Multinational Networks and Trade Participation*

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March 2025

Abstract

This paper provides a new explanation for the dominance of multinational corporations (MNCs) in international trade: after being acquired by an MNC, firms face lower entry frictions in countries in which their global parent already has a presence. We provide a model of firms' export and import choices that delivers firm-level gravity regressions to isolate these "MNC network effects" from other channels through which multinational ownership can affect firms' trade participation. We estimate the model combining rich administrative data for Belgium with data on MNCs' global affiliate networks. Event study results reveal that acquired firms are more likely to start exporting to and importing from countries that belong—or that are exogenously added—to their parental network. The effects are stronger when new affiliates are geographically and culturally close to their direct parent, which can facilitate transfer of information about the global parent's network. Combining the structure of our model with the empirical estimates, we find that MNC network effects have a large impact on firm growth. The effects of MNC ownership extend beyond the boundaries of the multinational: new affiliates are also more likely to start trading with countries that are geographically and culturally close to the MNC network, even if their parent has no affiliates there.

*We thank Pol Antràs, David Atkin, Joaquín Blaum, Kirill Borusyak, Banu Demir, Dave Donaldson, Peter Egger, Lionel Fontagné, Mayara Felix, Teresa Fort, Gordon Hanson, Beata Javorcik, Wolfgang Keller, Rocco Macchiavello, Isabela Manelici, Ignacio Marra, Thierry Mayer, Eduardo Morales, Michael Peters, Veronica Rappoport, Steve Redding, Andrés Rodríguez-Clare, Claudia Steinwender, Dan Trefler, Jose Vasquez, and Daniel Xu, as well as participants at the IES workshop at Princeton, the NBER Summer Institute on International Trade and Investment, the ERWIT, EOS, GEP, RIEF conferences, the CESifo workshop on Trade, Market Failures, and Development, the workshop on International Trade and Multilateralism, the Trade and Development workshop, the CITP conference, the conference on Trade and Value Chains at the Bank of Italy, and seminars at the LSE, Brandeis, Bielefeld, Durham, UCD, IADB, CEPII, Cambridge, Kings, Bank de France, Mannheim, Geneva, and Oxford for their comments. We are grateful to Paul Horsler, Camin McCluskey, Afrola Plaku, and Tommaso Sonno for their help with the data. This project started while Glenn Magerman was at the National Bank of Belgium. Paola Conconi gratefully acknowledges financial support from the European Research Council (Advanced ERC Grant Agreement No. 834253). Glenn Magerman gratefully acknowledges funding from the Fonds de la Recherche Scientifique (FRS-FNRS Grant No. H.P046.20).

1 Introduction

Multinational corporations (MNCs) dominate international trade, accounting for almost two-thirds of the value of global trade flows (Miroudot and Rigo, 2021). For example, in Belgium, multinational affiliates represent only 1% of the population of firms, but account for 60% of total exports and 65% of total imports.

In this paper, we propose a new mechanism that contributes to this dominance. We show that multinational ownership reduces country-specific trade frictions, making it easier for acquired firms to start exporting to and importing from countries in which their parent has other affiliates. We label this mechanism "MNC network effects," and isolate it from firm-specific channels emphasized in the existing literature, such as productivity increases due to technological or managerial transfers.[1] We find that MNC network effects account for a large fraction of affiliates' growth after they are acquired. We also provide evidence that the effects of MNC ownership are not confined to the boundaries of the multinational.

Our main contribution is to theoretically and empirically isolate network-specific effects of MNC ownership. In our theoretical model, firms choose which countries to source their inputs from to minimize costs and where to sell their output to maximize profits. MNC ownership can affect the export and import decisions of new affiliates, both at the extensive and intensive margins, through firm-specific channels (e.g., productivity gains), and through firm-country specific channels related to the countries in the MNC's network (e.g., alleviation of trade barriers in countries in which the parent already has a presence). The model delivers firm-level gravity equations that can be estimated to identify such MNC network effects.

We estimate the model using rich firm-level information from the National Bank of Belgium (NBB), allowing us to identify Belgian firms acquired by a foreign multinational and their direct parents (DP). Combining these data with the Global Orbis and Historical Orbis datasets from Moody's, we can trace the global ultimate owner (GUO) of each new affiliate and construct its MNC network, i.e., the set of countries in which the GUO has a presence. The impact of MNC ownership is identified by exploiting within-firm variation in MNC ownership status over time and cross-firm variation in the geographical structure of multinational networks at the time of the acquisition. We implement event studies that take into account that firms are acquired at different times, implying that the roll-out is staggered and treatment effects are time-varying.

The estimates show that multinational acquisitions give rise to "MNC network effects" at

[1] MNCs can increase affiliates' productivity through transfers of technology or managerial know-how (e.g., Bloom *et al.*, 2012; Bircan, 2019), which can lead affiliates to select into different margins of trade (e.g., Melitz, 2003; Helpman *et al.*, 2004; Guadalupe et al, 2012; Antràs *et al.*, 2017). MNC ownership can also boost trade participation by alleviating credit constraints (e.g., Harrison *et al.*, 2004; Manova *et al.*, 2015).

the extensive margin: new affiliates are more likely to start trading with countries belonging to their GUO's network. In terms of magnitude, the probability of exporting to (importing from) network countries increases by 5.7 (3.8) percentage points within four years after acquisition, a 33% (42%) increase compared to the unconditional probability of exporting (importing) in the estimation sample. We instead find no evidence of network effects at the intensive margin: the value of exports to (and imports from) countries a firm was already trading with before being acquired does not depend on whether the parent has a presence in those countries.

MNC network effects at the extensive margin are robust to using different samples of affiliates and of network countries, and to different clustering of standard errors. They also continue to hold when we exploit plausibly exogenous changes in affiliates' MNC networks. In particular, we use data from Orbis M&A to identify ownership changes that result in changes in the GUO of Belgian affiliates.[2] We find that affiliates are more likely to start exporting to and importing from countries that are added to their GUO's network.

One potential mechanism behind these results is that knowledge flows within the MNC hierarchy reduce the fixed costs of obtaining market-specific information that deter export and import entry. We suggest that the DP can provide information to its Belgian affiliate about local regulations and market conditions in countries in which the GUO has a presence. In this case, we would expect MNC network effects to be stronger when information can more easily flow from the DP to the affiliate, i.e., when the two are geographically and culturally closer (e.g., Keller and Yeaple, 2013; Gumpert, 2018; Bahar, 2020; Guillouët *et al.*, 2024). As expected, we find that new affiliates are more likely to start trading with countries in the GUO's network when their DP is located in a country that is geographically closer (i.e., in the same time zone as Belgium) or culturally closer (i.e., shares one of the official languages of Belgium).

MNC network effects are quantitatively important. Combining the structure of our model with estimates on the effects of MNC ownership on firms' sales and employment, we perform back-of-the-envelope calculations of the impact of MNC network effects on firm growth.[3] Our findings imply that the growth rate of acquired firms is more than twice as large as that of the median domestic firm due to MNC network effects: during our sample period, acquired

[2]This is similar to the strategy used by Atalay *et al.* (2019) to identify the impact of vertical integration on trade between U.S. establishments. Changes in MNC networks resulting from these global transactions can be taken as exogenous from the point of the Belgian affiliates in our sample: the (old and new) GUOs have very large networks and have no direct ownership of the affiliates.

[3]To identify causal effects of MNC ownership on firm size, we employ Hainmueller (2012)'s entropy balance re-weighting algorithm, which allows us to construct treatment and control groups that are indistinguishable in terms of the mean and higher moments of the distribution of a large set of firm characteristics. See Egger and Tarlea (2020) and Basri *et al.* (2021) for applications of this re-weighting strategy.

firms' sales (employment) grew by 6.7% (3.1%) per year due to MNC network effects; by contrast, the median annual growth rate of sales (employment) for non-acquired firms was 1.9% (0.0%).

Finally, we show that multinational acquisitions give rise to extended MNC network effects: new affiliates are more likely to start trading not only with countries in which their global parent has a presence, but also with countries that share a common border and a common language with a country in the GUO's network. These results are robust to excluding countries added to the GUO's network after the firm's acquisition. The literature on extended gravity (e.g., Albornoz, *et al.*, 2012; Morales *et al.*, 2019; Alfaro-Ureña *et al.*, 2023) suggests that these effects could be due to similarity in regulations and market conditions across countries that are geographically and culturally close to each other: acquiring information about regulations and market conditions in a network country (e.g., Argentina) can reduce the cost of acquiring this information in another country nearby (e.g., Chile), even if the GUO has no presence there. By construction, extended MNC network effects operate outside the boundaries of the multinational, since they involve countries in which the global parent has no presence. These results indicate that MNC ownership boosts affiliates' trade participation by alleviating market-specific entry frictions, rather than by simply facilitating trade between affiliates of the same multinational.[4]

Our analysis suggests that firms face sizable trade frictions that deter their entry into new export and import markets. Reducing such frictions is a widespread goal of trade promotion agencies established by the governments of many countries.[5] We show that, through their networks, MNCs can alleviate entry barriers in foreign markets, making it possible for their affiliates to expand the set of countries in which they have customers and suppliers.

Our paper is related to three main streams of literature. A first stream studies the effects of multinational ownership on firm-level outcomes. Much of this literature focuses on the productivity of acquired firms (e.g., Aitken and Harrison, 1999; Arnold and Javorcik, 2009) or on multinationals' productivity spillovers (e.g., Haskel *et al.*, 2007; Keller and Yeaple, 2009; Javorcik, 2004; Alfaro-Ureña *et al.*, 2022). A few studies show that multinational ownership can alleviate financial constraints faced by acquired firms (e.g., Harrison *et al.*, 2004; Manova *et al.*, 2015).[6] The closest paper to ours is Guadalupe *et al.* (2012). Using a panel dataset of

[4]Carballo *et al.* (2022) provide complementary evidence that MNCs generate network effects outside their boundaries: using data from Uruguay, they find that new independent suppliers of MNCs are more likely to start exporting to countries in which the respective multinational is headquartered or has an affiliate.

[5]For example, the Belgian Foreign Trade Agency organizes economic missions and disseminates information and documentation about foreign markets. See https://www.abh-ace.be/en/about-bfta. Some studies show that export promotion policies can be effective at boosting trade (e.g., Martincus and Carballo, 2008; Lederman *et al.*, 2010).

[6]Our paper also relates to the literature on the location decisions of MNCs (e.g., Tintelnot, 2017; Head

Spanish manufacturing firms, they show that firms acquired by MNCs conduct more product and process innovation, adopting new machines and organizational practices, only when they are more likely to export through their parent's distribution network. Our paper emphasizes more general effects of multinational ownership on trade participation: new affiliates are more likely to start exporting to and importing from countries in which their parent already operates and other countries connected to them.

We also contribute to the literature on networks in trade. Several studies model frictions in networks (e.g., Jackson and Rogers, 2007; Chaney, 2014), while others show that social and ethnic networks reduce information frictions between buyers and sellers (e.g., Rauch, 1999; Rauch and Trindade, 2002).[7] Antràs *et al.* (2024) find that multinational parents are more likely to trade with countries that are close to their affiliates, consistent with MNC-level fixed costs of trade. Their results cannot be interpreted causally, since they are based on correlations in cross-sectional data on U.S. MNCs. Ours is the first paper to exploit rich time-series data to identify the causal effects of MNC ownership on within-affiliate trade participation over time.

Our paper is also related to the empirical literature on mergers and acquisitions (M&As). Most studies focus on a small number of transactions in specific industries.[8] For example, Ashenfelter and Hosken (2010) look at five consumer products mergers to assess the effectiveness of US horizontal merger policy. Miller and Weinberg (2017) study the price effects of MillerCoors, a joint venture of SABMiller PLC and Molson Coors Brewing that combined the operations of these brewers in the United States. Alviarez *et al.* (2025) study the competition effects of multinational acquisitions in beer and spirits. None of these papers examine how multinational acquisitions affect affiliates' trade participation.

The rest of the paper is structured as follows. Section 2 develops a model in which MNC ownership affects export and import choices through firm-specific and network-specific channels. Section 3 presents the data used. Section 4 discusses our identification strategy. Section 5 presents our empirical findings. Section 6 concludes.

and Mayer, 2019; Garetto *et al.*, 2019; and Oberfield *et al.*, 2024).

[7] A few studies emphasize the role of managers in reducing search, information, and trust frictions in trade relationships (e.g., Mion *et al.*, 2014; Patault and Lenoir, 2024). There is also an emerging literature on the role of buyer-seller relationships (e.g., Bernard and Moxnes, 2018; Bernard *et al.*, 2022).

[8] One exception is the paper by Blonigen and Pierce (2016), who use confidential data from the U.S. Census Bureau to study the impact of domestic M&As on productivity and market power.

2 A Model of Multinational Ownership and Trade

This section provides a theoretical model that allows us to identify a novel network mechanism that can affect trade participation of multinational affiliates: MNC ownership alleviates trade frictions in countries that belong to the parental network. The model allows us to separate network-specific mechanisms from affiliate-level mechanisms highlighted in the existing literature (e.g., productivity increases due to technological or managerial transfers from the parent), which affect an affiliate's incentives to trade with all countries. This approach does not require us to take a stance on the reasons for multinationals' acquisitions.[9]

2.1 Environment

The world economy consists of a set of countries, denoted by c, each populated by firms, denoted by i. There is an infinite sequence of periods, denoted by t.

Demand

Demand Q_{ct} in country c at time t is given by a constant elasticity of substitution (CES) aggregator of the form:

$$Q_{ct} = \left[\sum_{i \in N_{ct}} \left(\bar{\zeta}_{ct} \zeta_{ict} q_{ict} \right)^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, \quad \eta > 1, \tag{1}$$

where q_{ict} is the quantity sold by firm i to country c at time t. $\bar{\zeta}_{ct}$ is a country-year-specific demand shifter common to all firms, while ζ_{ict} is a firm-country-year-specific demand shifter capturing the quality of the firms' products and their attractiveness to buyers. N_{ct} is the (endogenous) set of firms exporting to c at time t, and η is the elasticity of substitution between products. We denote the price index associated with equation (1) as P_{ct}.

Production Technology

Firms produce output q_{it} with CES technology:

$$q_{it} = z_{it} \left[\left(\bar{\xi}_{Lt} \xi_{iLt} L_{it} \right)^{\frac{\sigma-1}{\sigma}} + \sum_{c \in S_{it}} \left(\bar{\xi}_{ct} \xi_{ict} x_{ict} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad \sigma > 1. \tag{2}$$

L_{it} is firm i's domestic labor at time t and x_{ict} denotes firm i's intermediate inputs from country c (including the home country) at time t. S_{it} is the endogenous set of countries firm

[9] We address concerns about of the endogeneity of these acquisitions in Section 4.

i sources material inputs from at time t. We denote the elasticity of substitution between inputs of production by σ. z_{it} is firm i's Hicks-neutral productivity at time t. $\bar{\xi}_{Lt}$ and $\bar{\xi}_{ct}$ are labor- and source-country-specific shifters common to all firms at time t, whereas ξ_{iLt} and ξ_{ict} are firm-level labor- and source-country-specific shifters at time t, respectively. These variables capture, for example, factor-biased productivity, input quality, and home bias in input demand. The cost function associated with equation (2) is given by:

$$c_{it}\left(S_{it}\right)=\frac{B_{it}\left(S_{it}\right)}{z_{it}}, \qquad B_{it}(S_{it})=\left[\left(\frac{w_t}{\bar{\xi}_{Lt}\xi_{iLt}}\right)^{1-\sigma}+\sum_{c\in S_{it}}\left(\frac{b_{ict}}{\bar{\xi}_{ct}\xi_{ict}}\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}}, \tag{3}$$

where w_t is labor wage in the home country, and b_{ict} is the price of material inputs. Trade incurs iceberg trade costs $\tau_{ict}\geq 1$, so that the marginal cost of selling to country c at time t is $c_{ict}=\tau_{ict}c_{it}\left(S_{it}\right)$.

Firm Choices

Firms are price takers in input markets and monopolistically competitive in output markets. In each period, firm i chooses labor (L_{it}), a set of source countries (S_{it}), a vector of material inputs ($\mathbf{x_{ict}}$), a set of export destinations (C_{it}), and a vector of prices ($\mathbf{p_{ict}}$) to maximize profits, which are separable by export destination:

$$\pi_{it}=\max_{\substack{L_{it},S_{it},\mathbf{x_{ict}},\\ C_{it},\mathbf{p_{ict}}}}\sum_{c\in C_{it}}\underbrace{\left(p_{ict}-\tau_{ict}c_{it}\left(S_{it}\right)\right)q_{ict}}_{\equiv\pi_{ict}}-\sum_{c\in C_{it}}w_tF_{ict}^{x}-\sum_{c\in S_{it}}w_{ct}F_{ict}^{m}. \tag{4}$$

p_{ict} is the price set by firm i in country c at time t. π_{ict} and F_{ict}^{x} denote gross profits and fixed costs faced by firm i when selling to country c at time t, respectively. We assume that there are no fixed costs associated with domestic sales and normalize domestic wages w_t to one from now on. w_{ct} is the labor wage in source country c at time t and F_{ict}^{m} denotes the fixed cost faced by firm i when sourcing from country c at time t. There are no fixed costs when sourcing inputs domestically.[10]

Each period, we assume that firms first choose domestic and foreign inputs to minimize production costs. Conditional on their input choice, they then decide where to sell their final goods to maximize profits.[11] We solve the firm's problem using backward induction.

[10] In the model, we do not distinguish between export and import sunk and per-period fixed costs. We provide empirical evidence that input and export fixed costs are at least partially sunk in Section 5.5.

[11] This standard assumption enables us to derive an analytic solution for the equilibrium equations, which we can bring to the data. Allowing import choices to depend on export decisions would generate a combinatorial decision problem that should be solved numerically, as in Antràs *et al.* (2017), making our estimation approach unfeasible.

2.2 Equilibrium

The model delivers equilibrium expressions for the extensive and intensive margins of firms' export and sourcing choices, which we characterize below.

Export Probability

Equation (1) implies that firm i faces demand from country c at time t equal to $q_{ict} = E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}p_{ict}^{-\eta}\zeta_{ict}^{\eta-1}$, where E_{ct} is total expenditure in c at t. Profit maximization from equation (4) delivers the optimal price schedule $p_{ict} = \bar{\eta}\tau_{ict}c_{it}(S_{it})$, where $\bar{\eta} = \eta/(\eta-1)$. Therefore, variable export profits are $\pi_{ict} = (\bar{\eta}-1)\,\bar{\eta}^{-\eta}E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}\left(\tau_{ict}c_{it}(S_{it})\right)^{1-\eta}\zeta_{ict}^{\eta-1}$. Firm i exports to country c at time t if and only if variable profits exceed fixed costs of exporting, i.e., $\pi_{ict} \geq F_{ict}^x$. We can express the probability that this inequality holds as:

$$\Pr\left(\underbrace{\log(\bar{\eta}-1)\bar{\eta}^{-\eta}}_{k^x} + \underbrace{\log E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}}_{\varphi_{ct}^x} + \underbrace{(1-\eta)\log c_{it}(S_{it})}_{\varphi_{it}^x} + \underbrace{(\eta-1)\left(\log\zeta_{ict} - \log\tau_{ict}\right)}_{\varphi_{ict}^x} \geq \underbrace{\log F_{ict}^x}_{f_{ict}^x}\right). \tag{5}$$

Equation (5) states that the probability that firm i exports to country c at time t depends on a constant term (k^x), a country-time-specific component common to all firms (φ_{ct}^x), a firm-year component common across destinations (φ_{it}^x), a firm-country-year component reflecting firms' demand shifters and variable costs (φ_{ict}^x), and a firm-country-year component capturing the fixed cost that firm i faces when selling to country c at time t (f_{ict}^x). Because there are no fixed costs associated with domestic sales, all firms serve the home country.

Export Values

Conditional on exporting to a country, the value of firm i's exports to country c at time t is $r_{ict} \equiv p_{ict}q_{ict} = E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}\zeta_{ict}^{\eta-1}\left(\bar{\eta}\tau_{ict}c_{it}(S_{it})\right)^{1-\eta}$. Taking logs delivers the following equation for the intensive margin of exports:[12]

$$\log r_{ict} = \underbrace{(1-\eta)\log\bar{\eta}}_{\tilde{k}^x} + \underbrace{\log E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}}_{\tilde{\varphi}_{ct}^x} + \underbrace{(1-\eta)\log c_{it}(S_{it})}_{\tilde{\varphi}_{it}^x} + \underbrace{(\eta-1)\left(\log\zeta_{ict} - \log\tau_{ict}\right)}_{\tilde{\varphi}_{ict}^x}. \tag{6}$$

[12]The tildes used for the components of equation (6) reflect the fact that when examining the intensive margin, these terms can only be estimated using the subset of countries to which a firm already exports prior to year t. By contrast, when estimating the extensive margin in (5), we can use all country-year observations.

Similar to equation (5), equation (6) states that the log of the value of exports of firm i to country c at time t depends on a constant term ($\tilde{k}^x$), a country-time-specific component common to all firms ($\tilde{\varphi}^x_{ct}$), a firm-year component common across destinations ($\tilde{\varphi}^x_{it}$), and a firm-country-year component reflecting firms' demand shifters and variable costs ($\tilde{\varphi}^x_{ict}$). In contrast to equation (5), fixed costs do not enter the intensive margin of exports.

Import Probability

Unlike export choices, sourcing decisions are not separately additive across origins in equation (2), so the set S_{it} cannot be characterized in closed form (Antràs *et al.*, 2017; Blaum *et al.*, 2018). However, cost minimization requires that firm i imports from country c at time t if and only if the cost of sourcing from a set of countries that includes c is not greater than the cost of sourcing from a set of countries that excludes it, i.e., $\frac{B_{it}(S_{it})}{z_{it}} + w_{ct}F^m_{ict} \leq \frac{B_{it}(S_{it}\backslash\{c\})}{z_{it}}$. We can express the probability that this inequality holds as:

$$\Pr\left(-\underbrace{\log w_{ct}}_{\varphi^m_{ct}} - \underbrace{\log z_{it}}_{\varphi^m_{it}} + \underbrace{\log\left(B_{it}(S_{it}\backslash\{c\}) - B_{it}(S_{it})\right)}_{\varphi^m_{ict}} \geq \underbrace{\log F^m_{ict}}_{f^m_{ict}}\right). \tag{7}$$

Equation (7) states that the probability that firm i imports from country c at time t depends on a country-time-specific component common to all firms (φ^m_{ct}), a firm-year component common across origins (φ^m_{it}), and two firm-country-year components.[13] The first of these two terms reflects a firm's reduction in its input price index when adding country c to its optimal sourcing set (φ^m_{ict}) and the second captures the fixed cost faced by firm i when sourcing from country c at time t (f^m_{ict}). Because there are no fixed costs when sourcing domestically, all firms source material inputs from the home country.

Import Values

Conditional on sourcing from a country, applying Shephard's lemma to the cost function in equation (3) delivers material input demand equal to $m_{ict} \equiv b_{ict}x_{ict} = M_{it}B_{it}^{\sigma-1}\bar{\xi}_{ct}^{\sigma-1}\xi_{ict}^{\sigma-1}b_{ict}^{1-\sigma}$, where M_{it} is firm i's total material input expenditure at time t.[14] Taking logs delivers the following equation for the intensive margin of imports:

$$\log m_{ict} = \underbrace{(\sigma-1)\log\bar{\xi}_{ct}}_{\tilde{\varphi}^m_{ct}} + \underbrace{\log M_{it} + (\sigma-1)\log B_{it}}_{\tilde{\varphi}^m_{it}} + \underbrace{(\sigma-1)(\log\xi_{ict} - \log b_{ict})}_{\tilde{\varphi}^m_{ict}}. \tag{8}$$

[13] Since we solve the sourcing problem for a given level of output, an increase in z_{it} reduces the probability of importing material inputs from abroad in equation (7).

[14] Similarly, optimal labor is $w_tL_{it} = M_{it}\bar{\xi}_{Lt}^{\sigma-1}B_{it}^{\sigma-1}\xi_{iLt}^{\sigma-1}w_t^{1-\sigma}$.

Similar to equation (7), equation (8) states that the log of the value of imports of firm i from country c at time t depends on a country-time-specific component common to all firms ($\tilde{\varphi}^m_{ct}$), a firm-year component common across origins ($\tilde{\varphi}^m_{it}$) and a firm-country-year component reflecting firms' country-specific input shifters relative to variable costs ($\tilde{\varphi}^m_{ict}$). As in equation (6), fixed costs do not enter the intensive margin of imports.

2.3 The Role of MNC Ownership

Post acquisition, MNC ownership can affect firm outcomes (e.g., affiliates may become more productive), as well as firm-country outcomes over time (e.g., affiliates may face lower trade frictions in the markets where their multinational parent has a presence). The model provides multiple channels through which these mechanisms can affect trade outcomes. Specifically, the following model components can depend on MNC ownership:

$$\{z_{it}, \xi_{iLt}, S_{it}, C_{it}, F^m_{ict}, F^x_{ict}, \zeta_{ict}, \xi_{ict}, \tau_{ict}, b_{ict}\}. \tag{9}$$

The first component (z_{it}) represents the traditional firm-level effect of MNC ownership on firm outcomes: post acquisition, firms can become more productive, e.g., due to transfers of technology and managerial practices. In turn, these productivity gains can boost overall trade participation inducing firms to enter more markets and sell more in each entered market (Melitz, 2003). Acquisition might also affect labor productivity through such transfers via ξ_{iLt}, as well as the set of source and destination countries, S_{it} and C_{it}.

Our main goal is to evaluate the contribution of firm-country-specific effects of MNC ownership. For example, the MNC acquiring firm i may have knowledge of the local regulations and red tape in all the countries where its affiliates already operate. Post-acquisition, i may thus face lower fixed costs of exporting to and importing from those network countries (F^m_{ict}, F^x_{ict}), which would increase its probability of market entry. All other ict terms in equation (9) can also affect trade participation with network countries (at the extensive and intensive margin). For example, MNC ownership can: shift demand for a firm's output (ζ_{ict}), e.g., through brand recognition; shift a firm's input demand (ξ_{ict}), e.g., through better quality monitoring or customization of inputs; lower variable trade costs (τ_{ict}), e.g., through the parent's distribution network; lower input prices (b_{ict}), e.g., by improving access to higher quality/lower price suppliers.

In what follows, we show how MNC ownership can affect both firm and firm-country variables in a flexible way, while still delivering straightforward estimation equations. From now on, we use the subscript $i(p)$ to indicate variables pertaining to firm i when owned by parent p. We also make use of the following indicator variables: $MNC_{i(p)t}$, which is equal to

1 if firm i is owned by parent p at time t and 0 otherwise; and $In\ MNC_{cp}$, which is equal to 1 if country c belongs to the network of parent p and 0 otherwise.

Firm-Level MNC Effects

We let MNC ownership affect firm-year variables at the extensive margin (equations (5) and (7)) as:

$$\varphi^j_{i(p)t} = \overline{\psi}^j_{i(p)t} + h_j(MNC_{i(p)t}) + \epsilon^j_{i(p)t} \quad \text{for } j \in \{x, m\}. \tag{10}$$

In words, firm-year variables governing the extensive margin of export and import choices depend on an average component ($\overline{\psi}^j_{i(p)t}$), a function of MNC ownership status, which we denote by $h_j(MNC_{i(p)t})$, and an error term ($\epsilon^j_{i(p)t}$). We adopt an analogous definition for $\tilde{\varphi}^x_{i(p)t}$ and $\tilde{\varphi}^m_{i(p)t}$ when considering the intensive margins of exports and imports in equations (6) and (8), respectively.

Equation (10) allows MNC ownership to flexibly affect several affiliate characteristics, including their productivity, product quality, and appeal to buyers. Therefore, it encompasses the traditional firm-level effects of MNC ownership highlighted by the existing literature.

MNC Network Effects

In contrast to the existing literature, we also let MNC ownership affect firm-country-year variables, where c is either a potential source of inputs or a potential export destination, as:

$$\varphi^j_{i(p)ct} - f^j_{ict} = \psi^j_{i(p)cp} + g_j(MNC_{i(p)t}, In\ MNC_{cp}) + \epsilon^j_{i(p)ct} \text{ for } j \in \{x, m\}, \tag{11}$$

$$\tilde{\varphi}^j_{i(p)ct} = \tilde{\psi}^j_{i(p)cp} + \tilde{g}_j(MNC_{i(p)t}, In\ MNC_{cp}) + \tilde{\epsilon}^j_{i(p)ct} \text{ for } j \in \{x, m\}. \tag{12}$$

In words, firm-country-year variables governing the extensive margin of export and import choices in equation (11) depend on network-specific averages $\psi^j_{i(p)cp}$, a function of MNC ownership and the global presence of MNC parents, which we denote by $g_j(MNC_{i(p)t}, In\ MNC_{cp})$, and an error term ($\epsilon^j_{i(p)ct}$). A similar definition applies to the firm-country-year components for the intensive margin of export and import choices, denoted by a tilde, in equation (12).

The term $\psi^j_{i(p)cp}$ accounts for the fact that affiliates may systematically trade more with countries belonging to their parental network, both prior to and following the acquisition. The terms $g_j(MNC_{i(p)t}, In\ MNC_{cp})$ and $\tilde{g}_j(MNC_{i(p)t}, In\ MNC_{cp})$ are the main focus of our paper. They capture the idea that MNC ownership can potentially affect affiliates' variable and entry trade costs, product quality, and appeal in different ways across countries, depending on the MNC networks of their parents and the year in which firms are acquired. All

else equal, if $g_j(\cdot)$ and $\tilde{g}_j(\cdot)$ are increasing in their arguments, MNC ownership boosts trade at the intensive and extensive margin in countries belonging to the parental network.

2.4 Parametrization

Equations (5) to (8) together with equations (10) to (12) flexibly describe how belonging to an MNC network may affect affiliates' export and import choices at the extensive and intensive margins. To bring these to the data, we impose further parametric assumptions on $g_j(\cdot)$ and $\tilde{g}_j(\cdot)$. In particular, we let:[15]

$$g_j(\cdot) = \beta_1^j MNC_{i(p)t} + \beta_2^j In\ MNC_{cp} + \beta_3^j (MNC_{i(p)t} \times In\ MNC_{cp}) \quad \text{for } j \in \{x, m\}, \tag{13}$$

$$\tilde{g}_j(\cdot) = \tilde{\beta}_1^j MNC_{i(p)t} + \tilde{\beta}_2^j In\ MNC_{cp} + \tilde{\beta}_3^j (MNC_{i(p)t} \times In\ MNC_{cp}) \quad \text{for } j \in \{x, m\}. \tag{14}$$

After imposing this parametrization, our model delivers four gravity equations, one for each of the four margins of trade, with fixed effects. In particular:

$$\mathbf{1}(i \text{ exports to } c \text{ in } t) = \beta_3^x (MNC_{i(p)t} \times In\ MNC_{cp}) + k^x + \lambda_{ct}^x + \lambda_{it}^x + \lambda_{i(p)cp}^x + \varepsilon_{i(p)ct}^x. \tag{15}$$

$$\log r_{i(p)ct} = \tilde{\beta}_3^x (MNC_{i(p)t} \times In\ MNC_{cp}) + \tilde{k}^x + \tilde{\lambda}_{ct}^x + \tilde{\lambda}_{it}^x + \tilde{\lambda}_{i(p)cp}^x + \tilde{\varepsilon}_{i(p)ct}^x. \tag{16}$$

$$\mathbf{1}(i \text{ imports from } c \text{ in } t) = \beta_3^m (MNC_{i(p)t} \times In\ MNC_{cp}) + \lambda_{ct}^m + \lambda_{it}^m + \lambda_{i(p)cp}^m + \varepsilon_{i(p)ct}^m. \tag{17}$$

$$\log m_{i(p)ct} = \tilde{\beta}_3^m (MNC_{i(p)t} \times In\ MNC_{cp}) + \tilde{\lambda}_{ct}^m + \tilde{\lambda}_{it}^m + \tilde{\lambda}_{i(p)cp}^m + \tilde{\varepsilon}_{i(p)ct}^m. \tag{18}$$

Equations (15) and (17) are obtained by approximating equation (5) and (7) with a linear probability model. In Section B-1 of the Theoretical Appendix, we show how to derive our estimating equations and provide a structural interpretation of the fixed effects.

3 Data

In this section, we describe the data sources and methodology used to identify Belgian firms acquired by MNCs and construct multinational networks. We use the data to estimate the equations delivered by our model. Section A-1 of the Empirical Appendix provides more details on the data construction and summary statistics.

[15] This linear approximation with an interaction term allows us to estimate a linear model with fixed effects and to interpret the regression coefficients as shifters. Higher-order approximations are also possible.

3.1 Datasets

We obtain information about the characteristics, ownership structure, and international trade activities of the universe of firms registered in Belgium between 1997 and 2014 from the National Bank of Belgium (NBB). The first set of firms' characteristics comes from the Annual Accounts, which contain information on the firms' number of full-time equivalent employees, labor cost, sales, value-added, input expenditure, and fixed assets. All flow variables are annualized to map to calendar years in the other datasets.

Ownership information comes from the annual Survey on Foreign Direct Investment, which is mandatory for all foreign-owned firms active in Belgium. This dataset allows us to identify the Belgian affiliates of foreign multinationals: for each Belgian firm with a foreign parent, the survey reports the parent's location, name, year of acquisition, and equity share. We distinguish Belgian firms with a foreign parent (inward FDI) from Belgian firms that own equity abroad (outward FDI).

Data on international trade in goods come from the Foreign Trade dataset. This dataset provides information on firm-level exports and imports starting from 1993, collected separately for intra-EU (Intrastat) and extra-EU (Extrastat) trade. The Extrastat dataset is based on customs declarations and covers virtually all trade transactions. The Intrastat dataset covers all firms whose annual trade flows (overall receipts or shipments) exceed a certain threshold.[16] For each firm in Belgium, we observe the value of its exports to each destination country and its imports from each source country.

We obtain information on the main economic activity of the firm from the Crossroads Bank for Enterprises, reporting the main NACE code at the five-digit industry, which we aggregate to four and to two digits. All NACE codes are concorded over time and reported in the NACE Rev 2 (2008) version. We link all data sources using each firm's unique Enterprise Identification Number, allowing unambiguous merging across datasets.[17]

We collect information about the corporate structure of each Belgian affiliate's multinational parents using three datasets from Moody's, which can be linked using the firm identifiers: Orbis, Historical Orbis, and Orbis M&A. We use the first dataset to collect infor-

[16] Thresholds are set by individual member states so that reported trade covers at least 97% of total dispatch value (intra-EU exports) and 93% of total arrival value (intra-EU imports). These thresholds can vary across member states, across arrivals and dispatches and over time, and can be found here: https://marosavat.com/intrastat-thresholds/.

[17] We impose two criteria to avoid losing observations due to missing values. First, we interpolate missing values in the annual accounts. We do so only if the length of the missing spell is not longer than three consecutive years. Second, some firms always appear in the annual accounts but are in the Foreign Trade dataset only for some years. This may happen if firms did not engage in international trade or if their activities did not exceed the minimum reporting threshold in those years. As we cannot distinguish between these two cases, we treat all such missing trade values as zeros.

mation on the direct parent of each Belgian affiliate and to identify its global ultimate owner, the second to identify the countries where the multinational parents have other affiliates, and the third to identify Belgian affiliates' GUO changes.

Finally, we gather information about the characteristics of the countries in which the multinational parents of the Belgian firms are present from the CEPII gravity database (see Mayer and Zignago, 2011). We use this dataset to obtain information about characteristics of each country (e.g., GDP per capita, population size, geographical coordinates) and distance between countries (in kilometers). Information on the cultural distance between countries comes from Gurevich *et al.* (2024).

3.2 New Foreign Affiliates and their Multinational Network

We apply several criteria to select the Belgian firms included in our analysis. First, we exclude very small firms, which do not report at least one full-time equivalent employee in at least one year. Second, we focus on firms that operate in tradable good sectors (i.e., those that report a NACE code in agriculture, mining and quarrying, or manufacturing as their main activity), for which we can observe exports and imports throughout our sample period.[18] Third, we consider domestic firms and affiliates of foreign multinationals, excluding Belgian multinationals, i.e., firms that engage in outward FDI.[19,20]

To examine the effects of MNC ownership, we exploit the fact that some of these firms are new foreign affiliates, i.e. switch from domestic to foreign ownership during our sample period. To identify these switchers, we apply three additional selection criteria. First, we exclude firms already foreign owned in 1997, for which we cannot determine the acquisition date. Second, we exclude firms that are "born" with foreign investment (greenfield FDI). Brownfield FDI is by far the most prevalent form of multinational entry, with around 95% of FDI in Belgium being via acquisitions. Last, we exclude firms that switch between domestic and MNC ownership multiple times, as their trade participation can be affected by the reversal of MNC ownership status.[21]

[18] We exclude firms operating in tradable service sectors due to changes in the NBB data collection procedures: the NBB provides a quasi-exhaustive picture of firm-level trade in services up to 2005. Unfortunately, since then the collection system has become survey-based (see Ariu *et al.*, 2020).

[19] The predictions of our theoretical model apply to affiliates of both foreign and Belgian MNCs. However, the NBB data does not allow us to identify firms acquired by Belgian multinationals.

[20] After excluding firms that do not report at least one full-time equivalent employee in at least one year, there are 2,578 foreign affiliates. The number is reduced to 633 once we restrict the sample to affiliates operating in tradable sectors. After also excluding firms engaged in outward FDI, the sample includes 312 Belgian affiliates of foreign MNCs.

[21] After excluding firms under foreign control at the start of the sample, there are 182 affiliates of foreign MNCs. Removing those born through greenfield FDI leaves us with 174 affiliates, 115 of which switched from domestic to foreign ownership once during our sample period.

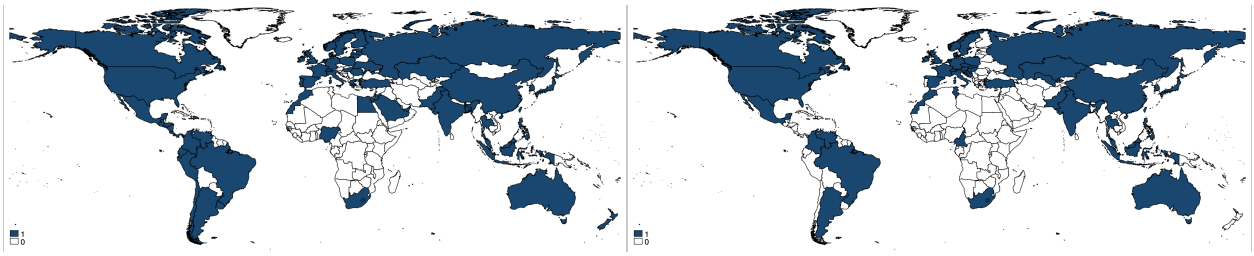
To construct the multinational network of new foreign affiliates, we proceed in two steps. First, we search for the firm identifier of the direct parent (DP) of each Belgian affiliate in the Orbis database. DPs typically own the vast majority of their affiliates' equity share (the mean ownership share is 89.09% and the median is 99.98%). Second, we construct the network of the global ultimate owner (GUO) of each affiliate. For each Belgian affiliate i, we use the subsidiary files in Historical Orbis (HO) to find the GUO of its DP, i.e., the firm that owns at least 25% of the DP.[22] For each GUO p, we then construct its network at the time of the acquisition, which is captured by the variable *In* MNC_{cp}, an indicator variable equal to 1 if the GUO has at least one affiliate in country p.[23]

Figure 1 illustrates geographical variation in MNC networks, focusing on two Belgian affiliates, denoted by A and B. Both affiliates' DPs are located in the Netherlands, while their GUOs are headquartered in Curaçao and the Netherlands, respectively. The networks of the GUOs differ not only in size (75 countries for the GUO of affiliate A, 51 for the GUO of affiliate B), but also in their geographical structure: there are countries in which only the parent of affiliate A has a presence (e.g., Greece, Chile, Egypt, Romania, Nigeria); and others in which only the parent of affiliate B has a presence (e.g., Austria, Czech Republic, Slovakia, Tunisia, Uzbekistan).

Figure 1

Comparing the GUO's Networks of two Belgian Affiliates

Affiliate A Affiliate B



The figure illustrates (in blue) the countries in which the GUOs of Belgian affiliates A and B have a presence.

Anecdotal evidence suggests that the trade expansion of new foreign affiliates may be skewed towards countries that belong to their parental network. For example, in 2000 a Belgian firm was acquired by a Japanese multinational. Before the acquisition, this firm was not exporting at all. From 2001, it started exporting to Japan and other countries belonging to its GUO's network (e.g., South Korea and the United States).

[22] The information on ownership is available in each year from 2007. Since HO information is only available as of 2007, we code this variable for the year in which a firm is acquired or in 2007, whichever is later.

[23] Four affiliates in our sample have multiple GUOs at the time of their acquisition; for these firms, the variable *In* MNC_{cp} is equal to 1 if any of the GUOs has a presence in country c.

In Section 5 we show that the geographical structure of the parental network systematically affects the probability of affiliates' export and import entry into new foreign markets. We focus on the 61 Belgian firms that have one DP at the time of the acquisition and for which we can construct the network of the GUO using Orbis data (in robustness checks we include all new affiliates for which we can construct the GUO's network).[24] Crucially, the sample used to identify MNC network effects is much larger, since we estimate gravity regressions at the firm-country-year level, across all the countries where an MNC could potentially have a presence.

Figure A-1 shows that Belgian firms switching to multinational ownership during our sample period outperform always-domestic firms in many dimensions prior to acquisition. The figure also shows that the 61 new foreign affiliates firms that we focus on in our empirical analysis are not significantly different from the broader set of all new foreign affiliates.

4 From Theory to Estimation

In this section, we discuss how we use the data described to estimate the firm-level gravity regressions derived from our theoretical model to identify MNC network effects.

4.1 Estimating Equations

We derive the following event-study specification from equations (15) to (18):

$$y_{i(p)ct} = \sum_{s=-k_l}^{k_u} \theta_s (MNC^{s}_{i(p)t} \times In\ MNC_{cp}) + \lambda_{it} + \lambda_{ct} + \lambda_{i(p)cp} + \varepsilon_{i(p)ct}, \tag{19}$$

where y_{ict} captures the different trade outcomes of interest at the firm-country-year level (the probability of export/import entry, the value of exports/imports). $MNC^{s}_{i(p)t}$ is a dummy variable identifying periods before and after the acquisition of firm i in year T. k_l and k_u denote the first and last period for which $MNC^{s}_{i(p)t}$ can be defined. $In\ MNC_{cp}$ identifies countries in which p (the GUO of affiliate i) has a presence in the year of the acquisition. The parameters θ_s measure the dynamic network effects of MNC acquisitions. We normalize $\theta_{-1} = 0$, implying that all other estimated coefficients are relative to the outcome in the year prior to the acquisition. We cluster standard errors at the firm level.

When considering the extensive margin of trade, we assume that firms can potentially trade with all the countries in our dataset in every year. The estimation sample is thus

[24] If the information about GUO networks is missing for the DP at the time of the acquisition, but is available for a future DP, we focus on the network of the next DP.

a balanced panel at the firm-country-year level. When considering the intensive margin of exports and imports, we restrict our attention to actual trade flows.

4.2 Identification

The fixed effects included in equation (19) capture several determinants of firms' trade participation. Firm-year fixed effects (λ_{it}) account for the standard channels through which MNC ownership can enhance trade participation, such as productivity improvements or alleviation of financial constraints. These fixed effects also control for firm-year-specific shocks that could explain selection into MNC ownership by any parent.[25] Country-year fixed effects (λ_{ct}) control for time-invariant factors (e.g., geographical distance, or colonial linkages) as well as time-varying factors that can influence trade between all Belgian firms and country c (e.g., the implementation of a trade agreement between the EU and a specific country, or income shocks). Finally, network-country fixed effects ($\lambda_{i(p)cp}$) account for the possibility that acquired firms may, on average, trade more (or be more likely to trade) with countries belonging to their parental network. They thus account for any time-invariant firm-network-country-specific shock that may drive selection into ownership by an MNC with a given network.[26]

Conditional on the fixed effects included in equation (19), the (parallel trends) identification assumption is that, had firm i not been acquired, it would have not changed its trade (and the extensive or intensive margin) with countries belonging to p's network. The main threat to identification is the existence of unobserved firm-country-year shocks, which may drive both i's trade participation and its acquisition by an MNC with a given network, leading to biased estimates of the MNC network effects.

We address this concern in three ways. First, we construct the variable $In\ MNC_{cp}$ using information about the countries in which the global ultimate owner (GUO) of affiliate i has a presence. GUOs have very large networks (the median number of subsidiaries is 89 and the mean is $3,875$) and have no direct ownership of the Belgian affiliates in our sample (which are acquired and controlled by the DP).[27] It is thus unlikely that an affiliate i is acquired because of trends in its trade relations with GUO network countries.

Second, we exploit recent advances in the difference-in-differences literature to test for the presence of significant pre-acquisition trends in firms' trade participation vis-à-vis network countries. Rejecting this hypothesis mitigates concerns that firms would have expanded their

[25] For example, Blonigen *et al.* (2014) show that MNCs often acquire firms that had high productivity levels several years prior to the acquisition, but subsequently experienced negative productivity shocks. Firm-year fixed effects address such selection mechanisms.

[26] The results are robust to replacing network-country fixed effects with firm-country fixed effects.

[27] In robustness checks, we drop the few cases in which the DP of an affiliate coincides with the GUO.

trade participation in network countries regardless of the acquisition. The recent literature surveyed by de Chaisemartin and D'Haultfœuille (2023) emphasizes that estimating event studies with a two-way fixed-effects (TWFE) estimator may fail to recover the treatment effect when the roll-out is staggered and treatment effects are time-varying. To deal with this concern, we use the estimator proposed by Nagengast and Yotov (2024), who extend the methodology developed by Wooldridge (2021) to a three-dimensional panel like ours. This estimator recovers cohort-specific dynamic treatment effects that can be aggregated in different ways (e.g., over time for an event study or in a single estimate). In our setting, cohorts are firm-country pairs (ic) such that each firm i is acquired in the same year T, and country c belongs to the multinational network of i's parent p. A cohort is thus defined by the year in which a firm is acquired, but only for countries belonging to its MNC network.[28]

Third, we exploit plausibly exogenous changes in affiliates' multinational networks. Using information from Orbis M&A, we identify a subset of affiliates that changed GUO during the sample period. The identification assumption is that the global transactions that lead to GUO changes are not driven by the trade patterns of a specific Belgian firm. This assumption is supported by the fact that Belgian firms are small in the large networks of their GUOs and are not directly controlled by them.

5 Empirical Results

In what follows, we show that multinational affiliates are more likely to start exporting to and importing from countries that belong to their parents' network (Section 5.1) or are added to the network as a result of plausably exogenous global ownership changes (Section 5.2). We then explore possible mechanisms behind MNC network effects (Section 5.3) and quantify their contribution to affiliates' overall growth in terms of sales and employment (Section 5.4). Finally, we provide evidence that the effects of MNC ownership extend beyond the boundaries of the multinational (Section 5.5).

5.1 Network Effects of Multinational Acquisitions

Extensive Margin

We first examine the effects on the extensive margin of trade. We bring equations (15) and (17) to the data using the event-study specification in equation (19). The dependent variable

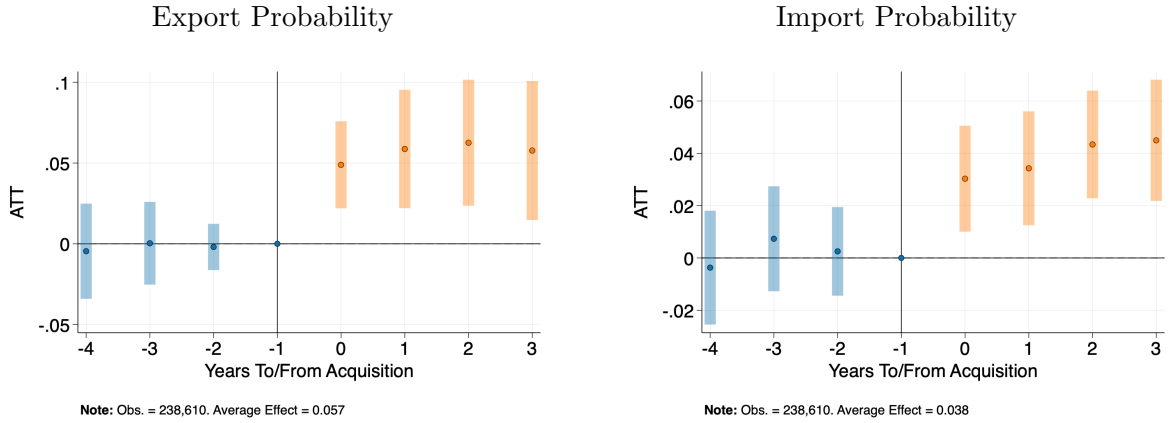
[28] Imagine, for example, that only two Belgian firms (1 and 2) are acquired in 2001, with the parent of firm 1 having a presence in countries A and B and the parent of firm 2 having a presence in countries C and D. In this hypothetical example, the 2001 cohort is defined by following firm-country pairs: (firm 1, country A), (firm 1, country B), (firm 2, country C), and (firm 2, country D).

(19) is $Entry^{j}_{i(p)ct}$, an indicator variable equal to 1 from the first year t in which firm i (owned by parent p) exports to, or imports from, country c.

Figure 2 reports the baseline results. After the acquisition, Belgian affiliates increase the probability of exporting to and importing from countries that belong to their parental network compared to countries that do not.[29] In terms of magnitude, the probability of exporting to (importing from) network countries increases by 5.7 (3.8) percentage points within the first four years after the acquisition, a 33% (42%) increase compared to the unconditional probability of exporting (importing) in the estimation sample. There is no evidence of trends leading up to the acquisition.

Figure 2

MNC Network Effects at The Extensive Margin



Note: The figure reports the event-study coefficients of $MNC^{s}_{i(p)t} \times In\ MNC_{cp}$ in equation (19) obtained using the estimator in Nagengast and Yotov (2024). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. Standard errors are clustered by firm.

Column 1 of Table 1 reports the event-study estimates corresponding to our baseline specification in Figure 2. The remaining columns report the estimates of a series of robustness checks (the corresponding figures can be found in the Appendix).

[29] Unlike the TWFE estimator, the one proposed by Nagengast and Yotov (2024) only uses never treated units as the control group. In our setting, control cohorts are firm-country pairs (ic) such that firm i is acquired in some year T but country c does not belong to the multinational network of i's parent p. Not-yet-treated observations, i.e., firm-country pairs such that firm i is not-year acquired and country c belong to the network of her parent, do not enter the control group. Instead, these observations are used to estimate pre-trends.

Table 1

MNC Network Effects at The Extensive Margin

	Baseline	Alternative Clustering	Excluding Tax Havens	GUO $\neq$ DP	Excluding Multiple GUOs	Larger Sample
Probability of Exporting						
	(1)	(2)	(3)	(4)	(5)	(6)
$t=-4$	−0.005	−0.005	−0.003	0.002	−0.009	0.002
	(0.015)	(0.008)	(0.015)	(0.015)	(0.018)	(0.011)
$t=-3$	0.000	0.000	0.002	0.009	0.001	0.007
	(0.013)	(0.006)	(0.013)	(0.013)	(0.016)	(0.011)
$t=-2$	−0.002	−0.002	−0.001	0.001	−0.003	0.014
	(0.007)	(0.004)	(0.008)	(0.007)	(0.008)	(0.010)
$t=-1$	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)
$t=0$	0.049***	0.049***	0.049***	0.053***	0.057***	0.039***
	(0.014)	(0.006)	(0.013)	(0.014)	(0.016)	(0.011)
$t=1$	0.059***	0.059***	0.058***	0.064***	0.069***	0.046***
	(0.019)	(0.006)	(0.019)	(0.019)	(0.022)	(0.015)
$t=2$	0.063***	0.063***	0.061**	0.066***	0.072***	0.050***
	(0.020)	(0.007)	(0.020)	(0.020)	(0.023)	(0.016)
$t=3$	0.058***	0.058***	0.056***	0.064**	0.068***	0.060***
	(0.022)	(0.007)	(0.023)	(0.022)	(0.025)	(0.017)
Probability of Importing						
	Baseline	Alternative Clustering	Excluding Tax Havens	GUO $\neq$ DP	Excluding Multiple GUOs	Larger Sample
	(1)	(2)	(3)	(4)	(5)	(6)
$t=-4$	−0.004	−0.004	−0.002	0.003	−0.002	−0.005
	(0.011)	(0.007)	(0.011)	(0.011)	(0.014)	(0.007)
$t=-3$	0.007	0.007	0.008	0.012	0.010	−0.002
	(0.010)	(0.005)	(0.010)	(0.010)	(0.012)	(0.007)
$t=-2$	0.003	0.003	0.003	0.004	0.001	−0.000
	(0.009)	(0.004)	(0.009)	(0.009)	(0.010)	(0.007)
$t=-1$	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)
$t=0$	0.030**	0.030***	0.030***	0.030**	0.037**	0.021**
	(0.010)	(0.005)	(0.011)	(0.011)	(0.012)	(0.008)
$t=1$	0.034***	0.034***	0.035***	0.033***	0.042***	0.023**
	(0.011)	(0.005)	(0.012)	(0.011)	(0.013)	(0.009)
$t=2$	0.043***	0.043***	0.044***	0.041***	0.052***	0.032***
	(0.011)	(0.006)	(0.011)	(0.010)	(0.012)	(0.009)
$t=3$	0.045***	0.045***	0.044***	0.042***	0.056***	0.035***
	(0.012)	(0.007)	(0.013)	(0.012)	(0.014)	(0.010)
Observations	236,256	236,256	196,240	202,872	219,992	346,252

Notes: The table reports the event-study coefficients of $MNC^{s}_{it} \times In\ MNC_{cp}$ in equation (19) obtained using the estimator of Nagengast and Yotov (2024). In the top panel (bottom panel), the dependent variable is *Export Entry*$_{i(p)ct}$ (*Import Entry*$_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. *In* MNC_{cp} is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. Standard errors are clustered by firm in columns (1) and (3)-(6), and by firm-country in column (2). Column (3) excludes tax havens as classified by Dharmapala and Hines (2009). Column (4) excludes firms whose GUO is also ever their DP. Column (5) excludes firms with multiple GUOs. Column (6) includes include firms with more than one DP upon acquisition.

Column 2 shows that the results are robust to clustering standard errors at the firm-country level (Figure A-4). Column 3 shows that the our findings are not driven by countries classified as tax havens (Figure A-5). In column 4, we drop every Belgian affiliate i whose

DP is also its GUO (Figure A-6). In column 5, we drop the four affiliates that have multiple GUOs upon acquisition (Figure A-7). Finally, in column 6 we extend the sample to include firms with more than one DP upon acquisition (see Figure A-8).[30]

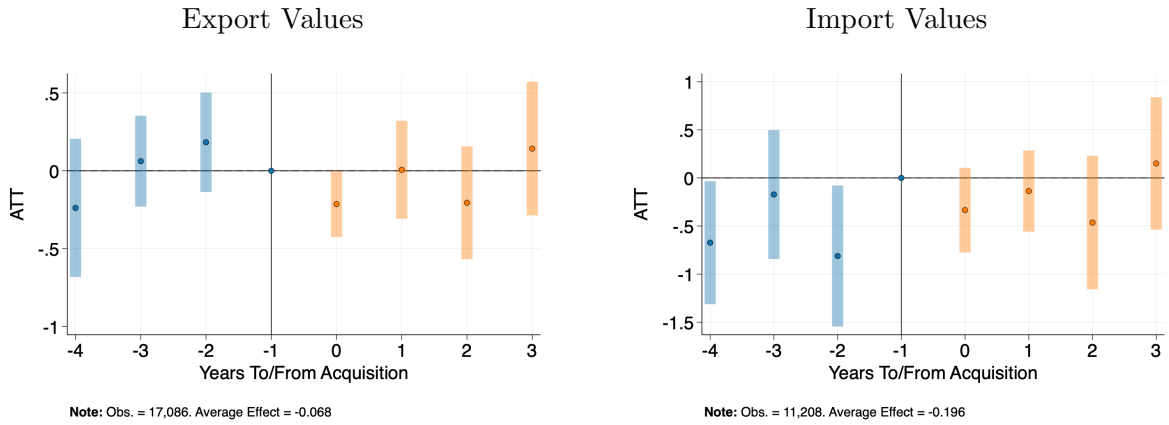
The results of all these event studies confirm that MNC ownership increases the probability that new affiliates start exporting to and importing from countries in which their global parent has a presence. One may be concerned that these effects are driven by new affiliates changing their trade participation from non-network to network countries. However, we find that MNC ownership in fact leads to an increase in the *total number of countries a firm exports to and imports from* (see discussion in Section 5.4).

Intensive Margin

To bring equations (16) and (18) to the data, we focus on the set of countries each affiliate i was already trading with before being acquired and examine whether the value of its exports and imports increases in countries in which its parent has other affiliates.[31]

Figure 3

MNC Network Effects at The Intensive Margin



Note: The figure reports the event-study coefficients of $MNC^{s}_{i(p)t} \times In\ MNC_{cp}$ in equation (19) obtained using the estimator of Nagengast and Yotov (2024). In the left panel, the dependent variable is log $Exports_{i(p)ct}$, the (log of) value of exports of firm i (owned by parent p) to country c in year t. In the right panel, the dependent variable is log $Imports_{i(p)ct}$, the (log of) value of imports of firm i (owned by parent p) from country c in year t. The sample is restricted to countries firm i was already trading with before being acquired. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. Standard errors are clustered by firm.

[30] There are 25 such affiliates, for which $In\ MNC_{cp}$ is constructed by merging the networks of their GUOs.

[31] A country c is classified as an "old" export destination (import source) for firm i if it was exporting to (importing from) c in at least one of the five years before being acquired. This definition does not suffer from left censoring: the NBB trade dataset starts in 1993; even for firms acquired in 1998, we can thus observe exports and imports in the previous five years (see also Conconi *et al.*, 2016).

The results reported in Figure 3 shows that MNC ownership does not affect affiliates' intensive margin of trade through network effects: post-acquisition, the value of exports to (and imports from) countries a firm was already trading with does not change depending on whether the multinational parent has a presence in those countries. In the rest of our analysis, we thus focus on the extensive margin of trade.

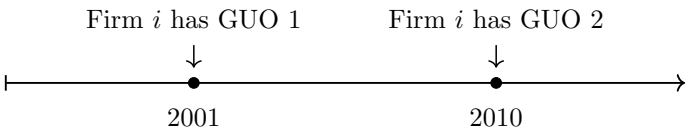
5.2 Network Effects of Exogenous GUO Changes

In this section, we exploit plausibly exogenous changes in Belgian affiliates' multinational networks to mitigate the concern that unobserved firm-country-specific shocks happening at the same time of the acquisition may be behind the increase in increase in trade participation in Figure 2. Our strategy aims to identify changes in affiliates' trade participation resulting from quasi-random changes in their MNC network.

As in the previous section, we consider the set of firms that were acquired by a foreign multinational during our sample period and had one DP at the time of the acquisition. Using information from Orbis M&A, we identify a subset of these firms that changed GUO during the period and exploit these ownership changes to identify network effects.[32]

Figure 4 provides an example of a firm i that changed GUO. This firm became foreign owned in 2001, when it was acquired by DP_i, which remained its direct parent until the end of the sample. DP_i was originally controlled by a Swedish company (GUO 1), but in 2010 it was acquired by another Swedish company (GUO 2). As a result of this ownership change, several countries were added to firm i GUO's network (the United States, China, South Korea, India, Vietnam, Colombia). In this example, the identifying assumption is that GUO 2 (which had 1,039 subsidiaries in 2010) did not acquire GUO 1 (which had 42 subsidiaries, including i's DP) to trade with particular countries through Belgian firm i. The key assumption is that the change in GUO is not driven by the trade patterns of a Belgian affiliate that these global companies control indirectly.

Figure 4
An Example



Only 13 firms experienced changes in their networks as a result of M&As leading to

[32] We focus on ownership changes occurring between 2007, which is the earliest year in which network data is available from Historical Orbis, and 2011, so that we can observe affiliates' trade patterns for at least three years after the change in GUO.

GUO changes, making it hard to study cohort effects. Moreover, examining the effects of GUO changes shortens the post-treatment time period we observe compared to when study the effects of firms switching from domestic to MNC ownership. We thus estimate average treatment effects of exogenous network changes by OLS with the following pooled regression:

$$Entry^{j}_{i(p)ct} = \beta_j(New\ MNC_{it} \times Only\ In\ New\ MNC_{cp}) + \lambda^{j}_{it} + \lambda^{j}_{ct} + \lambda^{j}_{i(p)cp} + \varepsilon^{j}_{i(p)ct}, \quad j \in \{x, m\}. \tag{20}$$

$Entry^{j}_{i(p)ct}$ is a binary indicator equal to 1 since the first year firm i, owned by parent p, starts exporting to, or importing from, country c. The notation of the fixed effects follows from equation (19). To inspect how firms adjust trade participation in response to quasi-random changes in their MNC network, we define two variables: $New\ MNC_{it}$, which is a dummy equal to 1 in the years in which firm i has GUO 2, and $Only\ in\ New\ MNC_{cp}$, which is equal to 1 if country c belongs to GUO 2's network but does not belong to GUO 1's network. Countries that only belong to the network of the initial GUO are excluded from the estimation sample. Therefore, the coefficient β_j captures the probability that firm i starts exporting to ($j = x$) or importing from ($j = m$) countries that are added to its network after changing GUO, relative to countries that belong to neither the old nor the new network.[33]

Table A-4 reports the results of estimating equation (20). The β_j coefficient is positive and significant at the 1% level for both export and import entry. Thus, when a Belgian affiliate changes GUO, it is more likely to start trading with countries that have been added to its GUO network as a result of the DP's ownership change (e.g., in the example shown in Figure 4, with the United States, China, South Korea, India, Vietnam, and Colombia).

5.3 The Role of Intra-MNC Information Flows

The results presented above suggest that new multinational affiliates experience a reduction in trade costs in countries in which their global parent has a presence. Crucially, MNC networks effects apply to both export and import participation, but only at the extensive margin: new affiliates are more likely to start trading with countries in which their GUO has a presence (see Figure 2), but the intensity of their pre-existing trade relations is unaffected (see Figure 3). These findings suggest that MNC ownership alleviates the fixed costs firms face in foreign markets (F^{x}_{ict} and F^{m}_{ict} in our theoretical model) rather than being driven by demand shocks (ζ_{ict}) or supply shocks (ξ_{ict}), which would affect both the intensive and extensive margins.

We investigate one possible mechanism generating these findings: knowledge flows within

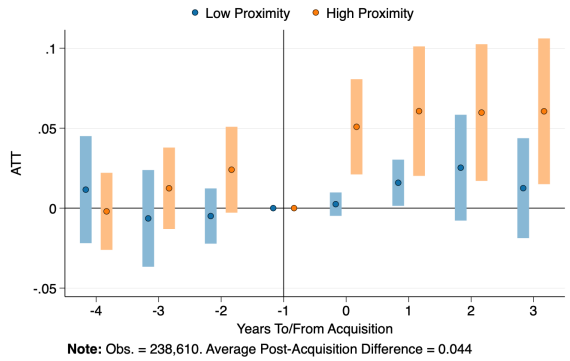
[33] In this exercise, we cluster standard errors at the firm-country level. Due to the small number of affiliates, we cannot apply the more conservative clustering at the firm level used in our baseline analysis.

the MNC hierarchy alleviate fixed information costs that deter entry into foreign markets. The key idea is that the DP—which controls the Belgian affiliate and regularly interacts with it—can provide information to the new affiliate about local regulations and market conditions in all countries in which the GUO has a presence. If this mechanism is at work, we would expect MNC network effects to be stronger when such information can more easily flow from the DP to the affiliate. In turn, the literature on knowledge flows within multinationals shows that physical and cultural proximity between the DP and the affiliate should facilitate information flows between them.

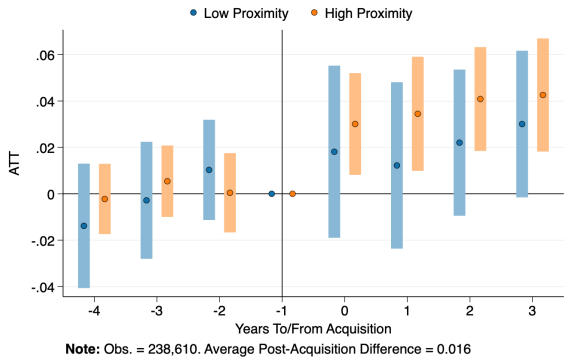
Figure 5

MNC Network Effects at The Extensive Margin
Proximity Between Affiliate and DP

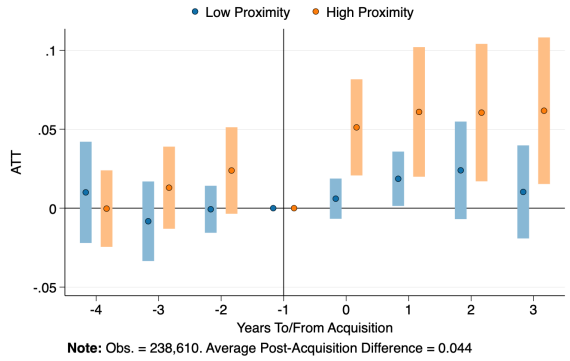
Export Probability - Physical Proximity



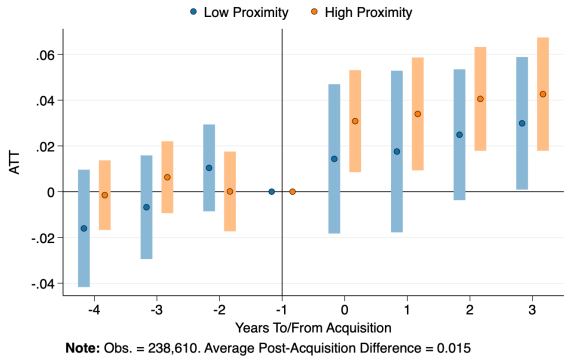
Import Probability - Physical Proximity



Export Probability - Cultural Proximity



Import Probability - Cultural Proximity



Note: The figure presents event-study estimates of $MNC_{i(p)t} \times In\ MNC_{cp}$ from equation (19), interacted with *Intra-MNC Communication*$_i$. In the left (right) panels, the dependent variable is *Export Entry*$_{i(p)ct}$ (*Import Entry*$_{i(p)ct}$), a dummy variable equal to 1 from the first year in which firm i, owned by parent p, begins exporting to (importing from) country c. The variable $MNC_{i(p)t}$ is a dummy equal to 1 after firm i is acquired, and $In\ MNC_{cp}$ is a dummy equal to 1 if country c is part of the global parent p's network. In the top (bottom) panels, *Intra-MNC Communication*$_i$ is an indicator variable equal to 1 if the DP is located in a country that is in the same time zone as Belgium (that shares an official language with Belgium). Standard errors are clustered by firm.

Following the literature, we construct two versions of the variable *Intra-MNC Communication*$_i$,

capturing geographic or cultural proximity between acquired firm i and its direct parent: the first is an indicator variable equal to 1 if the DP is located in the same time zone as the Belgian affiliate i; the second is an indicator variable equal to 1 if the country in which the DP is located shares an official language with Belgium.[34]

To examine the role of intra-MNC information flows, we estimate equation (19) again, interacting MNC network effects (captured by $MNC^{s}_{i(p)t} \times In\ MNC_{cp}$) with the two versions of the variable *Intra-MNC Communication*$_i$. Figure 5 shows the results. As expected, we find that we find that MNC network effects increase with the ease of intra-MNC communication: new affiliates are more likely to start trading with countries in the GUO's network when their DP is geographically and culturally closer to Belgium. The event-study estimates of $MNC_{i(p)t} \times In\ MNC_{cp}$ are always positive and significant for affiliates whose DP is located in a country in the same time zone as Belgium or speaks one the official languages of Belgium.

5.4 MNC Network Effects and Firm Growth

We next quantify the extent to which MNC network effects contribute to affiliates' overall growth in terms of sales and employment. We proceed in the three steps described below.

Firm Size and MNC Network Effects

First, we combine our theoretical model with the data to estimate the fraction of sales and employment attributable to MNC network effects in each post-acquisition year. The model in Section 2 assumes that firms decide on sales after selecting the optimal mix of production inputs. Building on this assumption, we infer changes in affiliates' sales from their export decisions and changes in labor demand from their import behavior. See Section B-2 of the Theoretical Appendix for more details about our methodology.

Firm i's total sales in year t is the sum of domestic and export revenues. We thus estimate the share of sales attributable to MNC network effects by dividing post-acquisition firm-level export revenues to MNC network countries by total sales across all destinations, including Belgium.

For employment, the first-order conditions with respect to labor and material inputs from equation (3) imply that labor costs are proportional to expenditures on imported inputs. Thus, we estimate the share of employment expenditure attributable to MNC network effects by dividing post-acquisition firm-level import expenditures from MNC network countries by total import expenditures from all origins.

Using this methodology, we find that approximately 21% of yearly post-acquisition rev-

[34] This measure is constructed using the Common Official Language Indicator of Gurevich *et al.* (2024).

enues and around 26% of yearly post-acquisition employment expenditures can be attributed to MNC network effects.

Impact of MNC Ownership on Firm Size

We next estimate the effect of MNC ownership on firm size (in terms of sales and employment). We estimate the following equation on the sample of acquired and non-acquired firms:

$$log(y_{it}) = \theta MNC_{it} + \delta_i + \delta_t + u_{it}, \tag{21}$$

where y_{it} is the outcome of interest for firm i at time t, and MNC_{it} is an indicator variable equal to 1 after firm i is acquired by a foreign multinational. The variables δ_i and δ_t are firm and year fixed effects, respectively, and u_{it} is an error term.

Acquired firms are systematically different from non-acquired firms: even before acquisition, future affiliates outperform always-domestic firms in many dimensions (see statistics in Table A-5). To account for selection effects, we employ Hainmueller (2012)'s entropy balance (EB) re-weighting algorithm. The key advantage of this method is that unlike other algorithms such as nearest-neighbor and propensity score matching, it guarantees that the treatment and control groups are similar not only in terms of average characteristics but also in higher moments of the distribution of their covariates. This further mitigates the concern that the post-acquisition changes in acquired firms' trade participation are due to pre-existing differential trends.[35]

For each year, we consider firms acquired in that year as treated observations and never-acquired firms as control units. We pool treated and control units across all years and use the algorithm to assign a weight between 0 and 1 to each firm.[36] Table A-6 shows that the algorithm guarantees that treated firms are indistinguishable from untreated firms in terms of multiple moments of the distribution of several characteristics used to construct the weights.

The results of estimating equation (21) are reported in Table 2. Columns 3-4 report the estimates when we use entropy balancing re-weighting to account for selection effects. The coefficients of MNC_{it} are positive and significant and imply that, after a firm is acquired, its sales and employment increase by 31.8% and 12.1%, respectively. It is interesting to compare

[35] See Egger and Tarlea (2020) and Basri *et al.* (2021) for applications of this re-weighting strategy.

[36] The algorithm assigns a weight of 1 to treated firms, and a weight between 0 and 1 to non-treated firms (with their sum constrained to be equal to 1). The initial sample includes 22453 firms. 5391 of them (24%) receive a positive weight, due to missing values in some characteristics. The average weight among non-treated firms in our sample is 0.017 and the standard deviation is 0.07. To transform entropy balance weights into regression weights, we follow Guadalupe *et al.* (2012) and assign a weight of 1 to treated firms and $1/(1 - w_f)$ to untreated ones, being w_f the entropy balance weight.

these results with the corresponding estimates in columns 1-2, in which we estimate equation (21) without re-weighting the sample. The coefficients are significantly larger, emphasizing the importance of accounting for selection effects.

Table 2
MNC Ownership and Firm Size

	Sales	Employment	Sales	Employment
	No Reweighting		EB Reweighting	
	(1)	(2)	(3)	(4)
MNC_{it}	0.428***	0.136**	0.318***	0.121*
	(0.098)	(0.064)	(0.103)	(0.062)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Estimator	OLS	OLS	OLS	OLS

The table reports the results of estimating equation (21). In columns 3-4, we compute the entropy balance weights as a function of all the observables in Table A-6. Standard errors clustered by firm in parenthesis. Significance levels: *** 0.01, ** 0.05, * 0.1.

We also consider the effects on trade participation to verify that MNC ownership leads to an overall increase in the total number of countries a firm exports to and imports from (rather than diverting trade from non-network to network countries). For this purpose, we estimate equation (21) focusing on trade outcomes: the number of countries a firm exports to and imports from.[37]

Table A-7 shows that, after a firm is acquired by a multinational, the number of countries it exports to and imports from increase by 22% and 28%, respectively. Again, the estimates in columns 3-4 are smaller than the corresponding estimates in columns 1-2, which do not account for selection effects. These findings indicate that the MNC network effects documented in Section 5.1 imply that new affiliates add new destination and source countries, rather than simply diverting trade from non-network to network countries.

Contribution of MNC Network Effects to Firm Growth

Finally, we compute the annual increase in affiliates' size due to MNC network effects. We do so by multiplying the fraction of sales and employment due to MNC network effects obtained in the first step by the overall increase in sales and employment due to the MNC acquisition obtained in the second step.

[37] When considering these outcomes, the dependent variable is expressed as $\log(1 + y_{it})$, to account for both extensive and intensive margin effects. The results are robust to using the inverse hyperbolic sine transformation which, unlike the log transformation, is defined at zero (Burbidge et al., 1988; MacKinnon and Magee, 1990).

The results are reported in the third column of Table 3. They indicate that exporting to new countries belonging to the parental network generates an average post-acquisition increase in sales of (21.2% × 31.8% =) 6.7%. Similarly, importing from new countries within the parental network generates an average post-acquisition increase in employment of (25.7% × 12.1% =) 3.1%. In comparison, the median annual sales growth rate among domestic Belgian firms during our sample period was 1.9% and there was no growth in median employment.

Table 3
Contribution of MNC Network Effects to Firm Growth

	(Model & Data) Post-Acquisition Share (1)	(EB Estimates) Post-Acquisition Increase due to MNC Network Effects (2)	(Back-of-the-Envelope) Post-Acquisition Increase due to MNC Network Effects (3)
Sales	21.2%	31.8%	6.7%
Employment	25.7%	12.1%	3.1%

5.5 Network Effects Beyond the Multinational Boundaries

The results presented in Section 5.1 show that new affiliates are more likely to start trading with countries in which their GUO has a presence (see Figure 2). In principle, these effects could be driven by a reduction in trade frictions within the boundaries of the multinational, which can lead acquired firms to start exporting to and importing from other affiliates of the same parent. In this case, however, we would also expect new affiliates to increase the value of their exports to and imports from countries in the parental network even if they were already trading with these countries before the acquisition. By contrast, we find that the intensity of their pre-existing trade participation is unaffected (see Figure 3), suggesting that MNC ownership reduces *country-specific* trade frictions.

In what follows, we document the existence of "extended network" effects, providing direct evidence that the effects of MNC ownership are not confined to the boundaries of the multinational: new affiliates are more likely to enter countries that are close—but do not belong—to their parental network.

We define the variable *Close to* MNC_{cp}, which is equal to 1 if country c shares a common border and a common language with a country in the parental network, but does not belong to the network of countries in which GUO p has affiliates.[38] To verify whether MNC own-

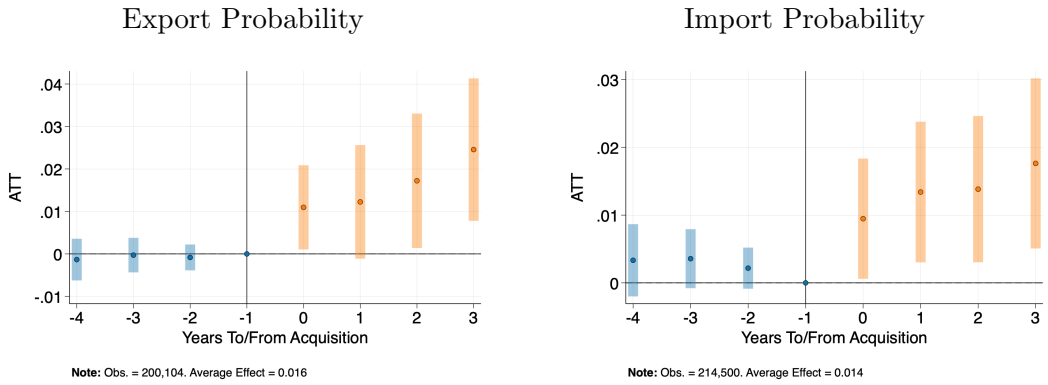
[38]The literature on extended gravity suggests that both physical and cultural proximity should matter. The results are robust to defining only contiguous countries as close to the network.

ership has extended network effects, we drop countries affiliate i was already exporting to (when looking at export choices) or importing from (when looking at import choices) before the acquisition. We then estimate the following regression:

$$Entry^{j}_{i(p)ct} = \sum_{s=-k_l}^{k_u} \alpha_s (MNC^{s}_{i(p)t} \times Close\ to\ MNC_{cp}) + \theta (MNC^{s}_{i(p)t} \times In\ MNC_{cp}) + \lambda^{j}_{it} + \lambda^{j}_{ct} + \lambda^{j}_{i(p)cp} + \delta^{j}_{i(p)cp} + \varepsilon^{j}_{i(p)ct}, \qquad j \in \{x, m\}. \tag{22}$$

In this regression, we control for MNC network effects (captured by the interaction $MNC_{i(p)t} \times In\ MNC_{cp}$), and estimate the leads and lags α_s associated with the interaction term $(MNC_{i(p)t} \times Close\ to_{cp})$.[39] $Entry^{j}_{i(p)ct}$ is a binary indicator equal to 1 since the first year firm i, owned by parent p, starts exporting to or importing from country c. The notation of the fixed effects λ^{j}_{it}, λ^{j}_{ct}, and $\lambda^{j}_{i(p)cp}$ follows from equation (19). We also include an additional fixed effect, $\delta^{j}_{i(p)cp}$, that accounts for the possibility that acquired firms may, on average, be more likely to trade with countries close—but not in—their parental network.

Figure 6
Extended Network Effects



Note: The figure reports the event-study coefficients of $MNC^{s}_{i(p)t} \times Close\ to\ MNC_{cp}$ in equation (22) obtained using the estimator in Nagengast and Yotov (2024). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. Standard errors are clustered by firm.

Figure 6 shows the results of estimating (22), which reveal that MNC ownership boosts affiliates' entry into countries that are close to the parental network. This finding echoes

[39] We estimate equation (22) using the estimator in Nagengast and Yotov (2024). However, since we are interested in $(MNC_{i(p)t} \times Close\ to\ MNC_{cp})$ and cannot identify the lags and leads of both $(MNC_{i(p)t} \times Close\ to\ MNC_{cp})$ and $(MNC_{i(p)t} \times In\ MNC_{cp})$, we estimate a single parameter for $(MNC_{i(p)t} \times In\ MNC_{cp})$ and a matrix of cohort-time-specific coefficients associated with $(MNC_{i(p)t} \times Close\ to\ MNC_{cp})$, which we then aggregate for the event-study specification.

results in the extended gravity literature, which shows that lowering trade barriers in one country increases the probability of entry in geographically and culturally close countries.

One may be concerned that the extended MNC network effects captured in Figure 6 could be driven by the GUO adding some countries to its network after the acquisition of affiliate i. If this is the case, some countries coded as close to the GUO's network could actually become part of this network. Figure A-9 shows that the results are robust to excluding countries added to the GUO's network after firm i is acquired.

These results provide direct evidence that the effects of MNC ownership are not confined to the boundaries of the multinational, i.e., acquired firms don't simply start exporting to and importing from other affiliates of the same parent. By construction, these "extended MNC network effects" operate outside the boundaries of the multinational, since they involve countries in which the global parent has no affiliates.

6 Conclusions

Firms affiliated with multinationals account for a disproportionately large share of international trade. Standard explanations for this dominance rely on mechanisms that operate at the firm level (e.g., new MNC affiliates become more productive, through transfers of technology or managerial know-how from the parent). In this paper, we identify a novel mechanism that operates at the firm-country level: firms acquired by an MNC face lower trade frictions in and around the network of countries in which their parent has other affiliates.

We provide a model in which MNC ownership can affect new affiliates' export and import decisions through firm-specific channels and firm-country specific channels. The model delivers structural firm-level gravity equations which can be estimated to identify the network effects of multinational ownership.

We leverage unique firm-level administrative data from Belgium with rich data on multinational networks constructed from various datasets from Moody's to estimate the model. We find evidence of MNC network effects at the extensive margin: new affiliates are more likely to start exporting to, and importing from, countries in which their global parent has a presence. These effects are stronger when the affiliate's direct parent is located in a country in the same time zone or that shares a common language with Belgium, suggesting that they are partly driven by intra-MNC information flows. Combining the structure of our theoretical model with our data, we find that MNC network effects account for a large share of affiliates' growth in terms of sales and employment: through these effects, the growth rate of acquired firms is more than three times as large as that of the median domestic firm. We also provide evidence of extended network effects: new affiliates are more likely to start

trading not only with countries in which their global parent has a presence, but also with countries that share a common border and a common language with a country in the GUO's network. By construction, these effects operate outside the boundaries of the multinational, since they involve countries in which the global parent has no presence.

Overall, our analysis suggests that MNC ownership boosts affiliates' trade participation by alleviating market-specific entry frictions rather than by simply facilitating trade between affiliates of the same multinational. Our results call for more research on how intra-MNC information flows facilitate affiliates' trade expansion. This would help shed light on whether government agencies can play a similar role to multinational firms, by designing policies to alleviate the country-specific trade frictions faced by domestic firms.

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Appendices

Empirical Appendix

A-1 Descriptive Statistics

A-1.1 New Affiliates

We find 22,938 Belgian firms that satisfy the sample selection criteria described in Section 3. Of these, 22,626 are always domestic and 312 are foreign affiliates for at least part of the sample period. Of the latter group, 115 firms were acquired via brownfield FDI some time after 1997 and did not switch between domestic and foreign ownership multiple times.

Table A-1 reports the number of new foreign affiliates by sector for the 115 firms that survive the selection criteria in Section 3.2. The most common NACE sectors are those between C19 and C22 (manufacture of coke, chemicals, pharmaceuticals, and rubber).

Table A-1
Number of New Foreign Affiliates by Sector

Sector	
Agriculture, Mining and Quarrying (A1 - B9)	2
Automobile, Transport (C29 - C30)	8
Coke, Chemicals, Pharmaceuticals, Rubbers (C19 - C22)	40
Computer, Machinery, Equipment (C26 - C28)	13
Food, Beverages, Tobacco (C10 - C12)	20
Furniture and Other (C31- C33)	5
Mineral, Metal, Steel (C23 - C25)	19
Wood, Paper, Media (C16 - C18)	8

Table A-2 illustrates the distribution of average equity share across the years that foreign parents own their Belgian affiliates. Direct parents DP typically own the majority of their affiliates' equity share (the mean ownership share is 89.12% and the median is 99.98%).

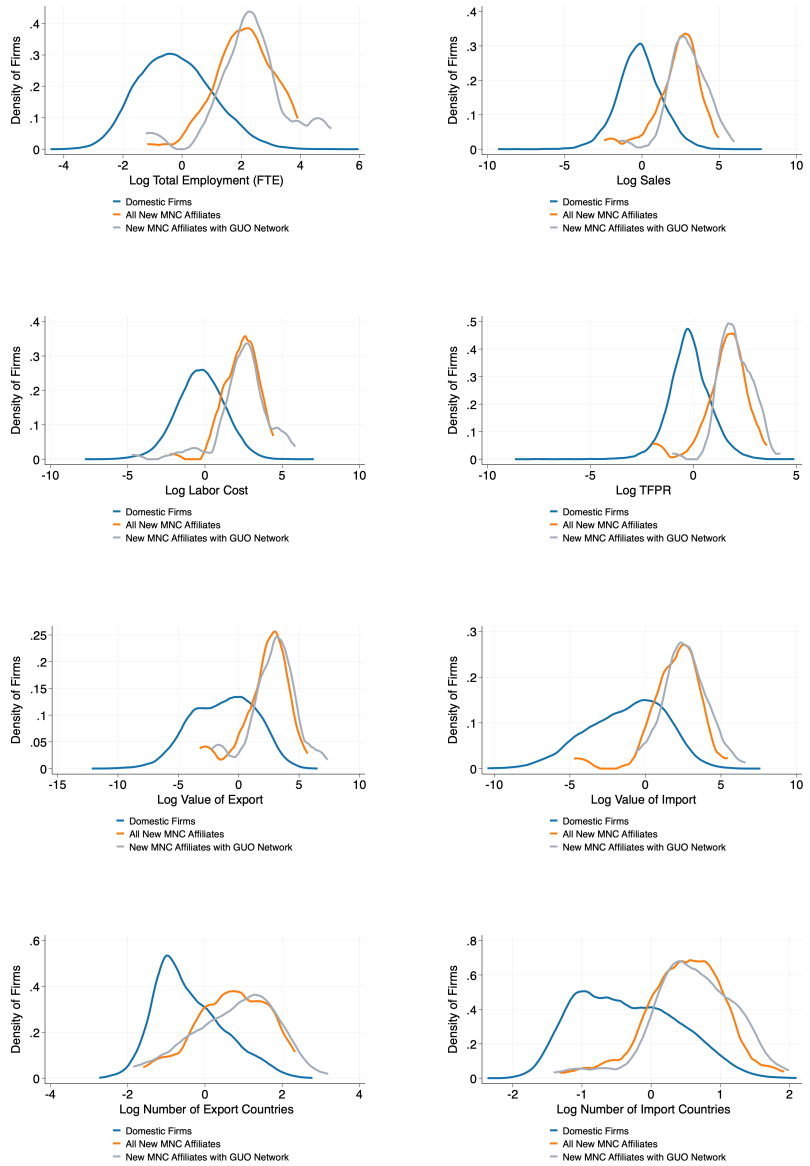
Table A-2
Distribution of Foreign Equity

Mean	1st Pctile	25th Pctile	Median	75th Pctile	99th Pctile
89.094%	23.000%	88.294%	99.975%	100.000%	100.000%

The table shows the distribution of average equity of new foreign affiliates (across the years in which they are foreign owned). For affiliates with more than one DP, we average across years and parents.

Figure A-1 provides descriptive statistics for the 115 new foreign affiliates and shows that there are systematic differences between them and non-acquired firms: firms that switch from domestic to multinational ownership during our sample period outperform always-domestic firms in many dimensions prior to acquisition. The figure also shows that the subset of 61 new affiliate firms that are the main focus of our gravity regressions (i.e., those that have one DP upon acquisition and for which we we can construct the GUO's network using data from Historical Orbis) are not significantly different from the other new affiliates.

Figure A-1
Selection Patterns



Note: The figure shows empirical probability density functions of firm-level variables (in logarithms and after demeaning by industry-time) for non-acquired firms and new affiliates (all, and those for which we can construct the GUO's network using data from Historical Orbis).

We construct the multinational network of the GUO of each foreign affiliate, using the subsidiary files in Historical Orbis to find the GUO of the DP of each Belgian affiliate. This is given by the BvD identifier of the firm that owns at least 25% of the DP. To collect the multinational network of each GUO, we look for the BvD identifier in the HO files where the shareholder is the main unit of observation and that contain information on each subsidiary owned by a given shareholder. Of the 186 GUO BvD identifiers linked to new Belgian affiliates, we find subsidiary relationships for 122 of them in the shareholder HO files. We can map out the countries where each of the GUOs has a network presence using the BvD identifier of each subsidiary. Table A-3 provides descriptive statistics about the size of multinational networks of the 61 Belgian affiliates in our main sample.

Table A-3

Number of Countries in the GUO's networks

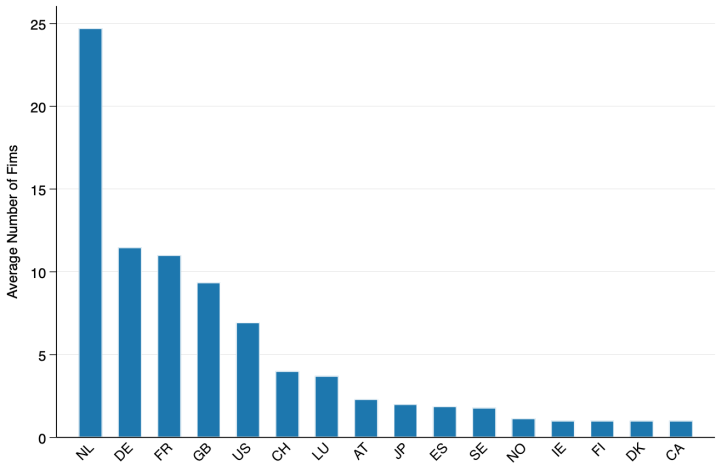
Mean	Median	Min	Max	Std. Dev.
34.15	25.00	1.00	142.00	32.76

The table reports summary statistics of the size of the multinational network of Belgian affiliates, i.e., the number of countries in which their GUOs have affiliates.

Figure A-2 illustrates the number of affiliates by country of the direct parent. Consistent with the empirical regularity that FDI follows gravity (e.g., Antràs and Yeaple, 2014), the Netherlands is the most frequent DP headquarters country. Figure A-3 shows that the GUOs of most Belgian affiliates are headquartered in countries geographically close to Belgium, or are in the United States.

Figure A-2

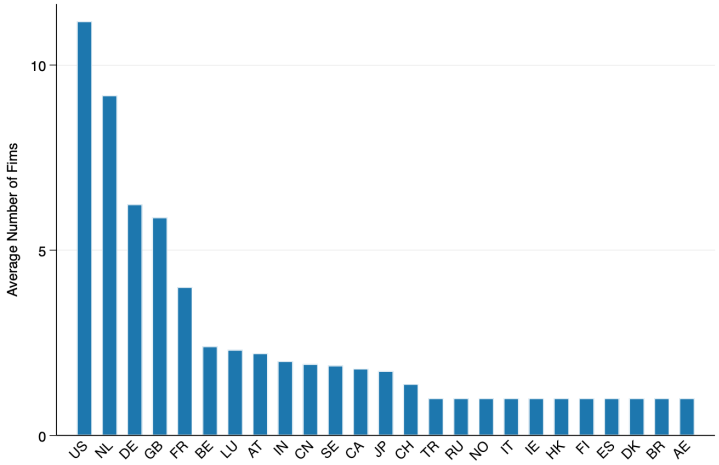
Number of New Foreign Affiliates by Country of the DP



The figure shows the average number of new Belgian foreign affiliates by DP country of origin.

Figure A-3

Number of New Foreign Affiliates by Country of the GUO



The figure shows the number of new Belgian foreign affiliates by GUO country of origin.

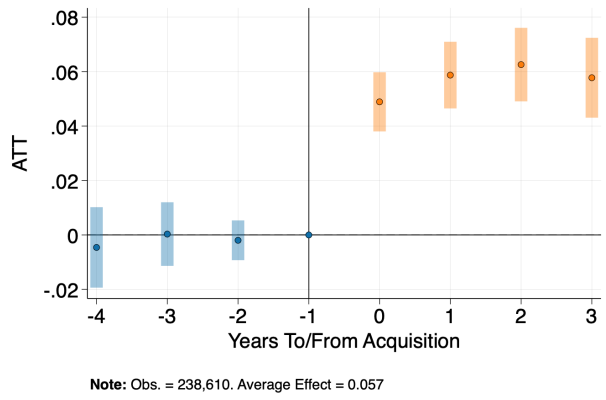
A-1.2 Additional Results and Robustness Checks

Figure A-4

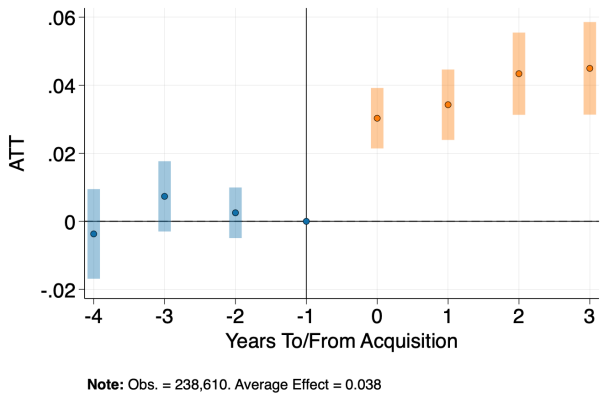
MNC Network Effects at The Extensive Margin

(Standard Errors Clustered at the Firm-Country Level)

Export Probability



Import Probability

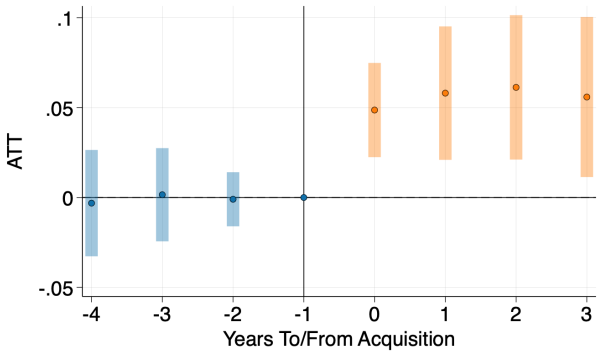


Note: The figure reports the event-study estimates of $MNC^{s}_{it} \times In\ MNC_{cp}$ in equation (19). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. Standard errors are clustered by firm-country.

Figure A-5

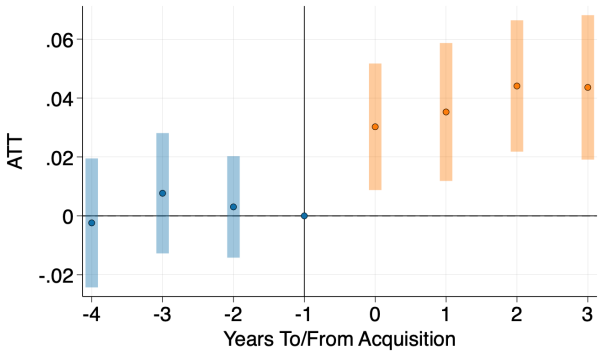
MNC Network Effects at The Extensive Margin
(Excluding Tax Havens)

Export Probability



Note: Obs. = 196,240. Average Effect = 0.056

Import Probability



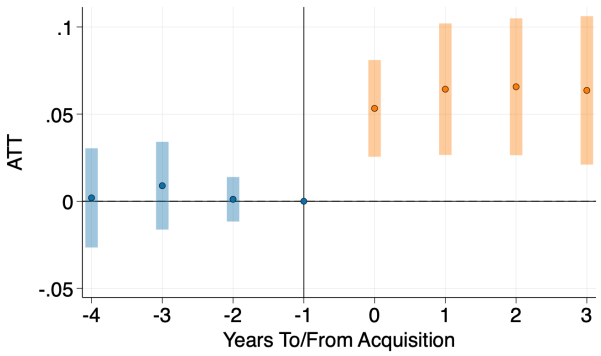
Note: Obs. = 196,240. Average Effect = 0.038

Note: The figure reports the event-study estimates of $MNC^{s}_{it} \times In\ MNC_{cp}$ in equation (19). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. The sample excludes countries i classified as tax havens as classified by tax haven countries by Dharmapala and Hines (2009). Standard errors are clustered by firm.

Figure A-6

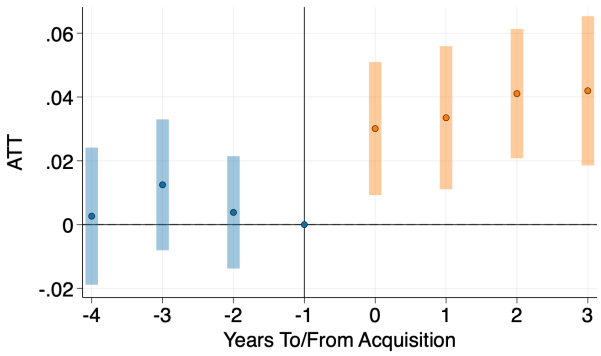
MNC Network Effects at The Extensive Margin
(Only Affiliates Whose DP is Different From the GUO)

Export Probability



Note: Obs. = 202,872. Average Effect = 0.062

Import Probability



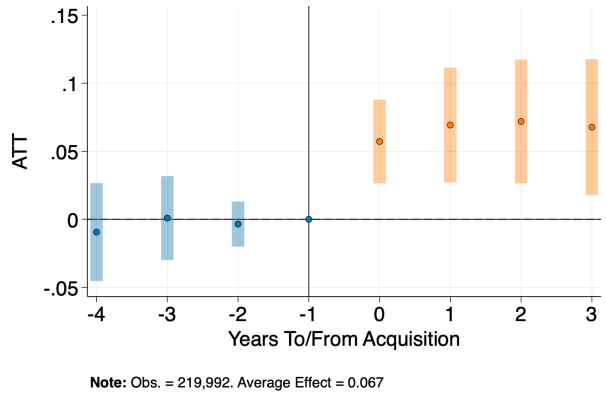
Note: Obs. = 202,872. Average Effect = 0.037

Note: The figure reports the event-study estimates of $MNC^{s}_{it} \times In\ MNC_{cp}$ in equation (19). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. The sample excludes affiliates whose DP is also their GUO. Standard errors are clustered by firm.

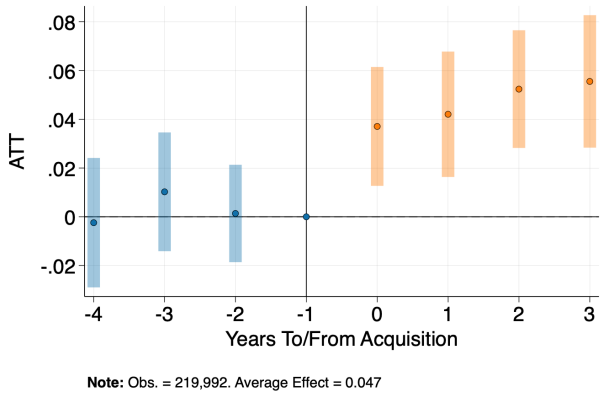
Figure A-7

MNC Network Effects at The Extensive Margin
(Excluding Affiliates With Multiple GUOs)

Export Probability



Import Probability

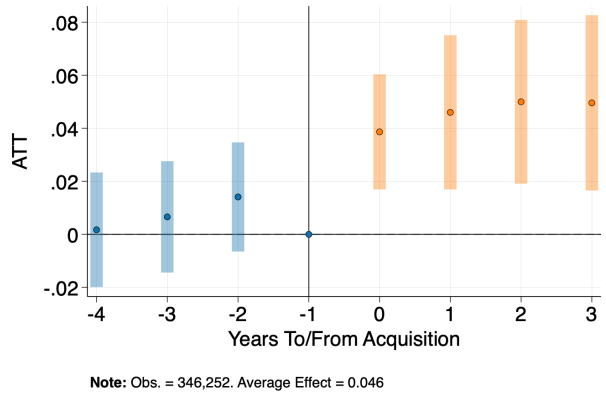


Note: The figure reports the event-study estimates of $MNC^{s}_{it} \times In\ MNC_{cp}$ in equation (19). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. The sample excludes affiliates with multiple GUOs. Standard errors are clustered by firm.

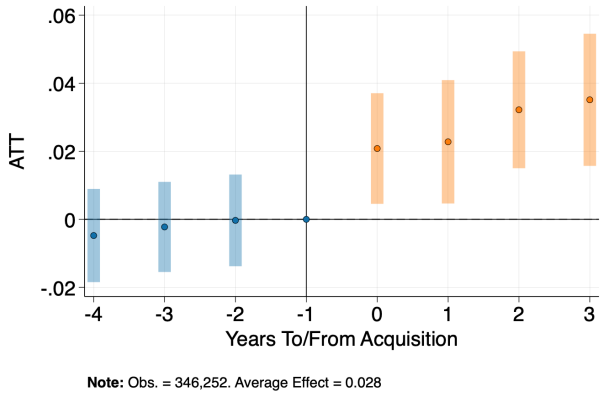
Figure A-8

MNC Network Effects at The Extensive Margin
(Including Affiliates With Multiple DPs)

Export Probability



Import Probability



Note: The figure reports the event-study estimates of $MNC^{s}_{it} \times In\ MNC_{cp}$ in equation (19). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $In\ MNC_{cp}$ is a dummy variable equal to 1 if country c belongs to the set of countries in which the global parent p has a presence. The sample includes affiliates with multiple DPs. Standard errors are clustered by firm.

Table A-4

Network Effects of MNC Ownership (Exogenous Network Changes)

	(1)	(2)
	Export Entry	Import Entry
New MNC$_{it}$ × *Only In New MNC*$_{ic}$	0.051**	0.086***
	(0.025)	(0.024)
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Network-Country FE	Yes	Yes
Observations	48,569	48,569
Estimator	OLS	OLS

The table reports the results of estimating equation (20). In column 1 (2), the dependent variable is *Export Entry*$_{ict}$ (*Import Entry*$_{ict}$), a dummy variable equal to 1 from the first year t in which firm i exports to (imports from) country c. *New MNC*$_{i,t}$ is a dummy variable equal to 1 in the years in which firm i has GUO 2. *Only In New MNC*$_{ic}$ is a dummy variable equal to 1 if country c belongs to GUO 2's network but does not belong to GUO 1's network. We focus on cases in which the sector of GUO 1 and GUO 2 are different from those of the Belgian affiliate and neither GUO has direct control over it. The sample excludes all countries that only belong to the initial GUO's network. Standard errors clustered at the firm-country level in parenthesis. Significance levels: *** 0.01, ** 0.05, * 0.1.

Table A-5

Distributions of Covariates of Treated (Acquired) and Untreated (Non-Acquired) Firms (Before Reweighting)

Covariates	Mean Treat	Mean Control	Var. Treat	Var. Control	Skew. Treat	Skew. Control
Lag Log Fixed Assets	16.20	13.65	1.60	2.56	–0.03	–0.38
Lag Log Fixed Assets	16.20	13.65	1.60	2.56	–0.03	–0.38
Lag Log Employees	4.93	3.19	1.08	1.37	–0.23	–0.38
Lag Log Sales	17.44	15.51	1.32	1.45	–0.09	0.11
Lag Log No. Export Countries	2.64	1.88	0.95	1.12	–0.35	–0.06
Lag Log No. Import Countries	2.32	1.69	0.30	0.58	–0.36	–0.64
Lag Log Exports	16.82	14.31	2.82	5.31	–1.02	–1.02
Lag Log Imports	16.43	13.87	1.97	4.58	–0.07	–1.07
Growth Rate Sales	0.08	0.00	0.15	0.10	0.68	–3.11
Growth Rate Exports	–0.07	–0.02	1.77	1.28	–3.18	–0.21
Growth Rate Imports	0.04	–0.03	0.58	1.18	–1.65	–0.41
Growth Rate No. Export Countries	0.01	0.00	0.15	0.19	0.82	–0.13
Growth Rate No. Import Countries	0.03	–0.00	0.07	0.18	0.41	–0.17
Log Distance	7.78	7.41	0.55	0.85	–1.16	–0.55
Lag Log GDP Per Capita (PPP)	20.84	21.05	0.19	0.36	–0.13	–0.02
Longitude	15.22	13.69	160.77	306.94	–0.22	0.14
Latitude	39.90	42.56	72.95	65.63	–0.86	–1.35

The table reports the mean, variance, and skewness of firms' characteristics for the treated and control groups. All the lagged variables refer to the year before the acquisition for firms in the treatment group and the year before the one in which they are controls for those in the control group. The same applies to variables in growth rates. Log Distance, Lag Log GDP per capita (PPP), Longitude, and Latitude refer to the characteristics of the countries with whom firms trade (export or import) in the year before the acquisition (if they are acquired) or in the year before the one in which they are controls (if they are not acquired).

Table A-6

Treated and Untreated Covariates' Distributions
(Post Reweighting)

Covariates	Mean Treat	Mean Control	Var Treat	Var. Control	Skew. Treat	Skew. Control
Lag Log Fixed Assets	16.20	16.20	1.60	1.60	–0.03	–0.03
Lag Log Employees	4.93	4.93	1.08	1.08	–0.23	–0.23
Lag Log Sales	17.44	17.44	1.32	1.32	–0.09	–0.09
Lag Log No. Export Countries	2.64	2.64	0.95	0.95	–0.35	–0.35
Lag Log No. Import Countries	2.32	2.32	0.30	0.30	–0.36	–0.36
Lag Log Exports	16.82	16.82	2.82	2.82	–1.02	–1.02
Lag Log Imports	16.43	16.43	1.97	1.97	–0.07	–0.07
Growth Rate Sales	0.08	0.08	0.15	0.15	0.68	0.68
Growth Rate Exports	–0.07	–0.07	1.77	1.77	–3.18	–3.18
Growth Rate Imports	0.04	0.04	0.58	0.58	–1.65	–1.65
Growth Rate No. Export Countries	0.01	0.01	0.15	0.15	0.82	0.82
Growth Rate No. Import Countries	0.03	0.03	0.07	0.07	0.41	0.41
Log Distance	7.78	7.78	0.55	0.55	–1.16	–1.16
Lag Log GDP Per Capita (PPP)	20.84	20.84	0.19	0.19	–0.13	–0.13
Longitude	15.22	15.22	160.77	160.77	–0.22	–0.22
Latitude	39.90	39.90	72.95	72.95	–0.86	–0.86

The table reports the mean, variance, and skewness of firms' characteristics for the treated and control groups. All the lagged variables refer to the year before the acquisition for firms in the treatment group and the year before the one in which they are controls for those in the control group. The same applies to variables in growth rates. Log Distance, Lag Log GDP per capita (PPP), Longitude, and Latitude refer to the characteristics of the countries with which firms trade (export or import) in the year before the acquisition (if they are acquired) or in the year before the one in which they are controls (if they are not acquired).

Table A-7

MNC Ownership and Trade Participation

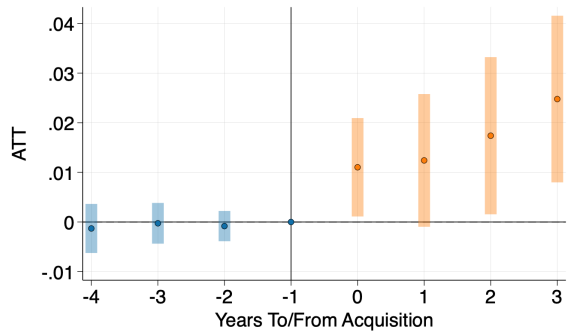
	Export Countries	Import Countries	Export Countries	Import Countries
	No Reweighting		EB Reweighting	
	(5)	(6)	(7)	(8)
MNC_{it}	0.324***	0.376***	0.220***	0.283***
	(0.069)	(0.049)	(0.073)	(0.050)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	305,179	305,179	93,171	93,171
Estimator	OLS	OLS	OLS	OLS

The table reports the results of estimating equation (21). In columns 3-4, we compute the entropy balance weights as a function of all the observables in Table A-6. Standard errors clustered by firm in parenthesis. Significance levels: *** 0.01, ** 0.05, * 0.1.

Figure A-9

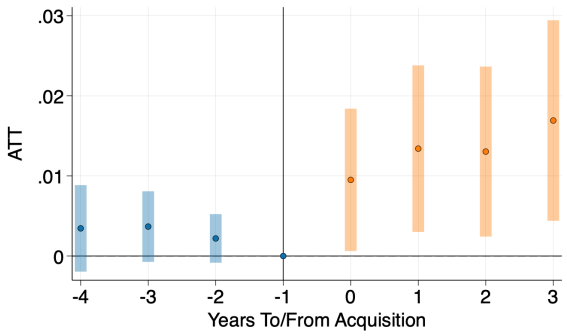
Extended Network Effects
(Excluding Countries Added to the GUO's Network)

Export Probability



Note: Obs. = 200,104. Average Effect = 0.016

Import Probability



Note: Obs. = 214,500. Average Effect = 0.013

Theoretical Appendix

B-1 Estimating Equations and Fixed Effects

In this appendix, we derive the firm-level gravity equations and the expressions for the fixed effects from our theoretical model. We obtain an expression for the probability of exporting by substituting equation (13) into equation (11) and plugging the resulting expression together with equation (10) into equation (5). We approximate the probability function using a linear model:

$$\Pr(i \text{ exports to } c \text{ in } t) = \beta_3^x(MNC_{i(p)t} \times In\ MNC_{cp}) + k^x + \lambda_{ct}^x + \lambda_{it}^x + \lambda_{i(p)cp}^x + \varepsilon_{i(p)ct}^x. \quad (23)$$

Where:

- $\lambda_{ct}^x = \varphi_{ct}^x$,
- $\lambda_{it}^x = \varphi_{i(p)t}^x + \overline{\psi}_{i(p)t}^x + h_x(MNC_{i(p)t}) + \beta_1^x MNC_{i(p)t}$,
- $\lambda_{i(p)cp}^x = \psi_{i(p)cp}^x + \beta_2^x In\ MNC_{cp}$,
- $\varepsilon_{i(p)ct}^x = \epsilon_{i(p)ct}^x + \epsilon_{i(p)t}^x$.

λ_{ct}^x accounts for any reason why all firms may trade more with a country over time, such as the introduction of trade agreements. λ_{it}^x controls for firm-specific time-varying forces driving trade, including post-acquisition productivity changes brought about after MNC acquisition. Finally, $\lambda_{i(p)cp}^x$ accounts for any time invariant MNC network level explanation of firm-level exports.

Substituting equation (14) into equation (12) and plugging the resulting expression together with equation (10) into equation (6) delivers the following estimating equation for the intensive margin of exports:

$$\log r_{i(p)ct} = \tilde{\beta}_3^x(MNC_{i(p)t} \times In\ MNC_{cp}) + \tilde{k}^x + \tilde{\lambda}_{ct}^x + \tilde{\lambda}_{it}^x + \tilde{\lambda}_{i(p)cp}^x + \tilde{\varepsilon}_{i(p)ct}^x, \quad (24)$$

Where:

- $\tilde{\lambda}_{ct}^x = \tilde{\varphi}_{ct}^x$,
- $\tilde{\lambda}_{it}^x = \overline{\tilde{\varphi}}_{i(p)t}^x + \overline{\tilde{\psi}}_{i(p)t}^x + \tilde{h}_x(MNC_{i(p)t}) + \tilde{\beta}_1^x MNC_{i(p)t}$,
- $\tilde{\lambda}_{i(p)cp}^x = \tilde{\psi}_{i(p)cp}^x + \tilde{\beta}_2^x In\ MNC_{cp}$,

- $\tilde{\varepsilon}^x_{i(p)ct} = \tilde{\epsilon}^x_{i(p)ct} + \tilde{\epsilon}^x_{i(p)t}$.

The fixed effects interpretation mirrors that for the extensive margin of exports.

We derive estimating equations for the import decisions using a symmetric argument. The estimating equation for the extensive margin of imports is:

$$\Pr(i \text{ imports from } c \text{ in } t) = \beta^m_3(MNC_{i(p)t} \times In\ MNC_{cp}) + \lambda^m_{ct} + \lambda^m_{it} + \lambda^m_{ic} + \varepsilon^m_{i(p)ct}. \quad (25)$$

Where:

- $\lambda^m_{ct} = \varphi^m_{ct}$,
- $\lambda^m_{it} = \varphi^m_{i(p)t} + \overline{\psi}^m_{i(p)t} + h_m(MNC_{i(p)t}) + \beta^m_1 MNC_{i(p)t}$,
- $\lambda^m_{i(p)cp} = \psi^m_{i(p)cp} + \beta^m_2 In\ MNC_{cp}$,
- $\varepsilon^m_{i(p)ct} = \epsilon^m_{i(p)ct} + \epsilon^m_{i(p)t}$.

The estimating equation for the intensive margin of imports is:

$$\log m_{i(p)ct} = \tilde{\beta}^m_3(MNC_{i(p)t} \times In\ MNC_{cp}) + \tilde{\lambda}^m_{ct} + \tilde{\lambda}^m_{it} + \tilde{\lambda}^m_{ic} + \tilde{\varepsilon}^m_{i(p)ct}, \quad (26)$$

where:

- $\tilde{\lambda}^m_{ct} = \tilde{\psi}^m_{ct}$,
- $\tilde{\lambda}^m_{it} = \tilde{\varphi}^m_{i(p)t} + \overline{\tilde{\psi}}^m_{i(p)t} + \tilde{h}_m(MNC_{i(p)t}) + \tilde{\beta}^m_1 MNC_{i(p)t}$,
- $\tilde{\lambda}^m_{i(p)cp} = \tilde{\psi}^m_{i(p)cp} + \tilde{\beta}^m_2 In\ MNC_{cp}$,
- $\tilde{\varepsilon}^m_{i(p)ct} = \tilde{\epsilon}^m_{i(p)ct} + \tilde{\epsilon}^m_{i(p)t}$.

The interpretation of the fixed effects when looking at import choices mirrors the proposed interpretation for export choices.

B-2 Firm Size and MNC Network Effects

We use the structure of our model to infer how exporting to, or importing from, new countries that belong to the parental network affects affiliates' sales and employment. Our assumption in Section 2 is that firms first make sourcing decisions and then make sales choices. Therefore, we use changes in the set of source countries to infer changes in employment and changes in the set of export countries to measure changes in sales.

Methodology for Sales

By definition, firm-level total sales in year t can be expressed as:

$$p_{it}y_{it} = \sum_{c \in C_{it}} p_{ict}q_{ict}.$$

We define the following indicator function:

$$\mathbf{1}^{x}_{ict} = \mathbf{1}\{MNC_{it} = 1 \;\&\; EntryX_{ict} = 1 \;\&\; MNCdate_{i} \leq EntryXdate_{ic} \;\&\; In\ MNC_{cp} = 1\},$$

where:

- $MNC_{it} = 1$ if firm i is owned by an MNC at time t;
- $EntryX_{ict} = 1$ since the first year firm i exports to country c;
- $MNCdate_{i}$ is the year in which firm i is acquired by an MNC;
- $EntryXdate_{ic}$ is the year in which firm i starts exporting to c;
- $In\ MNC_{cp} = 1$ if country c belongs to the network of parent p.

In words, $\mathbf{1}^{x}_{ict} = 1$ if firm i is owned by an MNC at time t and started exporting to country c belonging to the parental network after the acquisition year.

Firm i's average sales in year t post MNC acquisition can be written as:

$$Y^{'}_{it} = \frac{1}{|S_{it}|} \sum_{c \in S_{it}} \left(p_{ict}q_{ict} \times MNC_{it}\right). \tag{27}$$

Notice that $Y^{'}_{it}$ captures the effect of MNC ownership on export sales to *all* destination countries. Firm i's average post-acquisition sales in year t in new destination countries that *belong to the MNC network* are instead:

$$Y^{''}_{it} = \frac{1}{|S_{it}|} \sum_{c \in S_{it}} \left(p_{ict}q_{ict} \times \mathbf{1}^{x}_{ict}\right). \tag{28}$$

Under the assumption that destination fixed costs would have been similar across countries in the absence of the MNC network effects, the fraction of post-acquisition sales attributable to these effects is:

$$Y^{'''}_{it} = \frac{Y^{''}_{it}}{Y^{'}_{it}}. \tag{29}$$

The average of $Y_{it}^{'''}$ across firms and years in our sample is 21.2%, as reported in the first column of Table 3.

Methodology for Employment

Applying Shephards' Lemma to equation (3) implies that firm i's material input demand from country $c \in S_{it}$ at time t is:

$$b_{ict}x_{ict} = M_{it}B_{it}^{\sigma-1}\xi_{ict}^{\sigma-1}b_{ict}^{1-\sigma}.$$

Similarly, firm i's labor demand at time t is:

$$w_t L_{it} = M_{it}B_{it}^{\sigma-1}\xi_{iLt}^{\sigma-1}w_t^{1-\sigma}.$$

Taking the ratio of these two equations delivers the following expression for firm i's material input expenditure share on country $c \in S_{it}$ at time t:

$$s_{ict} \equiv \frac{b_{ict}x_{ict}}{\sum_{c\in S_{it}} b_{ict}x_{ict} + w_t L_{it}} = \frac{\xi_{ict}^{\sigma-1}b_{ict}^{1-\sigma}}{\sum_{c\in S_{it}} \xi_{ict}^{\sigma-1}b_{ict}^{1-\sigma} + \xi_{iLt}^{\sigma-1}w_t^{1-\sigma}}.$$

Firm i's labor expenditure share at time t is:

$$s_{iLt} \equiv \frac{w_t L_{it}}{\sum_{c\in S_{it}} b_{ict}x_{ict} + w_t L_{it}} = \frac{\xi_{iLt}^{\sigma-1}w_t^{1-\sigma}}{\sum_{c\in S_{it}} \xi_{ict}^{\sigma-1}b_{ict}^{1-\sigma} + \xi_{iLt}^{\sigma-1}w_t^{1-\sigma}}.$$

We can express firm i's labor demand at time t as:

$$w_t L_{it} = \frac{s_{iLt}}{s_{ict}} b_{ict}x_{ict} \qquad \Longleftrightarrow \qquad w_t L_{it} = \frac{1}{|S_{it}|}\sum_{c\in S_{it}} \frac{s_{iLt}}{s_{ict}} b_{ict}x_{ict}.$$

We define the following indicator function:

$$\mathbf{1}_{ict}^{m} = \mathbf{1}\{MNC_{it} = 1 \;\&\; EntryI_{ict} = 1 \;\&\; MNCdate_i \leq EntryIdate_{ic} \;\&\; In\ MNC_{cp} = 1\}.$$

Where:

- $MNC_{it} = 1$ if firm i is owned by an MNC at time t;
- $EntryI_{ict} = 1$ since the first year firm i sources from country c;
- $MNCdate_i$ is the year in which firm i is acquired by an MNC;

- $EntryIdate_{ic}$ is the year in which firm i starts sourcing from c;
- *In* $MNC_{cp} = 1$ if country c belongs to the network of parent p.

In words, $\mathbf{1}^{m}_{ict} = 1$ if firm i is owned by an MNC at time t and started sourcing from country c belonging to the parental network after the acquisition year.

Firm i's average labor demand in post-acquisition year t due to imports of material inputs from *all* source countries is:

$$L^{'}_{it} = \frac{1}{|S_{it}|} \sum_{c \in S_{it}} \left(\frac{s_{iLt}}{s_{ict}} b_{ict} x_{ict} \times MNC_{it} \right). \tag{30}$$

Firm i's labor demand in year t attributable to the addition of new countries *belonging to the MNC network* after MNC acquisition is instead:

$$L^{''}_{it} = \frac{1}{|S_{it}|} \sum_{c \in S_{it}} \left(\frac{s_{iLt}}{s_{ict}} b_{ict} x_{ict} \times \mathbf{1}^{m}_{ict} \right). \tag{31}$$

Under the assumption that sourcing fixed costs would have been similar across countries in the absence of the MNC network effects, post-acquisition labor demand attributable to these effects is:

$$L^{'''}_{it} = \frac{L^{''}_{it}}{L^{'}_{it}}. \tag{32}$$

The average of this ratio across firms and years in our sample is 25.7%, as reported in the first column of Table 3.