ultimate ownership (GUO) that correspond to at least seven of the 622 MNCs in the final sample. 53% of MNCs have the United States as their country of GUO.

## Online Appendix F.2   Procomer "Productive Linkages" Data

### Online Appendix F.2.1   Data Cleaning and Sample Construction

We were granted access to the records of Procomer (the Trade Promotion Agency of Costa Rica) that track its implementation of "Productive Linkages:" a matchmaking program between MNCs and domestic firms. At its origins in 1999, the program was supported by the Inter-American Development Bank and was known as the "Supplier Development Project for High-Technology MNCs." The program has since undergone several changes to its name (*Costa Rica Provee* or *"Costa Rica Supplies"* was its longest-lasting name) and, to a lesser extent, to its organizational structure. That said, on its key aspects, the program has not been significantly altered since 2001.[xiii] This allows us to consider matches mediated by Procomer since 2001 as receiving a similar treatment.

This confidential data could only be stored and accessed in a fully-secured location at the Central Bank of Costa Rica. Before making use of the Procomer records, we first had to complete three main tasks:

1. Carefully assign tax IDs to firms, as in most Procomer data sources firms were identified through a (non-standardized) version of their name. Without assigning a unique tax ID to each firm, one could not combine the various Procomer data sources and merge the result with administrative data sources.

2. Digitize those parts of the data shared as PDFs (mostly summaries of firm evaluations, approximately 650 PDFs) or archived emails (approximately 8,000 emails).

3. Check both the internal consistency of Procomer's records and their accuracy (e.g., the occurrence and amount of a certain transaction) in the firm-to-firm transaction data. We found reassuring overlaps between Procomer records and administrative records.

After concluding these tasks, we learned that Procomer had successfully mediated 1,985 deals between 2001 and 2016. For all deals, we observe the buyer and winning supplier, the year the deal was made, its amount, and a description of the good or service traded. These 1,985 deals correspond to 560 unique suppliers and 324 unique buyers.[xiv] Commonly purchased goods include machinery, plastic accessories, and chemical products. Among services, metalworking, software development, and plant and equipment maintenance are the most frequent.

The archived emails allowed us to reconstruct the shortlists for which there was no centralized record. Whenever there was no systematic archiving of the shortlists shared by Procomer with MNCs, we re-constructed them with the help of Procomer staff, by applying the

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[xiii]For more details, see Monge-González and Rodriguez-Álvarez (2013).

[xiv]Despite an exhaustive search, we were not able to find the tax ID of two of these firms. For obvious reasons, these firms and the deals they participated in cannot be used in the analysis.

rules originally used to generate them.[xv]

We add 1,149 evaluations undertaken by Procomer between 2004 and 2015. Each evaluation involves a firm visit from a Procomer assessor and a detailed survey. Recent surveys are organized around five modules: productive capacity, market capacity, cooperation, R&D capacity, and quality.[xvi] For example, the quality module asks whether the firm has both general quality management certificates (e.g., ISO-9001) and sector-specific certificates (e.g., ISO-13485, quality management requirements for organizations producing medical devices and related services). The cooperation module asks whether the firm has employees able to negotiate in the language relevant to the market it targets.

Each evaluation is concluded with an absolute score, a letter grade category based on this absolute score, and recommendations on which Procomer program the firm is fit to benefit from. The program we study here ("Productive Linkages" or *Linkage*, as abbreviated by Procomer) is one option of follow-up. Figure F6 provides an anonymized example of the actual summary of an evaluation of a firm manufacturing plastic bags.

These 1,149 evaluations refer to 921 distinct firms. Firms with multiple attempted deals are more likely to have multiple evaluations, as Procomer aimed to keep scores updated for active candidates. To compare winning and losing candidates for a deal, we use the absolute score of their most recent evaluation carried out prior to that deal.

Before setting the final set of rules that define the sample for the "winner vs. losers" research design, more context on the motivations and implementation of the "Productive Linkages" program was needed. To that end, we carried out extensive interviews with both contemporary and past Procomer staff, as well as with MNCs and domestic firms participating in the "Productive Linkages" program (see description of firm surveys in Online Appendix G). The main takeaway from these interviews was that in order to implement a clean "winner vs. losers" design, one had to study only deals meeting several strict criteria.

First, while the objective of "Productive Linkages" was to link domestic suppliers to MNC buyers, Procomer sometimes fostered linkages for suppliers that were foreign and/or for domestic buyers. Having been already had deals through Procomer in the past also did not disqualify a firm from joining future shortlists. The objective of Procomer was to share with each MNC a shortlist that contained the most competent firms to supply the demanded input.

Our interest lies in the impact of the first "Productive Linkages" deal of a domestic firm with an MNC. For this reason, we only consider the first such deals. To be precise, for firms that are only matched in one year by Procomer we keep all deals occurring that year. For firms

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[xv]For each deal, Procomer considered only firms that were either in the same four-digit ISIC sector or in the same sector category of the "suppliers database" of CINDE. All candidates needed to have been evaluated by Procomer prior to the deal and, hence, have a *Procomer score*. "Productive Linkages" only considered shortlists of up to five candidates. Shortlists could contain less than five candidates in cases in which (i) the scores of the last ranked firms were much worse than those of the highest scored candidate, or (ii) there were fewer than five firms in the needed supplying sector. In sum, for each deal, we use up to five of the highest-scoring firms satisfying the sectoral condition, as long as the difference between each firm's score and the highest score in that shortlist is less than 20 points.

[xvi]While the structure of the survey evolved across time, there is considerable continuity in the themes covered.

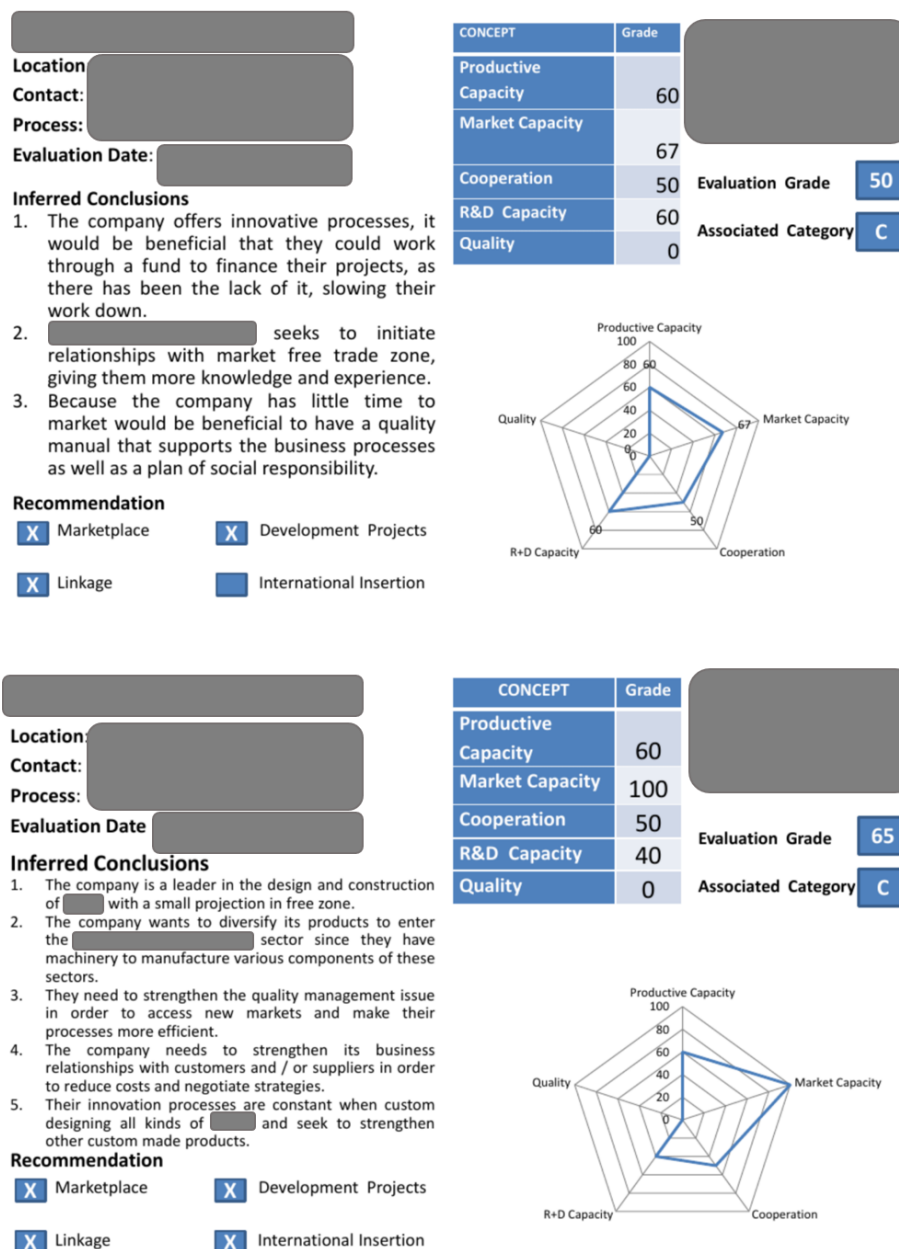with deals in several years, we only keep the deals occurring in the first year.



**Top summary sheet:**

Location:
Contact:
Process:
Evaluation Date:

| CONCEPT | Grade |
|---|---|
| Productive Capacity | 60 |
| Market Capacity | 67 |
| Cooperation | 50 |
| R&D Capacity | 60 |
| Quality | 0 |

Evaluation Grade: 50
Associated Category: C

**Inferred Conclusions**
1. The company offers innovative processes, it would be beneficial that they could work through a fund to finance their projects, as there has been the lack of it, slowing their work down.
2. ▮▮▮ seeks to initiate relationships with market free trade zone, giving them more knowledge and experience.
3. Because the company has little time to market would be beneficial to have a quality manual that supports the business processes as well as a plan of social responsibility.

**Recommendation**
[X] Marketplace    [X] Development Projects
[X] Linkage        [ ] International Insertion

**Bottom summary sheet:**

Location:
Contact:
Process:
Evaluation Date:

| CONCEPT | Grade |
|---|---|
| Productive Capacity | 60 |
| Market Capacity | 100 |
| Cooperation | 50 |
| R&D Capacity | 40 |
| Quality | 0 |

Evaluation Grade: 65
Associated Category: C

**Inferred Conclusions**
1. The company is a leader in the design and construction of ▮▮ with a small projection in free zone.
2. The company wants to diversify its products to enter the ▮▮ sector since they have machinery to manufacture various components of these sectors.
3. They need to strengthen the quality management issue in order to access new markets and make their processes more efficient.
4. The company needs to strengthen its business relationships with customers and / or suppliers in order to reduce costs and negotiate strategies.
5. Their innovation processes are constant when custom designing all kinds of ▮▮ and seek to strengthen other custom made products.

**Recommendation**
[X] Marketplace    [X] Development Projects
[X] Linkage        [X] International Insertion

**Figure F6: Anonymized Summary Sheets of the Evaluations of Two Domestic Firms**

*Notes:* The two figures above are anonymized summary sheets of two actual Procomer evaluations. Each summary sheet is based on a survey asking detailed questions on each of the five modules appraised by Procomer: productive capacity, market capacity, cooperation, R&D capacity and quality. For example, the quality module asks whether the firm has both general quality management certificates (e.g., ISO-9001) and sector-specific certificates (e.g., ISO-13485, quality management requirements for organizations producing medical devices and related services). The cooperation module asks whether the firm has employees able to negotiate in the language relevant to the market it targets. Each evaluation is concluded with an absolute score, a letter grade category based on the range of the absolute score and recommendations on which Procomer program the firm is fit to benefit from. The "Productive Linkages" program is one option of follow-up. The top summary sheet belongs to a firm that seeks to initiate business relationships with MNCs in a Free Trade Zone (FTZ), with the hope of acquiring knowledge and experience. The bottom summary sheet pertains to a firm diagnosed as having to make its processes more efficient; Procomer assesses that this boost in efficiency can be obtained through stronger buying and selling relationships [..with MNCs part of the FTZ].

Whenever the event was triggered by more than one MNC buyer, the amount associated to the event is the sum of all amounts sold to MNCs that year. We dismiss events for which this sum is less than 5,000 U.S. dollars, as to maintain a comparable "observability" threshold as in the firm-to-firm transaction data.

Moreover, we also drop first deals where (i) losers had already experienced deals with MNCs prior to the relevant deal (the deal where they are losers), or where (ii) losers start supplying to MNCs in the two years after the relevant deal. Otherwise, losers do not provide a valid counterfactual for the winner, as they have already experienced an event or are experiencing one contemporaneously. Allow them in the sample would obscure the interpretation of the behavior of winner outcomes relative to losers' outcomes.

Last, we only study first deals brokered by Procomer between 2009 and 2015 because (i) the corporate income tax returns and firm-to-firm transaction datasets only start in 2008 and we want to be able to cross-check Procomer records with these administrative datasets, and (ii) we need at least two years' worth of administrative data after the deal to study its effects. Applying all these restrictive conditions leaves us with 31 events that involve 31 distinct domestic winners, 84 domestic losers (of which 51 distinct),[xvii] and 53 distinct MNCs triggering these 31 events.

## Online Appendix F.2.2 Descriptive Statistics of Final Sample

In this section we present descriptive statistics on the Procomer sample of analysis. Table F8 compares winners and losers in the year before the relevant deal (the deal won by the winner or the deal to which the loser was a contender). This table fails to find statistically significant differences between winners and losers across several measures of firm performance built on data coming from different sources: corporate income tax returns data, firm-to-firm transaction data, and records of Procomer scores. Nevertheless, one can note that losers tend to be larger than winners. This aligns with anecdotal evidence from Procomer staff: sometimes deals did not materialize with the losers because losers were attending to other business at the exact moment at which the potential MNC buyer required their full attention. Such situations granted opportunities to smaller firms to win those MNC deals.

One may be concerned that Procomer scores are not informative about firm performance. For instance, one may fear that government officials are unable to correctly assess firm capabilities or that they may have ulterior motives to provide a too high or too low score to specific firms (to draw the attention of MNCs to their preferred candidates). Figure F7 plots the rela-

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[xvii]One might be concerned that the fact that some firms may belong to several shortlists is driven by Procomer staff trying to promote those firms against their merit. From interviews with Procomer staff, domestic firms, and MNCs we concluded this concern is most likely not justified for two reasons. First, MNCs were not obliged to purchase from any given supplier proposed by Procomer or to even purchase through Procomer to begin with. If a supplier did not meet the needs of the MNC, that supplier would not be chosen. Moreover, a recurrent theme during our interviews with Procomer staff was that of a need to build a strong positive reputation for domestic suppliers. Had firms undeserving of their score been added to shortlists, this would have jeopardized Procomer's attempt to create this positive reputation.

tionship between the Procomer score of firms and their value added per worker (in thousands of U.S. dollars) in the year before the relevant "Productive Linkages" deal (i.e., the deal for which a given firm is either a winner or loser). The value added per worker is computed using administrative data alone. We make the distinction between losers and winners, to check whether there is any systematic difference in the assessment of losers vs. winners.

Table F8: Comparison Between Winners and Losers in Year Before Deal

|  | Winners (1) | Losers (2) | Difference (3) |
|---|---|---|---|
| Employment | 43.79 | 69.06 | -25.27 |
|  | (61.12) | (83.79) | (16.48) |
| Value-added per worker | 13.30 | 19.48 | -6.18 |
|  | (8.01) | (17.22) | (3.22) |
| Total transactions per worker | 52.15 | 64.82 | -12.67 |
|  | (42.60) | (76.89) | (14.60) |
| Number of buyers per worker | 1.69 | 2.06 | -0.37 |
|  | (1.51) | (2.91) | (0.55) |
| Procomer score | 84.16 | 86.03 | -1.88 |
|  | (10.48) | (7.33) | (1.74) |
| # Winners | 31 | - | - |
| # Losers | - | 84 | - |

*Notes:* Table F8 presents summary statistics describing winners and losers in the year prior to the relevant deal (deal won by the winner or deal to which the loser was a contender). Column (3) reports the difference between winners' and losers' values. Value-added per worker and total transactions per worker are measured in CPI-deflated 2013 U.S. dollars. Robust standard errors in parentheses.
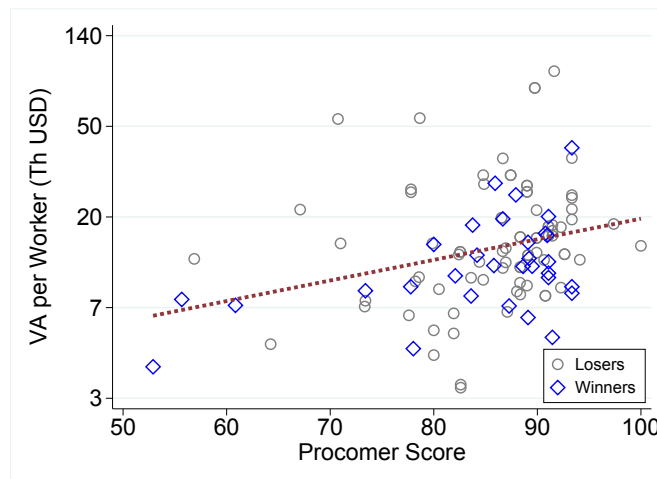


Figure F7: Relationship between Procomer Score and Value Added Per Worker

*Notes:* Figure F7 plots the relationship between the score assigned to firms by Procomer and their value added per worker (in thousands of CPI-deflated U.S. dollars) in the year before the relevant "Productive Linkages" deal (i.e., the deal for which a given firm is either a winner or loser). The figure makes the distinction between losers and winners, to investigate whether there is any systematic difference in the scoring of losers vs. winners. This figure only focuses on the sample of "Productive Linkages" deals used in the analysis.

We note that there is no systematic pattern assigning high scores to low value-added firms or vice versa. There is a clear positive correlation between the Procomer score and the value-added per worker, which means scores are informative on firm performance. That said, this correlation is far from 1. Rather than posing a problem, we interpret this to be evidence in favor of the usefulness of the Procomer score: its main advantage is that Procomer evaluates firms on features that are unobserved in our administrative data and that, while not reflected in the value-added per worker of the firm, are relevant to MNCs.

Table F9 reports summary statistics on the first relationship with an MNC buyer mediated by the "Productive Linkages" program. We notice that these mediated relationships are comparable to those in our baseline sample of unmediated economy-wide first-time supplying relationships (see Table E5 in Online Appendix E).

Table F9: Descriptive Statistics of Relationship with First MNC Buyer For Winners in Sample of Deals Mediated by 'Productive Linkages" Program

|  | N | Mean | Median | S.D. |
|---|---|---|---|---|
| First transaction with MNC (thous. of U.S. dollars) | 31 | 53.45 | 29.53 | 81.16 |
| Length of relationship with first MNC buyer (years) | 31 | 3.87 | 3.00 | 2.66 |

*Notes:* Table F9 provides descriptive statistics of the first relationship with an MNC mediated by the "Productive Linkages" program. The first row reports summary statistics of the amount sold to this MNC buyer in the first year of the relationship. The second row describes the overall length of this relationship (in years). These statistics characterize the sample of 31 "Productive Linkages" deals.

Figure F8 plots the frequency of shortlists containing two, three, four, and five candidates in the sample of "Productive Linkages" deals used in the analysis. Most shortlists proposed to MNCs contained four candidates.
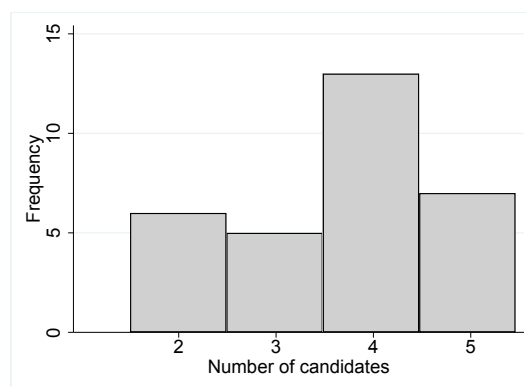


Figure F8: Distribution of Shortlist Length for Sample of Deals

*Notes:* Figure F8 plots the frequency of shortlists containing two, three, four, and five candidates in the sample of "Productive Linkages" deals used in the analysis.

# Online Appendix G    Surveys

## Online Appendix G.1    Survey Design and Implementation

We targeted with surveys the domestic firms in three groups. First, we targeted a 20% random sample of the 3,813 domestic firms experiencing an event in the economy-wide sample (3,813 firms that experienced a first-time supplying event with an MNC between 2010 to 2015), that is, 762 domestic firms. Second, we targeted *all* the winning firms in the "winner vs. losers" Procomer sample (31 firms). Last, we targeted *all other* domestic firms that started supplying to MNCs through Procomer (385-31=354 firms). It was essential to include the first sample, as it is the one generating our baseline results. The second sample is the basis of one of our main robustness checks. Most of the firms in the last sample are experienced suppliers and can bring a long-term perspective on their relationships to MNCs. In addition to the domestic firms in these three groups, we also targeted *all* the MNCs that served as first MNC buyers to these domestic firms (471, 53, and 163 respectively).[xviii]

Surveys had two core objectives: inquire on specific threats to identification and shed light on features of linkages between MNCs and their new suppliers that are unobservable in administrative data. We designed four surveys: two for domestic firms and two for MNCs. For each type of firm (domestic or MNC), we wrote a short and a long version of the survey. The *short version* of the survey focuses only on the core topics. The *long version* requests more details on the core topics, in addition to more information useful for context.

The co-authors of this project designed the survey instruments. BCCR, Procomer, and CINDE provided feedback that improved the initial drafts.[xix] We first wrote the questionnaires in English. Once we refined the order, structure, and wording of questions, a native Spanish speaker translated the questionnaires. We only conducted one round of surveys, all of which took place between June and September of 2018.

*Long version.* Long surveys were conducted in person and lasted 45 minutes to an hour. Procomer or CINDE established the first contact with firms by email. The email contained an official letter from BCCR describing the study and guaranteeing a fully-secured treatment of the data collected. Once a firm agreed to participate, our team would be granted permission to contact the firm directly in order to set up the survey meeting.[xx]

We decided to apply the long version of the survey to the firms involved in the "winner

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[xviii]These three sets of MNCs are overlapping as the same MNC can trigger events of the three types: economy-wide (unmediated), mediated by Procomer after 2009 and in our sample of analysis, or mediated by Procomer in any year and not part of our sample of analysis. Note also that some MNCs trigger events for more than one supplier; that explains why the number of MNCs triggering events can be smaller than the number of domestic firms experiencing the events. That said, it can also be that some suppliers sell to more than one MNC in the first year in which they sell to at least one MNC (the year of the event); that explains why the number of MNCs triggering events can also be larger than the number of domestic firms experiencing the events.

[xix]All three entities frequently survey firms in Costa Rica.

[xx]Procomer contacted domestic suppliers and MNCs part of their "Productive Linkages" database. CINDE contacted MNCs under the Free Trade Zone regime. Unless a firm agreed to participate in the survey, the email address of their contact was not revealed to our team.

vs. losers" design, that is to the 31 domestic suppliers experiencing the eligible Procomer events and the MNC buyers that triggered those events. This choice has two advantages. First, these are firms for which we had more reliable contacts (from either Procomer or CINDE); this improved the chance of a positive response to our request. Second, all of these firms had other deals (with domestic suppliers/MNCs) that were not mediated by Procomer. Applying the long version of the survey to these firms allowed us to inquire whether deals mediated by Procomer were different or not from unmediated deals.

The first in-person surveys served as the pilot, allowing the team to test not only the questionnaire, but also the survey protocols and logistics. For this reason, at least one of the co-authors joined these first meetings. Once this piloting phase ended, a team of two enumerators split the remaining in-person surveys among themselves. In the summer of 2018, both enumerators were in their final year of undergraduate studies in economics at the main national university. Enumerators went unaccompanied to their meetings, to avoid any risk of answers being influenced by either a Government official or our team.

The team agreed with BCCR, CINDE, and Procomer to share only the aggregated findings of the surveys. Enumerators made sure that firms knew that their specific answers were not to be shared with these public entities. This measure was meant to create an environment of trust and elicit truthful responses. Also, as almost all questions did not refer to the "Productive Linkages" program but focused on MNC-supplier relationships more broadly, enumerators clarified that surveys were not meant for program evaluation.

*Short version.* Short surveys were designed to be filled in online through a Google Form and take 15 to 20 minutes. The person filling in the survey would do so in the absence of any Government official or team member. In the invitation email, we included an official phone number and email address, in case the firm had any inquiries. We received few inquiries - of those, most were concerned whether the survey was legitimate or an imposture.

The invitation to participate in the online survey was sent to the firms that we targeted from the economy-wide sample of events (762 domestic firms and 471 MNCs) and to the firms involved in Procomer events that are not part of our sample of analysis (354 domestic firms and 163 MNCs).[xxi]

Depending on the firm, the invitation was sent by Procomer, CINDE, or BCCR. Procomer and CINDE had readily-available email addresses of specific key employees in each firm. As Procomer and CINDE contacted firms in their portfolio, this also reassured firms on the intention of the survey. Both factors significantly increased the likelihood of an answer.

BCCR contacted firms in the economy-wide restricted sample. Our team had to search for appropriate contacts from scratch. This step was the most challenging in the implementation of the surveys. Whenever firms could be found online with more than a phone number and a physical address, the most direct contact available was either a general email address (e.g., info@firm.cr) or a contact form on the website. To increase the likelihood of an answer, the

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[xxi]Again, note that while the sets of domestic firms in these different samples are disjoint, the sets of MNCs triggering the events are not.

two enumerators made calls to all firms with a phone number, describing the survey and requesting a direct email address of the person most qualified to answer the survey. Despite calls being made from an official BCCR number, many firms distrusted the calls and refused to share a personal email address.

We made up to six attempts to contact each firm. Depending on the available/preferred mode of contact, these attempts were either callbacks or email reminders. An unexpected challenge for the short survey came from the fact that certain corporate anti-virus software directed our email to the spam folder of the recipient, as it contained the link to the survey. Recipients were also advised against clicking on the link, to avoid phishing or malware downloads. Receiving the email from an official email address was not sufficient reassurance for some firms. One goal behind our persistent attempts was to bring reassurance on the safety of participating in the survey.

It is important to emphasize that surveys to both MNCs and domestic suppliers required specific knowledge about relationships between MNCs and domestic suppliers. Our ideal respondent was the employee whose job attributes and tenure with the firm allowed him/her to provide the most accurate answers. Questions to MNCs did not require the respondent to witness the first linkage to a specific domestic supplier. However the respondent had to be well-informed on the local procurement practices of the MNC. For this reason, we aimed to survey the supply chain (procurement, operations) manager of each MNC.

For domestic suppliers, part of the questions was retrospective. This required from the respondent to have worked at the firm before and during the first deals with MNCs. Given this constraint and the fact that most firms are small family-owned businesses, the ideal respondent was the founder of the firm (who is typically the general manager as well). The retrospective nature of the survey to domestic suppliers is unlikely to have jeopardized answer quality for two reasons. First, most questions did not ask for specific details on the first deal with an MNC, details which might otherwise be affected by the time lag. Second, survey answers show that the first deals with MNCs were transformative for the domestic firm. Thus, it is unlikely for the firm founder to misremember the circumstances of those deals.

We went to great lengths to identify the most suitable respondent inside each firm and make sure this person actually answered the survey. The supply chain manager of the MNC and the owner of the domestic firm are typically busy and inaccessible. Most firms do not even publicize the names of people in these positions, as to avoid their being pursued with unsolicited business proposals. It took considerable effort to ensure that our survey was known to and answered by the right person within each firm.

## Online Appendix G.2   Survey Response Rate and Representatives

In Table G1 we report the number of firm responses to our four surveys: the two versions of the survey to domestic firms (the long and the short) and the two versions of the survey to

Table G1: Number of Firm Responses

| Number of responses | Long survey | Short survey | Total |
|---|---|---|---|
| Domestic | 15 | 91 | 106 |
| MNCs | 23 | 35 | 58 |
| Total | 38 | 126 | **164** |

*Notes:* This table summarizes the number of survey responses by survey version (long or short) and target (domestic supplier or MNC). Out of a total of 164 completed surveys, 38 were completed in person and 126 online. Out of the same total of 164 completed surveys, domestic suppliers filled in 106 and MNCs filled in 58.

MNCs (again, the long and the short).

*Response rate for MNCs.* These 58 MNCs have triggered a total of 645 (distinct) events out of our economy-wide sample of 3,813 events (or 17%). These 58 MNCs include 51 of the 471 MNCs triggering these 3,813 events (or 11%). For the Procomer sample of analysis, these 58 MNCs cover 21 of the 31 events of interest (or 68%) and include 21 of the 53 MNCs triggering these 31 events (or 40%). When we focus on Procomer events other than those in the sample of analysis, 32 of these 58 MNCs trigger 122 events of a total of 354 (other) Procomer events (or 34%). As a percentage of the number of MNCs having (other) deals mediated by Procomer, these 32 MNCs represent 20% (of a total of 163 MNCs).

Recall that the same MNC can trigger events in all three samples. Overall these 58 responses from MNCs trigger 788 (788=645+21+122) events or 19% of the 4,198 events targeted (4,198=3,813+31+354) and 11% of the 527 distinct MNCs targeted (the union of 471, 53, and 163 MNCs).

*Response rate for domestic firms.* Of the 106 domestic firms answering the survey, 34 are part of the economy-wide sample, 12 are part of the Procomer sample of analysis, and the remaining 60 are part of the Procomer sample of suppliers not keep for analysis.

Out of the 762 targeted domestic firms and their associated economy-wide events, we have a response rate of 4%.[xxii] If we refer to the overall sample of 3,813 domestic firms and their associated economy-wide events, we have a response rate of 1%. Note, however that only 762 of these 3,813 firms were actually contacted. Of the targeted 31 domestic firms and their associated winning events in the Procomer sample of analysis, our 12 responses cover 39%. When we focus on Procomer suppliers other than those in the sample of analysis, the 60 surveyed suppliers represent 17% of the total of 354 targeted suppliers (or events).

Overall, the 106 responses from domestic firms cover 9% of the total of 1,147 domestic firms (events) targeted (1,147=762+31+354).

*Combined response rate.* The combined response rate is defined as the percentage of events on which we have a survey response from either the domestic firm experiencing the event or the MNC triggering that event.

Of the 3,813 events that create our economy-wide sample, we have information on 650 events, or 17%. Of the 31 events in the Procomer sample of analysis, we have responses from

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[xxii]When it comes to domestic firms, percentages out of number of domestic firms or events are identical as each domestic firm is mapped one-to-one to an event.

either the supplier or the MNC buyer for 24 events, that is, 77% of events. Of the 354 events mediated by Procomer but not in the sample of analysis, we have responses from either the supplier or the MNC buyer for 160 events, that is, for 45% of events.

Of the total 4,198 the events (4,198=3,813+31+354) of interest, we have information from either the supplier or the MNC buyer for 834 (834=650+24+160) events, that is, for 20% of events.

Table G2: Summary of Firm Response Rates

| Sample | (1) Economy-Wide | (2) Procomer Sample | (3) Procomer Other | (4) All Samples |
|---|---|---|---|---|
| Version | Online | Face-to-face | Online | |
| Domestic (% targeted firms) | 4% | 39% | 17% | 9% |
| Domestic (% targeted events) | 4% | 39% | 17% | 9% |
| MNCs (% all firms) | 11% | 40% | 20% | 11% |
| MNCs (% all events) | 17% | 68% | 34% | 19% |
| Combined (% all events) | 17% | 77% | 45% | 20% |

*Notes:* This table summarizes the survey response rates by firm type (domestic supplier or MNC), as a percentage of either the relevant number of firms or events, and with respect to three firms/events samples (firms/events targeted and contacted of all the economy-wide sample, all firms/events in the economy-wide sample – targeted or not –, all firms/events in the Procomer sample of analysis, all other firms/events in the Procomer set of deals, not part of the sample of analysis). Note that all MNCs from the economy-wide sample and all firms/events in the Procomer set of deals were targeted and contacted. The only firms for which only a 20% sample was targeted and contacted were the domestic firms experiencing economy-wide events.

Table G2 summarizes the statistics just discussed. Three patterns stand out. First, comparing column (1) to columns (2) and (3) one notices the higher response rates achieved for firms in the Procomer database, relative to the firms in the economy-wide sample whose contacts we searched for ourselves online. This is due to the higher quality of the contacts in the Procomer database. Second, we have achieved significantly higher response rates for face-to-face surveys than for online surveys. This is due to a certain distrust of survey invitations sent by email and to be filled in by clicking on a link (that the receiver fears to be a virus). Third, when one allows for an event to be described by either the domestic supplier experiencing the event or by the MNC triggering it, we reach a higher overall coverage of events.

While the response rate might appear low (particularly for the online surveys to domestic firms in the economy-wide sample), one should consider the following factors. Business surveys are often challenged with low response rates. Whenever businesses are not mandated to take part in a survey, they often refuse to disclose proprietary information. The type of

firms targeted by our surveys are either MNCs (hence firms with strict confidentiality rules) or domestic firms (of which, many preoccupied about revealing their trade secrets or suspicious over being contacted by email). Our survey was also not incentivized. Given the type of firms we targeted, it was unfeasible to provide a financially-meaningful incentive. Last, it was essential to the success of our survey for it to be filled in by the appropriate person within each firm. This factor was an important constraint to us, as it was generally difficult to reach these firms and particularly so, to reach key employees.

*Representativeness of domestic firm respondents.* In Table G3 we compare the 106 domestic firms that have participated in our survey to the 4,092 domestic firms of interest who have not participated. Recall that most of these 4,092 non-respondents have not been actually contacted, as we have only contacted a 20% random sample of the 3,813 domestic firms experiencing economy-wide events. We pool across firms coming from the three samples (economy-wide events, Procomer events in the sample of analysis, and Procomer events not in the sample), but the same patterns apply to comparisons of surveyed vs. not surveyed firms in the same sample. It is only for brevity that we show the pooled comparison alone.

Table G3: Comparison Between Surveyed and Not Surveyed Domestic Firms in Terms of Firm Size and Firm Performance

|  | Surveyed | Not surveyed | Difference |
| --- | --- | --- | --- |
| Number of Workers | 23.28 | 23.58 | -0.304 |
|  | (26.48) | (54.75) | (6.67) |
| Total Sales | 2.241 | 1.773 | 0.467 |
|  | (3.86) | (4.57) | (0.56) |
| Value Added Per Worker | 13.08 | 13.28 | -0.200 |
|  | (11.11) | (62.36) | (7.57) |

*Notes:* Table G3 compares the domestic firms who have participated in our survey to the domestic firms who have not in terms of their number of workers and total sales in 2009. The total sales are in millions of CPI-deflated 2013 U.S. dollars. The value added per worker is in thousands of CPI-deflated 2013 U.S. dollars. Standard deviations in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

From Table G3 we learn that the differences in firm size and firm performance between surveyed and non-surveyed domestic firms are not statistically significant. It is reasonable to expect that the answers of the responding domestic firms are representative for the overall samples of interest.

*Representativeness of MNC respondents.* In Table G4 we compare the 58 responding MNCs (who have accepted our survey invitation) to the remaining 469 MNCs who we have invited to participate in our survey, but who have either declined or have not replied to our request (typically because the email address was incorrect or because it was a generic email address). We pool surveyed vs. not surveyed MNCs across the three samples (economy-wide events,

Procomer events in the sample of analysis, and Procomer events not in the sample), but the same patterns apply to comparisons of surveyed vs. non-surveyed MNCs in the same sample. It is for brevity that we report the pooled comparison alone. Pooling is particularly inconsequential for MNCs as the same MNC can be part of all three samples (i.e., triggering events for domestic firms in the three samples).

Table G4: Comparison Between Surveyed and Not Surveyed MNCs in Terms of Size, Performance, and Free Trade Zone Status

|  | Surveyed | Not surveyed | Difference |
|---|---|---|---|
| Number of Workers | 561.4 | 408.2 | 153.2 |
|  | (874.28) | (923.49) | (131.26) |
| Total Sales | 108.4 | 43.35 | 65.01*** |
|  | (280.76) | (76.15) | (16.75) |
| Value Added Per Worker | 74.75 | 47.83 | 26.93 |
|  | (131.98) | (166.10) | (23.26) |
| Free Trade Zone | 0.564 | 0.408 | 0.156* |
|  | (0.50) | (0.49) | (0.07) |

*Notes:* Table G4 compares the MNCs who have participated in our survey to the MNCs who have not in terms of their number of workers, total sales, value added per worker, and Free Trade Zone status (1 if the MNC is part of the Free Trade Zone regime), all averaged across all years of activity in Costa Rica. The total sales are in millions of CPI-deflated 2013 U.S. dollars. The value added per worker is in thousands of CPI-deflated 2013 U.S. dollars. Standard deviations in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table G4 shows that surveyed MNCs have, on average, higher total sales than non-surveyed MNCs and are more likely to be part of Free Trade Zones. While they also seem to hire more workers and have a higher value added per worker, these two differences are not statistically significant. These findings reflect the fact that our most reliable contacts of MNCs came from CINDE and Procomer, who work closely with MNCs in Free Trade Zones. MNCs in Free Trade Zones tend to be larger and more sophisticated. Given our topics of interest, it is unclear how this affects the representativeness of their answers. Last, by comparing Tables E3 and G13 we notice that the countries of global ultimate ownership of the MNCs are similar between those of all the MNCs triggering events economy-wide and the surveyed MNCs.

## Online Appendix G.3   Survey Questions and Answers

Two features of our survey structure deserve mentioning. First, for a given type of survey (to domestic suppliers or to MNCs), questions in the long version are a strict superset of questions in the short version. The overlapped questions are identical between the two versions (no change in wording, no change in the order of proposed answers). This allows us to pool answers from the long and short versions. Second, across the two survey types, some key

questions are mirrored. For instance, both domestic suppliers and MNC are asked about the potential help provided by MNCs to first time suppliers. This allows to learn about the same topic from both perspectives.

Before analyzing the answers, we had to standardize the responses to open ended questions and perform some minimal quality checks on answers provided. One example of a quality check relates to the compatibility between a given question asked and the answer provided. E.g., one question asks MNCs about what they believe to be the most important benefit to domestic firms upon becoming their suppliers. Two MNCs provided answers that refer to the most important benefit *to the MNC* when having more domestic suppliers and had to be discarded. Another quality check makes sure that answer provided in the "Other: _____" option was not actually already covered by existing options that were not selected.

In what follows, we pool answers across sample sources. We do so because answers did not differ substantively among domestic firms/MNCs coming from different samples.

**Online Appendix G.3.1   Survey Answers from Domestic Firms**

Table G5: Summary of Job Titles for Respondents to the Survey to Domestic Firms

| Position | Frequency | Percent |
|---|---|---|
| CEO/President/Founder | 58 | 54.7 |
| Sales/Marketing/Client Outreach Manager | 15 | 14.2 |
| Other Unit Manager | 11 | 10.4 |
| Operations/Supply Chain Manager | 9 | 8.5 |
| Professional/Analyst | 5 | 4.7 |
| Assistant to CEO/President/Founder | 4 | 3.8 |
| Senior Partner | 4 | 3.8 |
| Total | N=106 | 100.0 |

*Notes:* This table summarizes the job titles (positions) of respondents to the survey to domestic firms. We have grouped job titles under seven categories. Under "CEO/President/Founder," one can find job titles such as Owner ("Dueño"), President ("Presidente"), or General Manager ("Gerente General"). Under "Sales/Marketing/Client Outreach Manager," one can find job titles such as Commercial Director/-Manager ("Gerente/Director Comercial") or ("Gerente Mercadeo y Ventas"). Under "Other Unit Manager," one can find job titles such as Finance Director ("Directora Financiera"), R&D Manager ("Gerente de Investigación y Desarrollo"), or Accounting Supervisor ("Supervisor de Contabilidad"). Under "Operations/Supply Chain Manager," one can find job titles such as Operations Director ('Directora de Operaciones'") or Logistics Manager ("Jefe de Logistica"). Under "Professional/Analyst," one can find job titles such as Technical Advisor ("Asesor Técnico") or Business and Operations Analyst ("Analista de Negocios y Operaciones"). Under "Assistant to CEO/President/Founder," one can find job titles such as Assistant to General Manager ("Asistente de Gerencia/Asistente de Gerencia General"). Under "Senior Partner," one can find job titles such as Partner ("Socio") or Managing Partner ("Socio Director").

**Question 1:** "Your position in the firm." Question type: open-ended. Survey version: both long and short (N=106). Responses are summarized in Table G5.

**Question 2:** "Did your firm expect multinational buyers to be different from domestic buyers?" Question type: Dichotomous. Survey version: only long (N=15).

100% of answers were positive ("Yes, our firm expected the contracts with multinational buyers to be markedly different from those with domestic buyers.") Please note that we emphasized that the question referred to expectations of the firm *before* the first contract with an MNC.
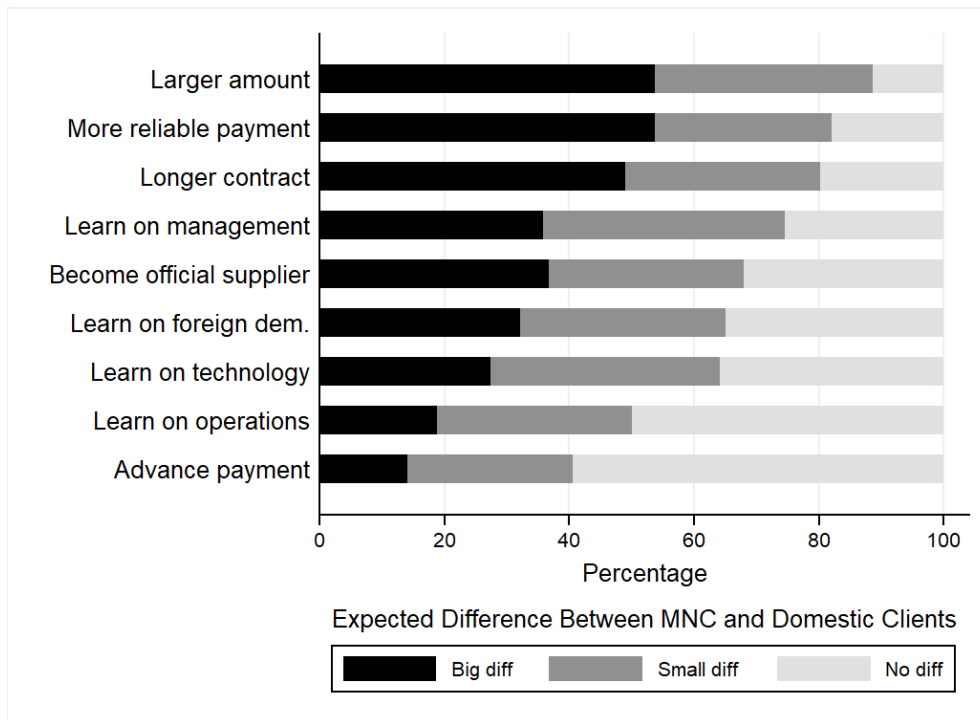


Figure G9: Question 3: Before the first contract with an MNC, how did your firm expect MNCs buyers to be different from domestic buyers?

*Notes:* This graph summarizes the answers of 106 domestic firms to the survey question ""Before the first contract with an MNC, how did your firm expect MNCs buyers to be different from domestic buyers?" Percentages do not need to sum up to 100 across options, as each firm had to rate the extent to which each proposed option applied to the firm. Percentages only need to sum up to 100 for each option.

**Question 3:** "Before the first contract with a multinational firm, how did your firm expect multinational buyers to be different from domestic buyers? Complete all the options, selecting whether you agree with the proposed difference. "Our firm expected contracts with multinationals...". Question type: Likert-type scale. Survey version: both long and short (N=106).

For each proposed difference, the respondent had to choose one of three options of answer: "No, this difference was not expected," "Yes, this was a **small** expected difference," "Yes, this was a **large** expected difference." We proposed nine potential differences (in order):"...would be more reliable in terms of payment," "... would help us with financing in advance," "... would order larger amounts," "... would have longer-term contracts," "... would help us improve management practices," "...would help us improve our technological knowledge," "...would help us improve our logistics and inventories," "... would help us learn about foreign demand, which would help improve our export performance," "... would allow us to become an official supplier not only for the affiliate in Costa Rica, but also for affiliates in other countries."

Figure G9 summarizes the answers to Question 3.

**Question 4:** "Before the first contact with a multinational in Costa Rica: Did the firm plan and make special arrangements to establish a relationship with this type of firm? Please, choose a SINGLE answer." Question type: Dichotomous. Options (in order): "Yes, our firm planned and adopted special measures in advance to start supplying to the multinationals" or "No, our firm did not take special measures to start supplying to the multinationals." Survey section: "On special preparations before establishing a relationship with multinationals in Costa Rica." Survey version: both long and short (N=106).

47 domestic firms chose the negative answer (44%) and 59 domestic firms chose the positive answer (56%).



Figure G10: Question 5: How did your firm prepare to supply to multinationals?

*Notes:* This graph summarizes the answers of 59 domestic firms to the survey question "How did your firm prepare to supply to multinationals (before establishing the first contact)?" The other 47 domestic firms had answered that they had not taken any special measures towards starting to supply to an MNC. Percentages do not need to sum up to 100 across options, as each firm had to rate the extent to which each proposed option applied to the firm. Percentages only need to sum up to 100 for each option.

**Question 5:** Question: "How did your firm prepare to supply to multinationals? (before establishing the first contact). Complete all the options, choosing an answer that best describes whether a given measure was taken by your firms "Before the first contact with a multinational, our firm ..." This question was a follow-up to Question 4. If a firm answered negatively to Question 4, this question would be automatically skipped.

For each proposed measure, the respondent had to choose one of three options of answer: "No, our firm did not do this," "Yes, our firm did this but very little," or "Yes, our firm was very involved in this change." We proposed ten measures that the firm might have undertaken in preparation of approaching MNC buyers (in order): "... studied the activity of the

multinational to adapt and offer its product to them," "... trained its workers on technologies relevant to supplying to multinationals," "... trained its workers on administrative or management practices relevant to supplying to multinationals," "...began preparing for certifications that were relevant to supplying to multinationals," "... bought machinery that potentially necessary to supplying to multinationals," "... changed its location to be closer to multinationals," "... started participating in more business events to try to find multinational buyers," "... started contacting multinationals directly, trying to present its products / services," "... created a website / blog / social networking page to be easier to find by multinationals," "... approached Procomer / CINDE / MEIC to request assistance in the search for multinational buyers."

Figure G10 summarizes the answers to Question 5.

**Question 6:** "Was there any notable change within your firm just before the first contract with a multinational that resulted in your firm starting to supply to that multinational? If the answer is YES, provide details about the unexpected event. If the answer is NO, skip to the next question." Question type: open-ended. Survey version: both long and short (N=106)

100 domestic firms (94%) answered negatively (variations of "N/A", "No", "No change"). Six domestic firms (6%) answered positively, offering details on the said change. Here is an example of one of these positive answers: "Yes, we started advertising our products on a new website and placed ads of the firm in the main search engines." The described changes do not challenge the interpretation of our estimates as capturing the treatment effect of becoming a supplier to MNCs.

**Question 7:** "To your knowledge, did your firm face difficulties in establishing the first contracts with multinational buyers? Please choose ONE option only." Question type: Dichotomous. Options (in order): "NO, it was relatively easy to start supplying to multinational buyers" or "YES, we faced difficulties in trying to start supplying to multinational buyers." Survey section: "Possible difficulties when trying to establish the first contracts with multinationals." Survey version: both long and short (N=106).

63 domestic firms (59%) provided a negative answer, 43 domestic firms (41%) provided a positive answer.

**Question 8:** This question was a follow-up to Question 7. If a firm answered negatively to Question 7, this question would be automatically skipped. Question: "Why was it difficult to get a first contract with a multinational? Consider all the potential answers, indicating how important a given explanation was for this difficulty." Question type: Likert-type scale. Survey version: both long and short (N=106 surveys, but 43 answers in practice).

For each proposed measure, the respondent had to choose one of four options: "Very important/Crucial," "Important," "Perhaps a bit important, not central," or "Irrelevant." We proposed eight potential reasons (in order): Multinationals "were difficult to contact," "were

not interested in sourcing locally," "did not know the firm and did not trust the product / service offered," "expected types of products or services that the firm did not offer," "expected a quality of products or services that the firm could not offer at that time," "required products or services produced faster than the firm could commit," "expected lower prices than those that this firm could offer," "required products or services for which the firm had to make large investments (for example, buy a machine, expand the scale of production)."

Figure G11 summarizes the findings from Question 8.



Figure G11: Question 8: Why was it difficult to get a first contract with a multinational?

*Notes:* This graph summarizes the answers of 43 domestic firms to the survey question "Why was it difficult to get a first contract with a multinational?" The other 63 domestic firms had answered that it was not particularly difficult to establish a contract with a multinational. Percentages do not need to sum up to 100 across options, as each firm had to rate the extent to which each proposed option applied to the firm. Percentages only need to sum up to 100 for each option.

**Question 9:** "What were the changes that the firm experienced when becoming a supplier to its first multinational buyers? Select all the answers that are TRUE." Question type: Multiple-choice. Survey section: "During and immediately after the first contracts with multinational buyers." Survey version: both long and short (N=106).

The question allowed for multiple answers among ten options (in order): "The multinational firm required specific products or services, so we expanded our portfolio of products or services that we offered," "We completely replaced the products or services that we previously offered, with those demanded by multinationals," "We continued to offer the same products or services, but the quality and / or the price changed," "We decided to expand our productive capacity in order to meet the larger orders from multinationals," "We hired more highly qualified workers to help us better serve multinational buyers," "Our workers had to

work harder and longer hours, because the expectations of the multinational were higher than they were used to," "We changed our sourcing strategy (for example, we sourced differently locally, imported more)," "We learned from the multinational about management practices or organization," "We learned from the multinational about technology relevant for our products or services."

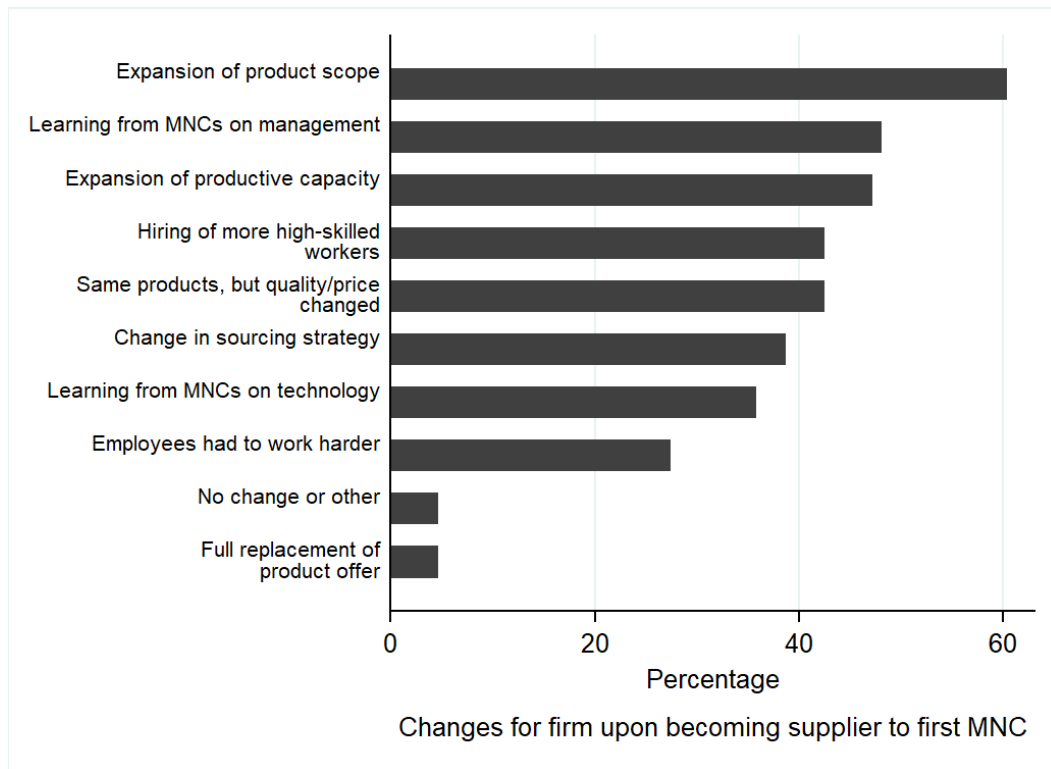Figure G12 summarizes the answers to Question 9.



Figure G12: Question 9: What were the changes that the firm experienced when becoming a supplier to its first MNC buyers? Select all the answers that are TRUE.

*Notes:* This graph summarizes the answers of 106 domestic firms to the survey question: "What were the changes that the firm experienced when becoming a supplier to its first multinational buyers? Select all the answers that are TRUE." Note that percentages do not need to sum up to 100 across options, as each firm could select all options that applied.

**Question 10:** "Please provide more details about the most important change that the firm experienced upon becoming a supplier to multinationals." Question type: Open-ended. Survey section: "During and immediately after the first contracts with multinational buyers." Survey version: both long and short (N=106).

Answers to this question were unguided, hence in order to be summarized had to analyzed and grouped by main topic. Table G6 summarizes the most frequent changes.

**Question 11:** "How did the first multinational buyers help the firm to undergo these changes? Mark all the answers that are TRUE." Question type: Multiple-choice. Survey section: "Possible help from the multinational." Survey version: both long and short (N=106).

The question allowed for multiple answers among nine options (in order): "The multinational did not participate directly, did not provide any explicit help, we dealt with the changes

Table G6: Question 10: What was the most important change experienced upon becoming a supplier to MNCs?

| Most Important Change | Frequency | Percent | Cum. |
|---|---|---|---|
| Improved management/organizational practices | 24 | 22.64 | 22.64 |
| Improved product/service quality, established quality management system | 16 | 15.09 | 37.74 |
| Increased productive capacity / expansion abroad | 13 | 12.26 | 50.00 |
| No important change | 9 | 8.49 | 58.49 |
| Other | 9 | 8.49 | 66.98 |
| Improved efficiency / delivery times | 8 | 7.55 | 74.53 |
| Improved sourcing / supply chain strategy | 8 | 7.55 | 82.08 |
| Expanded product / service scope | 7 | 6.60 | 88.68 |
| Had to improve firm financing ability | 4 | 3.77 | 92.45 |
| Acquired new machinery / equipment | 3 | 2.83 | 95.28 |
| Improved job security / worker safety | 3 | 2.83 | 98.11 |
| Worked longer hours | 2 | 1.89 | 100.00 |
| Total | N=106 | 100 | |

*Notes:* This table summarizes the answers of 106 domestic firms to the survey question: "Please provide more details about the most important change that the firm experienced upon becoming a supplier to multinationals." As this question was open, the team had to organize answers by topic.

on our own," "The multinational provided a model ("blueprint") of the desired product or service or some other relevant documentation," "Employees of the multinational visited our firm and helped us with advice in the adjustment process (for example, the multinational conducted audits of the firm and guided it on ways to improve)," "Our employees made visits to the multinational to observe parts of their production that were relevant to the input we were supplying to the multinational," "The multinational had standardized training programs that they offered to our employees," "The multinational put us in contact with another firm that supplies similar products or services to the multinational in other locations, to advise us on best practices," "The multinational has lent us money or paid us in advance so that we can make the necessary investments," "The multinational is the one that bought the specific machinery necessary to supply the good / service and they have lent / rented the machinery to us," "Other: _____."

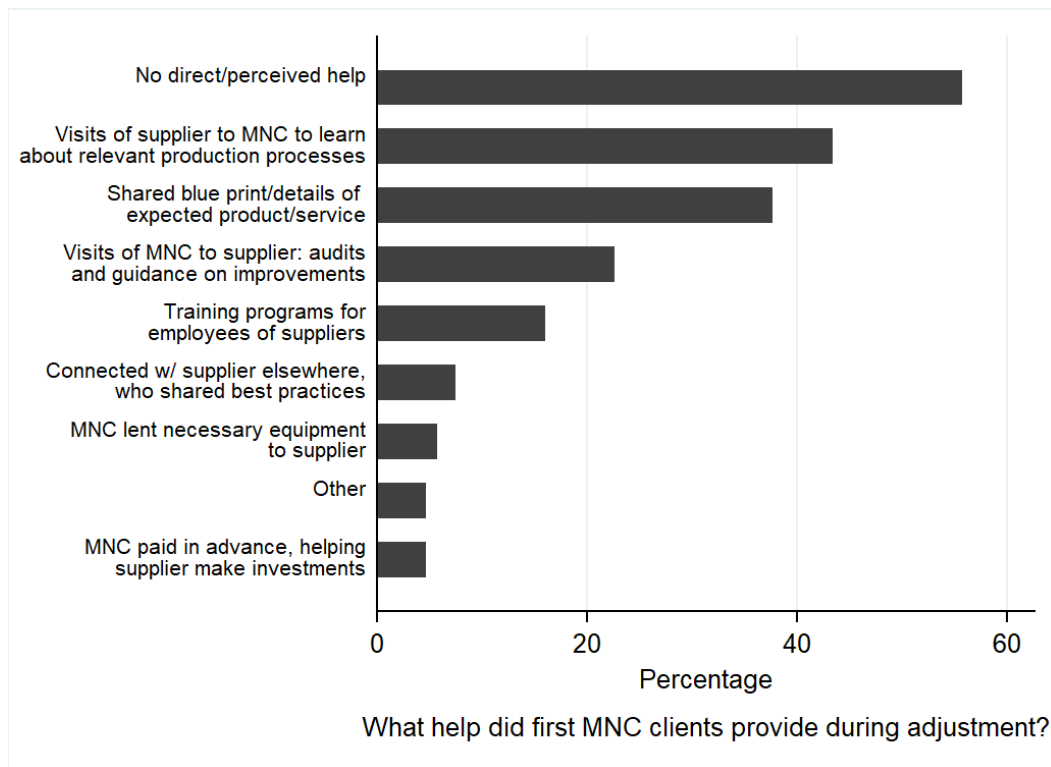Figure G13 summarizes the answers to this question.

Figure G13: Question 11: How did the first MNC buyers help the firm to undergo these changes?

*Notes:* This graph summarizes the answers of 106 domestic firms to the survey question "How did the first multinational buyers help the firm to undergo these changes? Mark all the answers that are TRUE." Note that percentages do not need to sum up to 100 across options.

**Question 12:** "From the previous answers, please provide more details about the most important assistance provided by the first multinational buyers." Question type: Open-ended. Survey section: "Possible help from the multinational." Survey version: both long and short (N=106).

In the open-ended field, suppliers explained the nature of their interactions with their first MNC buyers and the extent to which these interactions are perceived as help or as integral to their deal. The main takeaway from these answers is that the adjustment period was exacting for most local suppliers. While interactions with MNCs were instrumental in understanding MNCs' expectations from both the supplier overall and the product/service provided in particular, these interactions were not always perceived as supportive/helpful. Our interpretation is that during these interactions MNCs placed high demands on their new suppliers and, while the MNC was constructive in proposing ways to improve, implementing those suggestions was still in the responsibility of the supplier. For example, the answer of one domestic form captures the subtle distinction between direct and indirect help:

> The most important help received from MNCs came in the form of audits to our plant. Another important and related support from MNCs was to give us time to address the [quality] complaints they made during these audits so that we could develop a business model incorporating their quality standards.

**Question 13:** "If the multinational provided direct/explicit help, how was your firm supposed to reward the multinational for this help? Please choose ONE option only." The question allowed for a single answer among seven options (in order): "The multinational did not offer any (direct/explicit) help in our adjustment to supply it, so this question does not apply," "The help offered was not NOT to be rewarded, it was part of the Corporate Social Responsibility strategy of the multinational, there were no specific expectations from the multinational in exchange of that help," "The help provided was to be rewarded through lower prices than those we could offer before the collaboration with the multinational, for the same product or service (same quality)," "The help provided was to be rewarded through higher quality products / services, at prices that did not change much," "The help provided was to be rewarded through higher quality products / services AND ALSO through prices falling," "The help provided was to be rewarded through an exclusive contract between our firm and the multinational, we had to become its exclusive suppliers," and "Other: ____." Survey version: both long and short (N=106)

Table G7 summarizes the answers to Question 13.

Table G7: Question 13: If the multinational provided direct/explicit help, how was your firm supposed to reward the multinational for this help? Please choose ONE option only

| Most Important Change | Frequency | Percent |
|---|---|---|
| No direct/explicit help | 57 | 53.77 |
| Better quality of product/service, same prices | 18 | 16.98 |
| Better quality of product/service, falling prices | 12 | 11.32 |
| No need for compensation, part of MNC CSR | 11 | 10.38 |
| Lower prices for same product/service quality | 4 | 3.77 |
| Other | 4 | 3.77 |
| Total | N=106 | 100 |

*Notes:* This table summarizes the answers of 106 domestic firms to the survey question: "If the multinational provided direct/explicit help, how was your firm supposed to reward the multinational for this help? Please choose ONE option only"

**Question 14:** "If your firm has incurred losses from deals with MNC buyers, why does your firm have such deals with MNCs, despite this risk of losses? If your firm has never incurred losses with MNCs, you can skip the question." Question type: Open-ended. Survey section: "Possible help from the multinational." Survey version: long only (N=15).

11 of 15 respondents have provided examples of situations when they have incurred losses from deals with MNCs and their reasons behind tolerating such losses. In general, the answers reflect the stronger bargaining power of MNCs and the longer-term vision of the supplier, who is willing to accept short-term losses with the expectation that the MNC would be satisfied with its service and continue purchasing its service in the future. The supplier would learn from its initial mistakes and reduce the probability of future losses.

We have already provided an example of one such situation in Section 4. Hereafter, we

present two other examples.

> When we started supplying to MNCs, at the very beginning, there was a certain margin of loss. We were expected to be very fast. In the workshop we had to make a lot of efforts. We decided to produce more than what was initially ordered by the MNC, to have a margin in case the MNC ordered more. The extra quantities produced and not ordered became losses.

An example from another supplier:

> There is uncertainty not in the costs of a given product, but in whether the product will correspond to the expectations [of the MNC buyer]. Given the business of our firm, there is no standardized product. Hence some products might end up costing us more if more iterations are needed. The final product might look very different from what we initially thought. If we make mistakes and do not design the right product from the beginning, this can lead us to a loss. However, we see this as a learning opportunity. Sometimes one has to incur losses to learn.

**Question 15:** "For a purchase order of the same product, quantity and quality, is there a difference in the price charged to a national buyer with respect to a multinational buyer? Please choose ONE option from the following." The question allowed for a single answer among five options (in order): "Almost always a higher price for the multinational buyer," "More often a higher price for the multinational buyer," "In most cases, the same price for both types of buyers," "More frequently, a lower price for the multinational buyer," and "Almost always a lower price for the multinational buyer."

Survey version: only short (N=91.) There was an almost identical question in the long survey as well. However, that question was amended to specify that the order was for the same *quantity*. Suppliers explained during the interviews that for the same product and quality, MNCs are more likely to be offered lower prices as they typically place larger orders.

Table G8 summarizes the choices made by the 91 domestic firms to Question 15.

Table G8: Question 15: For a purchase order of the same product, quantity and quality, is there a difference in the price charged to a national buyer with respect to a multinational buyer?

| Answer | Frequency | Percent |
|---|---|---|
| Usually same price | 53 | 58.24 |
| More frequently a lower price for MNC | 14 | 15.38 |
| More frequently a higher price for MNC | 10 | 10.99 |
| Almost always a higher price for MNC | 9 | 9.89 |
| Almost always a lower price for MNC | 5 | 5.49 |
| Total | N=91 | 100 |

*Notes:* This table summarizes the answers of 91 domestic firms to the survey question: "For a purchase order of the same product, quantity and quality, is there a difference in the price charged to a national buyer with respect to a multinational buyer? Please choose ONE option from the following."

Table G9: Question 16: Has becoming a supplier of MNCs changed your firm's business with domestic buyers?

| Choices | Freq. | Percent | Details on main reason | Freq. | Percent |
|---------|-------|---------|------------------------|-------|---------|
| **No. No Impact** | 59 | 55.66 | | | |
| **Yes. Sold More** | 31 | 29.25 | | | |
| | | | Better quality, same prices | 15 | 48.39 |
| | | | Higher visibility | 9 | 29.03 |
| | | | Same quality, lower prices | 4 | 12.90 |
| | | | Attractive new offer | 2 | 6.45 |
| | | | Better quality, lower prices | 1 | 3.23 |
| | | | **Total** | **N=31** | 100 |
| **Yes. Sold Less** | 16 | 15.09 | | | |
| | | | Own decision to focus on MNCs | 9 | 56.25 |
| | | | Attractive new offer, higher prices | 4 | 25.00 |
| | | | New offer not attractive, similar prices | 3 | 18.75 |
| | | | **Total** | **N=16** | 100 |
| **Total** | **N=106** | 100 | | | |

*Notes:* This table summarizes the answers of 106 domestic firms to the survey question: "Has becoming a supplier of a multinational changed your firm's business with domestic buyers? Please choose ONE option only from the options below that best describes this impact."

**Question 16:** "Has becoming a supplier of a multinational changed your firm's business with domestic buyers? Please choose ONE option only from the options below that best describes this impact." The question allowed for a single answer among ten options (in order): "No. There was no impact on our domestic business, we continued to sell the same products, at the same prices, without changes in the demand of domestic buyers," "Yes, in general we DECIDED to sell LESS to domestic buyers, since we decided to focus only on multinational buyers," "Yes, in general we started selling LESS to domestic buyers, because we started producing goods or services that were not attractive to domestic buyers, despite similar prices," "Yes, in general we started selling LESS to domestic firms because, despite producing attractive goods or services, these goods or services were too expensive for domestic buyers," "Yes, in general we started selling MORE to domestic buyers, because we were selling better quality products / services, at the same price as before," "Yes, in general, we started selling MORE to domestic buyers, because we were selling products / services of the same quality, but at lower prices than before," "Yes, in general we started selling MORE to domestic buyers, because we

were selling better quality products / services EVEN IF at higher prices than before," "Yes, in general we started selling MORE to domestic buyers, because we were selling new products or services than those we offered before," "Yes, in general we started selling MORE to domestic buyers, because selling to multinationals made us more visible in the market. However, the products and prices had not really changed," and "Other: _____." Survey version: both long and short (N=106). Section: "Relationships with other types of buyers."

Table G9 reports the findings from this question. First, we group choices in three broad categories: "No. No Impact" (option 1), "Yes. Sold Less" (options two to four), and "Yes. Sold More" (options five to nine). While five firms had originally chosen the "Other: _____" option, their answers fell into an already existing option among the previous nine. These broad groups are reported in decreasing order of frequency. We then provide details on the actual choices of firms falling into either the "Yes. Sold More" or "Yes. Sold Less" categories.

**Question 17:** "Did becoming a supplier to a first multinational improve the ability of your firm to obtain more multinational buyers? Please choose ONE option only." Question type: Dichotomous. Options in order: "NO. Finding each new multinational buyer is as difficult as finding the first multinational buyer" or "YES. Becoming a supplier to a first multinational improved the capacity of our firm to obtain more multinational buyers." Survey version: both long and short (N=106). Section: "Relationships with other types of buyers."

83 domestic firms chose the "YES" answer (78%) and 23 domestic firms chose the "NO" answer (22%).

Table G10: Question 18: Why was it easier to find more multinational buyers after having your first (multinational) buyer? Please choose all the options that are TRUE.

| Answer | Frequency | Percentage |
|---|---|---|
| Easier to gain MNCs' trust | 71 | 85.5 |
| Learned about MNCs' needs | 60 | 72.3 |
| Improved managerial practices | 52 | 62.7 |
| Expanded product/service offer | 43 | 51.8 |
| Improved quality without price rise | 37 | 44.6 |
| Improved quality with price rise | 25 | 30.1 |
| Lowered prices on prior products/services | 5 | 6 |
| Other | 2 | 2.4 |

*Notes:* This table summarizes the answers of 83 domestic firms to the survey question: "Why was it easier to find more multinational buyers after having your first (multinational) buyer? Please choose all the options that are TRUE." Note that the frequency of answers does not need to sum up to 83 or the percentage to 100, as each firm could select all options that applied.

**Question 18:** "Why was it easier to find more multinational buyers after having your first (multinational) buyer? Please choose all the options that are TRUE." Question type: Multiple-

choice. Survey section: "About the multinational buyers that followed." Survey version: both long and short (N=106 surveys, but 83 answers in practice).

This question was a follow-up to Question 17. If a firm selected the negative answer in Question 17, it would automatically skip this question. Hence, the following findings pertain to the 83 domestic firms choosing "YES" in Question 17.

Table G10 summarizes the answers to Question 18.

**Question 19:** "How many of the deals of your firm with multinational buyers in Costa Rica occur through Procomer? Please choose ONE option only." The question allowed for a single answer among five options (in order): "(Almost) all deals are mediated through Procomer," "More than half of the deals are mediated by Procomer, but not all," "Less than half of the deals are mediated through Procomer, but there are still many," "Very few (or almost none) of these deals are mediated through Procomer." Survey version: long only (N=15). Survey section: "On the intermediation of deals with multinationals by Procomer."

Table G11 summarizes the answers to Question 19.

Table G11: Question 19: How many of the deals of your firm with multinational buyers in Costa Rica occur through Procomer? Please choose ONE option only.

| Answer | Frequency | Percentage |
|---|---|---|
| Very few to almost none | 12 | 80.00 |
| Less than half, but some | 2 | 13.33 |
| (Almost) all | 1 | 6.67 |
| Total | N=15 | 100 |

*Notes:* This table summarizes the answers of 15 domestic firms to the survey question: "How many of the deals of your firm with multinational buyers in Costa Rica occur through Procomer? Please choose ONE option only."

**Question 20:** "What are the main reasons why your firm wants to make such deals through Procomer? Please, choose (at most) the two most relevant options." The question allowed for at most two answers out of six options (in order): "Procomer deals are not different from the deals we get for ourselves, but allow us to have multiple sources of deals," "Procomer has better access to multinational buyers or the specific type of deals our firm wishes to have (for example, larger amounts, longer contracts, more high-tech buyers, etc.)," "Procomer gives us credibility in front of multinational buyers," "Procomer prepares us before each specific deal with a multinational buyer, so we feel better prepared to start deals mediated by Procomer," "Procomer accompanies our deals with multinational buyers, provides us with services even after the deal was made and is in progress," and "Other: _____." Survey version: long only (N=15). Survey section: "On the intermediation of deals with multinationals by Procomer."

Table G12 summarizes the answers to Question 20.

Table G12: Question 20: What are the main reasons why your firm wants to make such deals through Procomer? Please, choose (at most) the two most relevant options.

| Answer | Frequency | Percentage |
|---|---|---|
| Procomer has better access to MNCs | 9 | 60.0 |
| Deals not different, just another source of deals | 8 | 53.3 |
| Procomer offers credibility in front of MNCs | 6 | 40.0 |
| Procomer helps prepare the firm before the deals | 0 | 0.0 |
| Procomer accompanies the firm during the deals | 0 | 0.0 |
| Other | 2 | 13.3 |

*Notes:* This table summarizes the answers of 15 domestic firms to the survey question: "What are the main reasons why your firm wants to make such deals through Procomer? Please, choose (at most) the two most relevant options."

**Question 21:** "Please share with us the most negative surprise or the biggest disappointment for your firm after becoming a supplier to MNCs." Question type: Open-ended. Survey section: "Questions to wrap up." Survey version: only long (N=15).

The general message is that domestic suppliers often find themselves in asymmetric relationships with MNCs, where they feel that their efforts to make the relationship successful are not reciprocated. There is also a significant imbalance of power, size, and financial robustness between MNCs and domestic suppliers to which MNCs do not seem to be sensitive. Hereafter, we include the answers of two different suppliers that are representative of the other answers.

> One negative surprise is that MNCs do not seem to understand how impactful some of their mistakes are for their small suppliers. For instance, MNCs do not seem to be aware of how costly it is for us, as a small firm, to prepare a bid. Therefore they invite us to bid, despite having already chosen the winner. Or, sometimes, bills are misplaced, and our payment is made with delay. Even officially, MNCs have gone from 15 days of trade credit to up to 120 days. MNCs use the entire trade credit length agreed upon initially (say 120 days). Once a bill gets to accounting, it will be paid automatically 120 days after. It is true that the payment is most of the time reliable. But small suppliers like us are bearing a lot of the risks and providing financing to MNCs, as opposed to the other way around. This is surprising given how small our bills are compared to the overall turnover of these MNCs.

> We were very hopeful of positive outcomes before the first contracts. However, we had to lower prices massively to be granted those contracts. MNCs were aggressive in negotiating the reduction of prices. We still have to offer very low rates to maintain these contracts. Also, we started the deals with MNCs with one month of trade credit. Now, MNCs expect 3.5 months of credit on average. Last, we feel that MNCs are not very interested in developing local suppliers, that they act as if they are entitled to receive high-quality goods or services at meager prices.

**Question 22:** "Please share with us the most positive surprise or the biggest unexpected benefit for your firm after becoming a supplier to MNCs." Question type: Open-ended. Survey

section: "Questions to wrap up." Survey version: only long (N=15).

The main takeaway from these answers is that these domestic firms are now enjoying the fruits of their initial hardships experienced upon becoming suppliers to MNCs. The following is a representative quote from one of the respondents.

> The beginnings [of relationships with MNCs] were very tough because we had to lower prices a lot. Once we adapted to the new ways of doing business, we started growing. We started buying new machines or renovating older machines, having more employees. The hardship at the beginning allowed us to rise afterward. Year after year, the contracts get renewed, so we need to continue learning and maintaining competitive prices. Whenever the costs of inputs increase, we have to improve on some other dimension to keep our prices low [better-trained machine operators, faster machines, etc.]. Also, now the MNCs have become more involved. Sometimes staff from MNCs ask: "What is slowing you down? Let us help you with that."

**Online Appendix G.3.2    Survey Answers from Multinational Firms (MNCs)**

**Question 1:** "Country where the headquarters of the multinational is." Question type: open-ended. Survey version: both long and short (N=58). Responses are summarized in Table G13.

Table G13: Question 1: MNC's Headquarters Country

| HQ country | Frequency | Percentage |
|---|---|---|
| United States | 24 | 41.38 |
| Great Britain | 4 | 6.90 |
| Costa Rica | 3 | 5.17 |
| Germany | 3 | 5.17 |
| Netherlands | 3 | 5.17 |
| Panama | 3 | 5.17 |
| Spain | 2 | 3.45 |
| France | 2 | 3.45 |
| Japan | 2 | 3.45 |
| Venezuela | 2 | 3.45 |
| Belgium | 1 | 1.72 |
| Canada | 1 | 1.72 |
| Switzerland | 1 | 1.72 |
| Colombia | 1 | 1.72 |
| Guatemala | 1 | 1.72 |
| Ireland | 1 | 1.72 |
| Cayman Islands | 1 | 1.72 |
| Mexico | 1 | 1.72 |
| Peru | 1 | 1.72 |
| El Salvador | 1 | 1.72 |
| Total | N=58 | 100 |

*Notes:* This table summarizes the answers of 58 multinationals to the survey question: 'Country where the headquarters of the multinational is."

**Question 2:** "Your position (job title) in the multinational." Question type: open-ended. Survey version: both long and short (N=58). Responses are summarized in Table G14.

Table G14: Summary of Job Titles for Respondents to the Survey to Multinationals

| Position (Standardized) | Frequency | Percentage |
|---|---|---|
| Supply Chain/Procurement/Operations Manager | 22 | 37.93 |
| General Manager CR Operation / Country Manager | 18 | 31.03 |
| Other Unit Manager | 14 | 24.14 |
| Supply Chain/Procurement Specialist | 4 | 6.90 |
| Total | N=58 | 100 |

*Notes:* This table summarizes the answers of 58 respondents (to the survey to multinationals) to the survey question: "Your position (job title) in the multinational." We have grouped job titles under four categories. Under "Supply Chain/Procurement/Operations Manager," one can find job titles such as Purchasing Manager ("Gerente de Compras"), Global Operations Manager ("Gerente Global de Operaciones"), or Purchasing and Logistics Manager ("Gerente de Compras y Logistica"). Under "General Manager CR Operation / Country Manager," one can find job titles such as Plant Manager ("Gerente de Planta"), Manager of XX Costa Rica ("Gerente de XX Costa Rica") or Site Supervisor. Under "Other Unit Manager", one can find job titles such as Manager of Public Relations ("Gerente Asuntos Públicos"), Manager of Government Affairs ("Gerente de Asuntos Gubernamentales"), or Finance Manager ("Gerente Financiero"). Under "Supply Chain/Procurement Specialist," one can find job titles such as Buyer ("Encargado de Compras") or Import/Export Analyst ("Analista Import / Export").

**Question 3:** "To your knowledge, how important were the following factors in the decision of the multinational to locate itself in Costa Rica? Complete all the options, choosing how important you think each criterion was. Note: There is a separate question about the decision to stay and / or expand in Costa Rica." Question type: Likert-type scale. Survey version: both long and short (N=58). Section: "General questions about the multinational's incentives to invest in Costa Rica."

For each proposed factor, the respondent had to choose one of four options: "Very important/Crucial," "Important," "An advantage, but not that important," or "Not important, does not apply." We proposed eight potential reasons (in order): "The distance between Costa Rica and the HQ country," "The distance between Costa Rica and your target markets," "The Costa Rican market itself," "The level of education of the labor force," "Relatively low wages for the type of employees needed by the multinational," "Tax conditions such as the Free Zone regime," "The availability of suppliers at the prices and / or quality that the multinational needs," "The natural resources (for example, minerals) of Costa Rica, necessary for the production of the multinational."

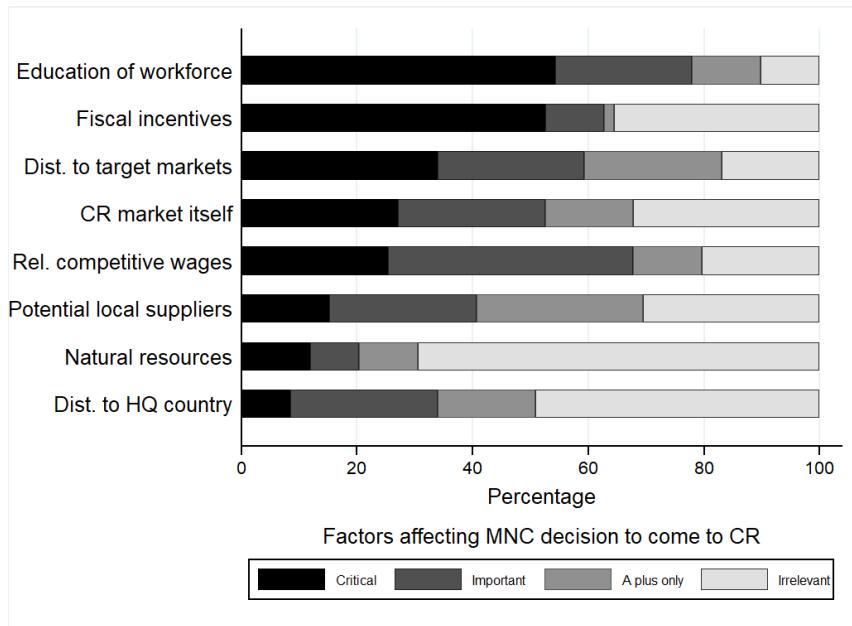Figure G14 summarizes the findings from Question 3.

Figure G14: Question 3: How Important Were the Following Factors in the Decision of the Multinational to Locate Itself in Costa Rica?

*Notes:* This graph summarizes the answers of 58 multinationals to the survey question "To your knowledge, how important were the following factors in the decision of the multinational to locate itself in Costa Rica? Complete all the options, choosing how important you think each criterion was." Percentages do not need to sum up to 100 across options, as each respondent had to rate the extent to which each criterion had been relevant to the MNC. Percentages only need to sum up to 100 for each criterion.
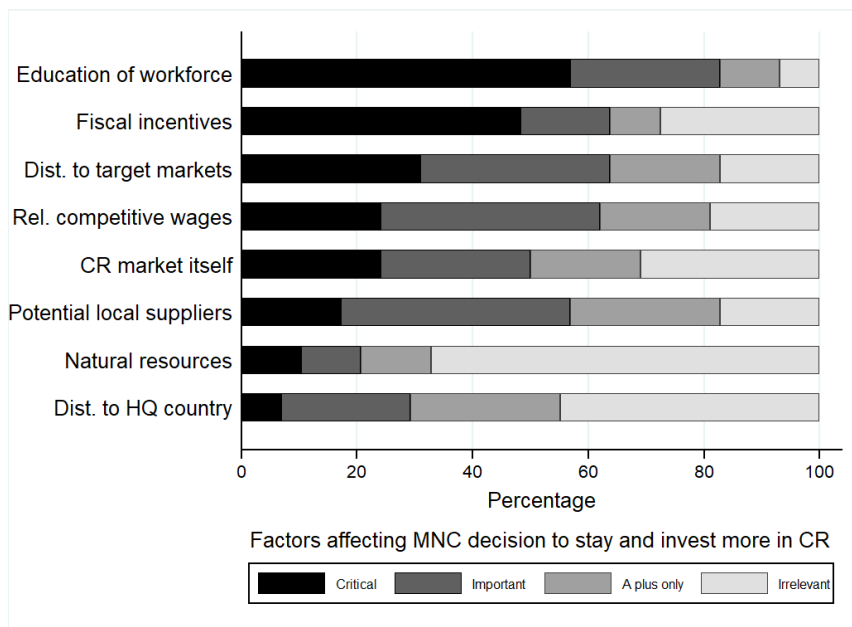


Figure G15: Question 4: To your knowledge, how important were the following factors in the decision of the multinational to STAY or EXPAND in Costa Rica?

*Notes:* This graph summarizes the answers of 58 multinationals to the survey question "To your knowledge, how important were the following factors in the decision of the multinational to STAY or EXPAND in Costa Rica? Complete all the options and choose how important you think each criterion was." Percentages do not need to sum up to 100 across options, as each respondent had to rate the extent to which each criterion had been relevant to the MNC. Percentages only need to sum up to 100 for each criterion.

**Question 4:** "To your knowledge, how important were the following factors in the decision of the multinational to STAY or EXPAND in Costa Rica? Complete all the options and choose how important you think each criterion was." Question type: Likert-type scale. Survey version: both long and short (N=58). Section: "General questions about the multinational's incentives to invest in Costa Rica." The scale and the options were the same as those proposed for Question 3.

Figure G15 summarizes the findings from Question 4.

Table G15: Question 5: In general, how important are the following criteria when choosing a new supplier in Costa Rica (Costa Rican or not)?

| Criterion | Critical | V. Important | Important | Only useful | Irrelevant |
|---|---|---|---|---|---|
| Quality of products/services | 75.9 | 15.5 | 6.9 | 0.0 | 1.7 |
| Will or ability to adapt to MNCs | 60.3 | 25.9 | 10.3 | 1.7 | 1.7 |
| Price of products/services | 43.1 | 32.8 | 15.5 | 6.9 | 1.7 |
| Reliability, traceability etc. | 31.0 | 37.9 | 19.0 | 6.9 | 5.2 |
| ISO certificates | 20.7 | 50.0 | 15.5 | 5.2 | 8.6 |
| Productive capacity | 12.1 | 29.3 | 36.2 | 10.3 | 12.1 |
| Will or ability to invest | 8.6 | 32.8 | 25.9 | 15.5 | 17.2 |
| Distance supplier-MNC | 6.9 | 24.1 | 20.7 | 27.6 | 20.7 |
| Prior experience exporting | 5.2 | 19.0 | 15.5 | 25.9 | 34.5 |
| Foreign language | 5.2 | 19.0 | 17.2 | 20.7 | 37.9 |
| Same HQ country | 3.4 | 0.0 | 5.2 | 19.0 | 72.4 |
| Be part of a FTZ | 3.4 | 1.7 | 13.8 | 22.4 | 58.6 |
| Will to move closer | 1.7 | 17.2 | 19.0 | 37.9 | 24.1 |
| Prior experience w/ MNCs | 1.7 | 36.2 | 25.9 | 20.7 | 15.5 |
| Being foreign-owned | 0.0 | 0.0 | 1.7 | 13.8 | 84.5 |

*Notes:* This table summarizes the answers of 58 multinationals to the survey question "In general, how important are the following criteria when choosing a new supplier in Costa Rica (Costa Rican or not)? Complete all the options, selecting the importance that you think each criterion has." Percentages do not need to sum up to 100 across criteria, as each respondent had to rate the extent to which each criterion is relevant to the MNC. Percentages only need to sum up to 100 for each criterion.

**Question 5:** "In general, how important are the following criteria when choosing a new supplier in Costa Rica (Costa Rican or not)? Complete all the options, selecting the importance that you think each criterion has." Section: "Relations with local suppliers (located in Costa Rica). From this moment, our questions will focus on the relationship between the multinational and its local suppliers."

For each proposed factor, the respondent had to choose one of five options: "Of critical importance," "Very important," "Important," "Useful, but not a decisive factor," or "Without importance, irrelevant, does not apply." We proposed fifteen potential reasons (in order): "The physical distance between the supplier and the multinational," "The willingness of the supplier to move closer to the multinational," "Having previous experience with multinationals,"

"Having previous experience exporting," "Being from the same country as the multinational," "Being foreign-owned, even if not from the same country as the multinational," "Being under the Free Trade Zone regime," "The price of goods or services already on offer," "The quality of goods or services already on offer," "Willingness or ability to adapt and supply the exact product or service needed by the multinational," "Having a manager (or employee) who speaks the main language of the multinational," "Reliability / inventory management / input traceability / other characteristics of the organization," "Having standardized quality certificates, relevant to the business (for example, ISO 13485 in the medical device sector)," "The size of the supplier, that is, that already has sufficient productive capacity," "The willingness or ability to make large investments to supply to the multinational."

Table G15 summarizes the answers to Question 5.

**Question 6:** "Does the multinational provide any particular support or guidance to a new supplier to improve its ability to supply to the multinational?" Question type: Dichotomous. Survey version: both short and long (N=15). Question type: Dichotomous. The two options available were "NO, the multinational does not provide any explicit support" and "YES, the multinational carries out specific actions to help the new supplier adapt to their relationship."

40 multinationals answered "YES" (69%) and 18 multinationals answered "NO" (31%).

**Question 7:** "Which of the following options describe the way(s) in which the multinational provides support to the new supplier to adapt to their new relationship? Mark all the answers that are TRUE." Question type: Multiple-choice. Survey section: "More details on the support provided by the multinational to suppliers." Survey version: both long and short (N=40).

We proposed eight potential options (in order): "The multinational provides an instruction manual ("blueprint") of the desired product or service or other relevant documentation," "Employees of the multinational visit the supplier and help it with advice in the adjustment process (for example, the multinational performs supplier audits and guides the supplier on ways to improve)," "Employees of the supplier are invited to visit the multinational to observe parts of its production that are relevant to the inputs they will supply to the multinational," "The multinational has standardized training programs that the multinational offers to employees of local suppliers," "The multinational puts the supplier in contact with another supplier that sells similar products or services to the multinational in other places, to advise the new supplier on best practices," "The multinational lends money or pays the firm in advance so that the firm can make the necessary investments," "The multinational is the one that buys the specific machinery necessary to provide the good / service and lends / rents it to the local supplier," or "Other: _____."

Table G16 summarizes the answers of 40 multinationals to Question 7.

Table G16: Question 7: Which of the following options describe the way(s) in which the multinational provides support to the new supplier to adapt to their new relationship?

| Support | Frequency | Percentage |
|---|---|---|
| Share blueprint/details of expected product/service | 33 | 82.5 |
| Visits of supplier to MNC, learn about relevant production process | 33 | 82.5 |
| Visits of MNC to supplier, audits and guidance on improvements | 32 | 80.0 |
| Training programs for suppliers' workers | 13 | 32.5 |
| Connect w/ supplier elsewhere, who shares best practices | 9 | 22.5 |
| MNC pays in advance, helping supplier make investments | 6 | 15.0 |
| MNC lends necessary equipment to supplier | 2 | 5.0 |
| Other | 5 | 12.5 |

*Notes:* This table summarizes the answers of 40 respondents (to the survey to multinationals) to the survey question: "Which of the following options describe the way(s) in which the multinational provides support to the new supplier to adapt to their new relationship? Mark all the answers that are TRUE." Note that the 18 multinationals that responded "NO" to Question 6 skipped this question.

**Question 8:** "If possible, please provide more details on the most important way in which the multinational assists the supplier to adjust to its new relationship with the multinational. For example, the duration of the assistance provided, the frequency of the assistance, the number of trained employees, the size of the loan offered and the conditions, etc." Question type: Open-ended. Survey section: "More details on the support provided by the multinational to suppliers." Survey version: long and short (N=40). This question was a follow-up to Question 7, for those having chosen "YES" in Question 6.

Each MNC responding positively to Question 6 provided details on its most important form of support extended to its new suppliers. The main takeaway is that there is great variety in the breadth and depth of the support provided by MNCs to their new suppliers. The lighter forms of assistance include sharing of detailed descriptions of the good or service expected (without additional guidance on how to actually produce it) or sharing of an instruction manual on the general practices that MNCs expect their suppliers to follow. The following quote pertains to one of the MNCs whose support seemed more substantial.

> The most important help that we offer comes in the form of standardized training programs. Given that our industry has very high standards of quality, we need to make sure that our suppliers can live up to the same standards as we do. For that reason, our local experts provide tailored training to suppliers, share corporate best practices with them. This leads to a win-win: it benefits us as it turns the supplier into an ally, it benefits the supplier as it is improving its [business and technical] practices. Whether the training is offered only to the manager of the supplier or whether it includes other employees as well depends on the nature of the training, how deep it goes into the processes of the supplier, how large is the gap between where the supplier is and where it needs to get.

Table G17: Question 9: How is the supplier expected to compensate the multinational for the support received? Please choose ONE option only.

| Compensation | Frequency | Percentage |
|---|---|---|
| Increasing quality, prices not changing much | 15 | 37.5 |
| Increasing quality, falling prices | 12 | 30.0 |
| Not to be compensated, part of CSR | 8 | 20.0 |
| Other | 3 | 7.5 |
| Exclusivity contract b/n MNC and supplier | 1 | 2.5 |
| Quickly falling prices, same product/service | 1 | 2.5 |
| Total | N=40 | 100 |

*Notes:* This table summarizes the answers of 40 respondents (to the survey to multinationals) to the survey question:"How is the supplier expected to compensate the multinational for the support received? Please choose ONE option only." Note that the 18 multinationals that responded "NO" to Question 6 skipped this question.

**Question 9:** "How is the supplier expected to compensate the multinational for the support received? Please choose ONE option only." Survey section: "More details on the support provided by the multinational to suppliers." Survey version: long and short (N=40).

The question allowed for a single answer among seven options (in order): "The support provided is NOT intended to be reciprocated. For example, this support is part of the Corporate Social Responsibility strategy of the multinational," "The support must be corresponded through lower prices in the SHORT-TERM than the prices that the firm could offer before the collaboration with the multinational, for the same product or service," "The support must be corresponded through a trend of GRADUALLY decreasing prices compared to the prices that the firm could offer before the collaboration with the multinational, but for the same product or service," "The support must be corresponded through ensuring a higher quality of the product / service, BUT with prices that do not change much," "The support must be corresponded through ensuring a greater quality of the product / service AND with prices also falling," "The support must be reciprocated through an exclusivity contract between the firm and the multinational, the firm must become an exclusive supplier," or "Other: _____."

Table G17 summarizes the answers of 40 multinationals to Question 9.

**Question 10:** "Please, if possible, provide more details about the previous answer." This question is a follow-up to the question above. Survey section: "More details on the support provided by the multinational to suppliers." Survey version: long only (N=23).

By and large, MNC staff describe the support provided to the suppliers of the MNC as meant to establish a win-win collaboration. The following answer from the Supply Chain Manager of one MNC is representative for all other 22 answers.

While there is no formal commitment during the period of support, we expect that the supplier is

willing to educate itself, to learn how to improve the quality and service offered. Moreover, we help the supplier improve its processes, its management practices. Hence there is the expectation that cost reductions would be shared between the supplier and us, that the help we provided led to a win-win situation. For instance, we excel in lean manufacturing and invite suppliers to see how we manage our operation, so that they can apply the same principles to their operation. Suppliers are under constant control of their quality and service. If we put suppliers under probation and if their quality/service does not improve within a couple of months, they lose the contract with us.

**Questions 11, 12, and 13:** We summarize here the answers to three consecutive and related questions: "From your point of view, what are the three most probable profits/benefits/advantages that Costa Rican firms experience when they become suppliers of MNCs? Provide details to your answers." All three answers were open-ended. Survey version: long only (N=23).

In Table G18 we categorized the answers provided by the 23 respondents into four categories, which we created based on the common themes emerging across answers.

Table G18: Questions 11, 12, and 13: Top three most important benefits to becoming a supplier to MNCs, according to MNCs

|   | Most important benefit |   | Second most important benefit |   | Third most important benefit |
|---|---|---|---|---|---|
| 8 | Stability and predictability | 11 | Learning opportunities | 12 | Learning opportunities |
| 7 | Learning opportunities | 7 | Stability and predictability | 5 | Scale and global opportunities |
| 7 | Scale and global opportunities | 4 | Scale and global opportunities | 2 | Stability and predictability |
| 1 | Reputation | 1 | Reputation | 1 | Reputation |
| 0 | None | 0 | None | 3 | None |
| N=23 |   | N=23 |   | N=20 |   |

Hereafter, we provide an example of an answer for each of the four categories. Each answer comes from a different respondent.

Example for "stability and predictability":

The first most important gain/benefit /advantage for Costa Rican firms is the contract length. The type of business they establish is a win-win relationship, where it is possible for suppliers to project themselves into the future and begin to be part of a stable supply chain.

Example for "learning opportunities":

The third largest gain/benefit/advantage derived from becoming a supplier to MNCs has to do with the improvements and the strengthening of the management model of the supplier, both concerning production and service provision. The modus operandi a supplier learns during the collaboration with MNCs is helpful in several ways. If the supplier manages to standardize processes and apply the same principles for other clients, the supplier will always win because it is better prepared. This gain is particularly significant for SMEs.

Example for "scale and global opportunities":

Once a firm joins our list of approved suppliers for a given commodity, opportunities are global for that supplier within the organization. [They] are in the system and visible globally. That supplier becomes available to anyone at any site. As long as the pricing is correct and the business proposition is the right one, then they can supply elsewhere as well.

Example for "reputation":

The second largest gain goes to the reputation of the supplier. Once one MNC uses a supplier, given the high expectations of MNCs, if that initial deal goes well, the news spreads to other MNCs that have similar requirements.

**Questions 14, 15, and 16:** We summarize here the answers to three consecutive and related questions: "From your point of view, what are the three losses/risks/disadvantages that Costa Rican companies experience when they become suppliers of MNCs? Provide details to your answers." All three answers were open-ended. Survey version: long only (N=23).

In Table G19 we categorized the answers provided by the 23 respondents into six categories, which we created based on the common themes emerging across answers.

Table G19: Questions 14, 15, and 16: Top three most important risks to becoming a supplier to MNCs, according to MNCs

| Most important risk | | Second most important risk | | Third most important risk | |
|---|---|---|---|---|---|
| 11 | Financial or legal risk | 7 | None | 18 | None |
| 7 | Demanding changes | 5 | Demanding changes | 2 | Financial or legal risk |
| 3 | None | 4 | Financial or legal risk | 1 | Bad reputation |
| 1 | Bad reputation | 4 | Bad reputation | 1 | Demanding changes |
| 1 | Specificity | 2 | Other | 1 | Other |
| 0 | Other | 1 | Specificity | 0 | Specificity |
| N=23 | | N=23 | | N=23 | |

Hereafter, we provide an example of an answer for the categories "financial or legal risk," "demanding changes,"" "bad reputation," and "specificity." Each answer comes from a different respondent.

Example for "financial or legal risk":

A first considerable risk comes from the volumes ordered by MNCs. The supplier might need to invest a lot to live up to its large orders. However, if the supplier is unable to deliver the expected level of quality and service, it might lose the contract and get in trouble because of the investment made. It is not the policy of the multinational to sign long-term contracts with a supplier because they cannot commit to continuing a contract with a supplier that does not deliver what it is supposed to deliver time and again.

Example for "demanding changes":

The most significant disadvantage/risk has to do with the level of pressure that a firm is put under when becoming a supplier to an MNC. Supplying to an MNC comes with many requirements, many

specifications, high standards. MNCs are very demanding. This can be very stressful for a small Costa Rican firm. Sometimes some misunderstandings come up due to misaligned expectations.

Example for "bad reputation":

The second most important risk is reputational. MNCs participate at seminars, at fora. They exchange on their experience with local suppliers. If a given relationship with an MNC goes sour, then this will become quickly known to other MNCs as well. For this reason, every commercial relationship matters for the reputation of a supplier, not to gain a reputation of being a bad supplier, from which it is hard to recover.

Example for "specificity":

Given the market in which the MNC is, suppliers of direct inputs might feel too narrowly specialized.

**Questions 17 and 18:** We bundle together these two questions. Question 17 asked about the procurement decision process on key inputs, Question 18 about the decision process on secondary inputs. "WHICH AFFILIATE decides on the procurement of KEY (or SECONDARY) INPUTS for the affiliate in Costa Rica and HOW? Please choose ONE option only. Note: Key inputs are those inputs that affect the quality and final characteristics of the core product. An example of a good / service that may **not** be key (may be secondary) is packaging or spare parts for the machinery used in production."

The question allowed for a single answer among six options (in order): "Most decisions about key (secondary) inputs are made by the headquarters (or another affiliate other than the affiliate in Costa Rica), with little to no feedback on Costa Rican suppliers from the Costa Rican affiliate," "Most of the decisions on key (secondary) inputs are made by the headquarters (or another affiliate other than the affiliate in Costa Rica), but with comments on Costa Rican suppliers from the Costa Rican affiliate," "Decisions on key (secondary) inputs are made jointly between the headquarters (or another affiliate other than the affiliate in Costa Rica) and the Costa Rican subsidiary," "Most decisions on key (secondary) inputs are made by the Costa Rican affiliate, but with comments from the headquarters (or another affiliate other than the affiliate in Costa Rica)," "Most decisions on key (secondary) inputs are made by the Costa Rican affiliate, with little to no feedback from the headquarters (or any affiliate other than the affiliate in Costa Rica)," or "Other: _____."

Table G20 summarizes the answers from both Questions 17 and 18.

Table G20: Questions 17 and 18: WHICH AFFILIATE decides on the procurement of KEY (SECONDARY) INPUTS for the affiliate in Costa Rica and HOW? Please choose ONE option only.

|  | Core inputs | | Secondary inputs | |
|---|---|---|---|---|
|  | Frequency | Percent | Frequency | Percent |
| HQ, little local feedback | 7 | 12.1 | 0 | 0.0 |
| HQ, with local feedback | 12 | 20.7 | 2 | 3.5 |
| Joint decision | 15 | 25.9 | 10 | 17.2 |
| Local, with HQ feedback | 8 | 13.8 | 15 | 25.9 |
| Local, little HQ feedback | 12 | 20.7 | 28 | 48.3 |
| Other | 4 | 6.9 | 3 | 5.2 |
| Total | N=58 | 100 | N=58 | 100 |

*Notes:* This table summarizes the answers of 58 respondents (to the survey to multinationals) to the survey questions: "WHICH AFFILIATE decides on the procurement of KEY (SECONDARY) INPUTS for the affiliate in Costa Rica and HOW? Please choose ONE option only."

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