Multinational Networks and Trade Participation*

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Abstract

Multinational corporations (MNCs) dominate international trade. We provide a novel explanation for this fact: multinational affiliates face lower trade frictions in countries in which their parent already has a presence. Combining rich administrative data for Belgium with data on MNCs' global affiliate networks, we show that firms acquired by a multinational are more likely to start exporting to and importing from countries that belong—or that are exogenously added—to their parental network. 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 close to the MNC network, even if their parent has no presence there. We provide a model of firms' export and import choices to show how firm-level gravity regressions isolate "MNC network effects" from other channels through which multinational ownership can affect firms' trade participation. Combining the structure of the model with our empirical estimates, we find that MNC network effects have a large impact on new affiliates' growth.

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1 Introduction

Multinational corporations (MNCs) dominate international trade, accounting for around two-thirds of the value of global trade flows.[1] In this paper, we propose a novel mechanism to explain this dominance: multinational ownership reduces country-specific trade frictions, making it easier for affiliates to start exporting to and importing from countries in which their parent already has a presence. We label this mechanism an "MNC network effect" and isolate it from firm-specific channels emphasized in the existing literature, such as productivity increases due to technological or managerial transfers.[2]

We use rich firm-level information from the National Bank of Belgium (NBB) to identify Belgian firms acquired by an MNC and their direct parents (DP). Combining these data with the Global Orbis and Historical Orbis datasets from Moody's, we trace the global ultimate owner (GUO) of each new affiliate and construct its multinational network, i.e., the set of countries in which the GUO has a presence. To isolate network effects from other channels through which MNC ownership can affect trade participation, we estimate event studies with three-way fixed effects, exploiting within-firm variation in ownership status over time and cross-firm variation in the geographical structure of multinational networks at the time of the acquisition. Our identification strategy takes into account that firms are acquired at different times, implying that the roll-out is staggered and treatment effects are time-varying.

We find that multinational acquisitions give rise to MNC network effects at the extensive margin: new affiliates are more likely to start trading with countries that belong to their GUO's network.[3] In terms of magnitude, the probability of exporting to (importing from) network countries increases by 5.7 (3.8) percentage points in the four years after acquisition, a 33% (42%) increase compared to the unconditional probability of exporting (importing) in the estimation sample. There are no significant pre-trends leading up to the acquisition. We 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. The results for MNC network effects at the extensive margin hold in a battery of robustness checks (e.g., using

[1] For example, we find that multinational affiliates represent only 1% of the population of firms in Belgium, but account for 60% of total exports and 65% of total imports. In the United States, MNCs comprise less than 0.3 percent of firms, but account for 72% of exports and 69% of imports (Antràs *et al.*, 2024). Miroudot and Rigo (2021) report similar statistics using data for different OECD countries.

[2] 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).

[3] Focusing on countries in which the GUO has a presence helps to address endogeneity concerns: GUOs have very large networks and do not usually own the Belgian affiliates in our sample directly.

different samples of affiliates and network countries, controlling for extended gravity effects, clustering standard errors at different levels). They also continue to hold following plausibly exogenous changes in affiliates' MNC networks.[4]

One potential mechanism behind these results is that knowledge flows within the MNC hierarchy reduce the fixed costs of obtaining market-specific information, fostering affiliate export and import entry. In hierarchical organizations, members communicate with the tiers immediately above and below: information and instructions are imparted from above and distributed through the vertical channels of management below each level.[5] This suggests that Belgian affiliates in our sample may obtain knowledge through interactions with their DP, including information about the local regulations and market conditions in countries in which the GUO has a presence. It has also been shown that geographic and cultural proximity facilitate communication within firms.[6] The size of MNC network effects should therefore depend on the geographic and cultural distance between Belgian affiliates and the firm that is closest to them in the MNC hierarchy, i.e., their DP. 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).

We further 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 those countries outside the GUO's network that share a common border and a common language with a network country. These results are robust to excluding countries added to the GUO's network after the firm's acquisition. They also continue to hold when controlling for extended gravity effects (Albornoz, *et al.*, 2012; Morales *et al.*, 2019; Alfaro-Ureña *et al.*, 2023). This literature suggests that extended MNC network effects could arise due to similarity in regulations and market conditions across countries that are geographically and culturally close: for example, 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 that shares a common border and language (e.g., Chile), even if the multinational parent has no presence there. One

[4]We use data from Orbis M&A to trace global transactions that lead to changes in the GUO of Belgian affiliates in our sample, resulting in plausibly exogenous changes in their MNC networks.

[5]For example, Liberti and Mian (2009) observe the level at which a loan is approved within a large bank in Argentina. They find that less hierarchical distance between the loan approving officer and the information collecting agent is associated with greater reliance on soft information. Skrastins and Vig (2019) analyze plausibly exogenous changes to the organizational design of a large bank in India and show that adding layers of hierarchical distance reduces loans to small borrowers and increases contract standardization.

[6]Giroud (2013) finds that proximity to headquarters facilitates information flows within firms, increasing plant-level investment and productivity. Several studies emphasize that geographical and cultural proximity facilitate communication within MNCs (e.g., Keller and Yeaple, 2013; Gumpert, 2018; Guillouët *et al.*, 2024).

implication of this finding is that, 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. Thus, MNC ownership boosts affiliates' trade participation by alleviating market-specific entry frictions, rather than by simply facilitating trade between affiliates of the same multinational.[7]

We next show that the estimating equations identifying MNC network effects can be derived from a theoretical model where firms choose which countries to source their inputs from to minimize costs and in which countries to sell their output to maximize profits. In the model, new affiliates' export and import decisions can be affected by MNC ownership, 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).

Finally, we quantify the impact of MNC network effects on firm growth in terms of sales and employment by combining the structure of our model with the gravity estimates.[8] Our analysis shows that, following acquisition, affiliates experience an average increase in sales of approximately 32% and in employment of 12%. About one-third of the total growth in sales and half of the growth in employment can be attributed to multinational network effects. By contrast, during the same period, the median annual sales growth among domestic Belgian firms was just 1.9%, and there was no growth in median employment.

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.[9] We show that MNCs can alleviate entry barriers in foreign markets through their networks, allowing their affiliates to profitably expand the set of countries in which they have customers and suppliers.

The paper is related to three main streams of literature. A first stream studies the effects

[7]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.

[8]This quantification also involves identifying the causal effects of MNC ownership on various firm outcomes. To do this, 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 algorithm). Our findings indicate that firms acquired by an MNC increase total export and import values and add new destination and source countries (rather than simply diverting trade from non-network to network countries). MNC ownership also increases firm's sales and employment.

[9]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).

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). Others study the the location decisions of MNCs (e.g., Tintelnot, 2017; Head and Mayer, 2019; and Oberfield *et al.*, 2024). The closest paper to ours is Guadalupe *et al.* (2012). Using a panel dataset of 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.

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).[10] Within this literature, the closest paper to ours is Antràs *et al* (2024). In their model, firms incur country-specific fixed costs to sell their goods in a country and to source inputs from a country. Crucially, these costs are assumed to be shared across all establishments of the same firm. Using cross-sectional data for 2007, they find evidence consistent with MNC-level fixed costs of trade: U.S. multinationals trade more with countries in which they have affiliates and with other countries in the same region. We complement their work in two important ways: we identify causal effects by exploiting within-firm variation over time in MNC ownership and trade participation, as well as cross-firm variation in the structure of the parental network; and we quantify the contribution of MNC network effects to firm growth in terms of sales and employment.

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.[11] 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

[10] 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).

[11] 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.

how multinational acquisitions affect affiliates' trade participation.

The rest of the paper is structured as follows. Section 2 presents the data used. Section 3 outlines how we estimate MNC network effects and discusses our identification strategy. Section 4 presents our main empirical findings. Section 5 shows that our estimating equations can be derived from a theoretical framework in which MNC ownership affects export and import choices through firm-specific and network-specific channels. In Section 6, we combine the structure of the model with our estimates to quantify the contribution of MNC network effects to firm growth. Section 7 concludes.

2 Data

We use data from various sources to identify Belgian firms acquired by MNCs and construct their multinational networks. Section A-1 of the Empirical Appendix provides more details about the data used and summary statistics.

2.1 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, and input expenditures. All flow variables are annualized to map to calendar years in the other datasets.[12]

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

[12]Firm characteristics are used in Section 6 to quantify the impact of MNC network effects on firm growth.

certain threshold.[13] 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.[14]

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 their firm identifiers: Orbis, Historical Orbis (HO), and Orbis M&A. We use the first dataset to collect information 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 countries where multinational parents of the Belgian firms are present from the CEPII gravity database (see Mayer and Zignago, 2011), including GDP per capita, population size, geographical coordinates, and geographical distance between countries. Information on the cultural distance between countries comes from Gurevich *et al.* (2024).

2.2 New Foreign Affiliates and Their Multinational Networks

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 sample 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.[15] Third, we consider domestic firms and affiliates of foreign multinationals, excluding

[13] 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/.

[14] 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.

[15] 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).

Belgian multinationals, i.e., firms that engage in outward FDI.[16,17]

To examine the effects of MNC ownership, we exploit the fact that some of these firms are new foreign affiliates, i.e., they 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 acquisition. Third, we exclude firms that switch between domestic and MNC ownership more than once.[18] We do so to ensure monotonicity in the treatment status of each firm, a necessary requirement for identification.

To construct the multinational network of new foreign affiliates, we proceed in three steps. First, we collect information (name, country, equity share) on the direct parent (DP) of each Belgian affiliate from the NBB FDI dataset. 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 search for the DP's identifier in the Orbis database. Third, we construct the network of the GUO of each affiliate. For each Belgian affiliate i, we use the subsidiary files in HO to find its DP's GUO, i.e., the firm that owns at least 25% of the DP.[19] For each GUO p, we then construct its network at the time of the acquisition, which is captured by the variable $MNC\ Network_{cp}$, an indicator variable equal to 1 if the GUO has at least one affiliate in country p.[20]

Figure 1 illustrates geographical variation in MNC networks, focusing on two Belgian affiliates, denoted by A and B. Both the DP and GUO of affiliate A are headquartered in Sweden, while the DP of affiliate B is in the Netherlands and its GUO in the United States. The networks of the GUOs differ not only in size (22 countries for the GUO of affiliate A, 28 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., Australia, Canada, Poland, Spain,

[16]The theoretical framework we present in Section 5 can be used to interpret the trade participation of affiliates of both foreign and Belgian MNCs. However, the NBB data does not allow us to identify firms acquired by Belgian multinationals.

[17]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.

[18]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.

[19]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.

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

and Sweden) and others in which only the parent of affiliate B has a presence (e.g., China, France, India, the United States, and Russia).

Figure 1

Comparing the GUO 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 new foreign affiliates' trade expansion may be skewed towards countries that belong to their parental network. For example, in 2000 a Belgian firm in our sample 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).

In Section 4, we use an event study design to show that the geographical structure of the parental network systematically affects the probability that new affiliates start exporting to and importing from foreign markets. In our baseline analysis, we focus on the 61 Belgian firms that have one DP at the time of the acquisition and for which we can construct the GUO's network using Orbis data. In robustness checks we include all new affiliates for which we can construct the GUO's network.[21] Crucially, the sample used to identify MNC network effects is much larger than the number of affiliates 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 the new foreign affiliates firms in our main sample are not significantly different from the broader set of all new foreign affiliates. In line with previous studies (e.g., Blonigen *et al.*, 2014), this figure also highlights selection effects: prior to the acquisition, Belgian firms that will switch to multinational ownership outperform always-domestic firms in many dimensions. For this reason, when estimating the event studies, we

[21] 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.

only use acquired firms and include firm-year fixed effects to control for firm-year-specific shocks that could explain selection into MNC ownership. Network effects are identified by exploiting differences in the timing of acquisition and in the geographical structure of their parental network.[22]

3 Empirical Framework

Our goal is to identify the effects of MNC ownership on trade participation that can be attributed to the network structure of the multinational. The key challenge is to separate these effects from the other channels through which MNC ownership can affect firms' exports and imports post acquisition. These include affiliates becoming more productive, e.g., through transfers of technology or managerial know-how, which can lead them to increase their trade participation.

Crucially, MNC network effects operate at the firm-country level, i.e., affect trade participation of new multinational affiliates in countries in which their parent has a presence. In what follows, we show how we can use event studies to isolate network-specific effects of MNC ownership on trade participation from affiliate-level effects.[23]

3.1 Estimating Equations

We estimate the following event-study specification, in which the subscript $i(p)$ indicates variables pertaining to firm i when owned by parent p:

$$y_{i(p)ct} = \sum_{g \in G} \sum_{s=-k_l}^{k_u} \theta_{g,s} \mathbf{1}\{(ic) \in g\} (MNC^{s}_{i(p)t} \times MNC\ Network_{cp}) + \lambda_{i(p)t} + \lambda_{ct} + \lambda_{i(p)cp} + \varepsilon_{i(p)ct}. \quad (1)$$

The dependent variable, $y_{i(p)ct}$, captures 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 $MNC^{s}_{i(p)t}$ is defined. $MNC\ Network_{cp}$ identifies countries in which p (the GUO of affiliate i) has a presence in the year of the acquisition. The indicator function $\mathbf{1}\{(ic) \in g\}$ equals one if the firm-country

[22] Always-domestic firms are only used to quantify the contribution of MNC network effects in Section 6. In that section, we will deal with selection into multinational ownership by using Hainmueller (2012)'s entropy balance re-weighting algorithm 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.

[23] The theoretical framework in Section 5 derives the static version of the estimating equations from a model that separates network-specific mechanisms from affiliate-level mechanisms.

pair (ic) belongs to cohort $g \in G$. In our setting, treated cohorts are firm-country pairs 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.[24] 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.[25] Not-yet-treated observations, i.e., firm-country pairs such that firm i is not-yet acquired and country c belongs to the network of i's parent, do not enter the control group. Instead, these observations are used to estimate pre-trends.

The fixed effects included in equation (1) capture several determinants of firms' trade participation. Firm-year fixed effects ($\lambda_{i(p)t}$) account for the standard channels through which MNC ownership can enhance trade participation, such as productivity improvements or the alleviation of financial constraints. These fixed effects also control for firm-year-specific shocks that could explain selection into MNC ownership by any parent. 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. Country-year fixed effects (λ_{ct}) control for time-invariant factors (e.g., geographical distance, or colonial linkages) as well as time-varying factors (e.g., income shocks in that country, or the implementation of a trade agreement with the EU) that can influence trade between all Belgian firms and country c. 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]

In practice, we estimate equation (1) allowing for time-varying and staggered treatment using the estimator of Nagengast and Yotov (2025), who extend the methodology developed by Wooldridge (2021) to a three-dimensional panel similar to ours.[27] The parameters $\theta_{g,s}$ measure the cohort-specific dynamic network effects of MNC acquisitions, and should be

[24] For example, imagine 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, the parent of firm 2 having a presence in countries C and D, and neither parent having a presence in country E. 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), which are assigned a value of 1, whereas all other firm-country pairs are assigned a zero.

[25] Going back to the example in footnote 24, the control group includes: (firm 1, country C), (firm 1, country D), (firm 1, country E), (firm 2, country A), and (firm 2, country B) and (firm 2, country E).

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

[27] 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.

understood as average treatment effects on the treated (ATT). We normalize $\theta_{g,-1} = 0$ for all cohorts, implying that all other estimated coefficients are relative to the outcome in the year prior to the acquisition. We then aggregate cohort-time-specific treatment effects—either over time, as in an event study, or into a single estimate—using cohort size as a weight. We cluster standard errors at the firm level.

In terms of sample, when examining the extensive margin of trade, we include all countries with which firms in our dataset can potentially trade. When considering the intensive margin, we restrict the sample to countries firms were already exporting to or importing from before being acquired.

3.2 Identification

Identification relies on two sources of variation in trade participation: (*i*) within firms across countries that are either part of or outside their parental network; and (*ii*) between firms within a given destination, based on the footprint of their parent companies.

Conditional on the fixed effects included in equation (1), the parallel trends assumption is that had firm i not been acquired by parent p, it would have not changed its trade (on 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 $MNC\ Network_{cp}$ 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 78 and the mean is 373) and usually have no direct ownership of the Belgian affiliates in our sample, which are acquired and controlled by a DP.[28] It is thus unlikely that an affiliate i is acquired because of trends in its trade relations with GUO network countries.

Second, we 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 trade participation in network countries regardless of the acquisition.

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

[28] In robustness checks, we exclude the few (9) cases in which the DP coincides with the GUO.

is supported by the fact that Belgian firms are small in their GUOs' large networks and are not under direct GUO control.

4 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 4.1) or are added to the network as a result of plausibly exogenous global ownership changes (Section 4.2). We then explore possible mechanisms behind MNC network effects (Section 4.3). Finally, we provide evidence that the effects of MNC ownership extend beyond the boundaries of the multinational (Section 4.4).

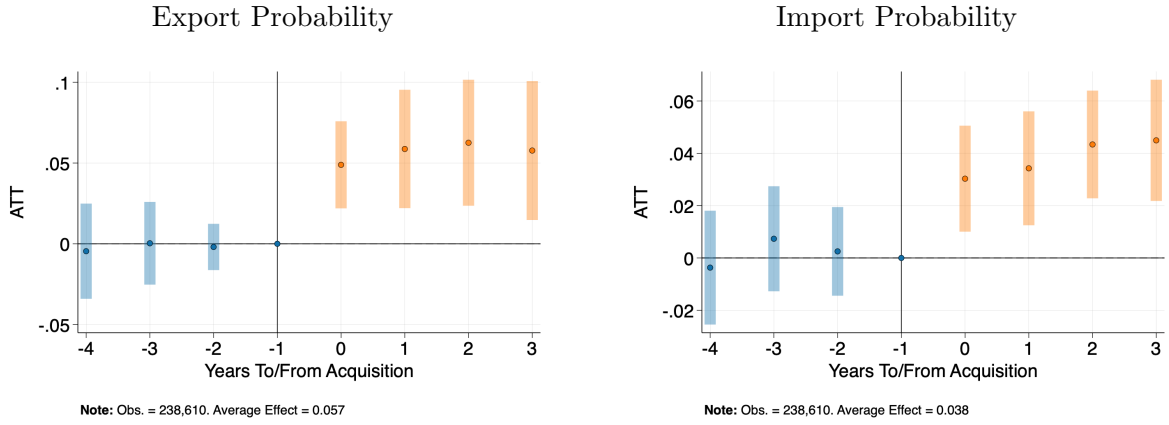
4.1 Network Effects of Multinational Acquisitions

Extensive Margin

We first examine the effects on the extensive margin of trade. In this case, the dependent variable in equation (1) is $Entry_{i(p)ct}$, 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

MNC Network Effects at The Extensive Margin



Note: The figure reports the event study coefficients of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1) obtained using the estimator in Nagengast and Yotov (2025). 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. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

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. 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.

Table 1 reports the event study estimates. Column 1 corresponds to the baseline specification in Figure 2. The remaining columns report the estimates of a series of robustness checks (also illustrated in Figures A-4 to A-10 in the Empirical Appendix).

One potential concern is that the our baseline results may partly be driven by "extended gravity effects," i.e., new affiliates may start trading with countries that are close to those they were already exporting to/importing from before their acquisition. The estimates reported in column 2 of Table 1 show that the results are unaffected if we control for whether country c shares a common border and a common language with a country that firm i was already trading with before the acquisition.

As discussed above, 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. To address this concern, we construct the variable $MNC\ Network_{cp}$ using information about the countries in which the GUO of affiliate i (rather than the DP, which directly owns the affiliate) has a presence. In nine cases, however, the DP and the GUO coincide. Our baseline estimates are unaffected if we drop every Belgian affiliate i whose DP is also its GUO, as shown in column 3. Even when the GUO and the DP do not coincide, some countries in the GUO's network are also in the DP's network. The estimates reported in column 4 show that our results continue to hold if we exclude these countries when constructing the variable $MNC\ Network_{cp}$.

The remaining columns of Table 1 report the results of a series of additional robustness checks. Column 5 shows that the results are robust to clustering standard errors at the firm-country level. Column 6 shows that the our findings are not driven by countries classified as tax havens. In column 7, we drop the four affiliates that have multiple GUOs upon acquisition. Finally, In column 8 we extend the sample to include firms with more than one DP upon acquisition.[29]

[29] There are 25 such affiliates. For these firms, we construct the variable $MNC\ Network_{cp}$ by merging the networks of their GUOs.

Table 1

MNC Network Effects at The Extensive Margin

	Baseline	Extended Gravity	GUO ≠ DP	No DP Countries	Alternative Clustering	No Tax Havens	Only one GUO	Larger Sample
Probability of Exporting								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$t=-4$	-0.005	-0.004	0.002	-0.006	-0.005	-0.003	-0.009	0.002
	(0.015)	(0.014)	(0.015)	(0.017)	(0.008)	(0.015)	(0.018)	(0.011)
$t=-3$	0.000	-0.000	0.009	-0.000	0.000	0.002	0.001	0.007
	(0.013)	(0.012)	(0.013)	(0.015)	(0.006)	(0.013)	(0.016)	(0.010)
$t=-2$	-0.002	-0.001	0.001	-0.008	-0.002	-0.001	-0.003	0.014
	(0.007)	(0.006)	(0.007)	(0.009)	(0.004)	(0.008)	(0.008)	(0.010)
$t=-1$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$t=0$	0.049***	0.048***	0.053***	0.049***	0.049***	0.049***	0.057***	0.039***
	(0.014)	(0.013)	(0.014)	(0.015)	(0.006)	(0.013)	(0.016)	(0.011)
$t=1$	0.059***	0.057***	0.064***	0.055***	0.059***	0.058***	0.069***	0.046***
	(0.019)	(0.018)	(0.019)	(0.019)	(0.006)	(0.019)	(0.022)	(0.015)
$t=2$	0.063***	0.061**	0.066***	0.053***	0.063***	0.061**	0.072***	0.050***
	(0.020)	(0.019)	(0.020)	(0.020)	(0.007)	(0.020)	(0.023)	(0.016)
$t=3$	0.058***	0.056***	0.064**	0.052***	0.058***	0.056***	0.068***	0.060***
	(0.022)	(0.021)	(0.022)	(0.023)	(0.007)	(0.023)	(0.025)	(0.017)
Probability of Importing								
	Baseline	Extended Gravity	GUO ≠ DP	No DP Countries	Alternative Clustering	No Tax Havens	Only one GUO	Larger Sample
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$t=-4$	-0.004	-0.004	0.003	0.006	-0.004	-0.002	-0.002	-0.005
	(0.011)	(0.010)	(0.011)	(0.013)	(0.007)	(0.011)	(0.014)	(0.007)
$t=-3$	0.007	0.006	0.012	0.013	0.007	0.008	0.010	-0.002
	(0.010)	(0.009)	(0.010)	(0.013)	(0.005)	(0.010)	(0.012)	(0.007)
$t=-2$	0.003	0.001	0.004	-0.003	0.003	0.003	0.001	-0.000
	(0.009)	(0.008)	(0.009)	(0.011)	(0.004)	(0.009)	(0.010)	(0.007)
$t=-1$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$t=0$	0.030**	0.030***	0.030**	0.028***	0.030***	0.030***	0.037**	0.021**
	(0.010)	(0.010)	(0.011)	(0.011)	(0.005)	(0.011)	(0.012)	(0.008)
$t=1$	0.034***	0.033***	0.033***	0.029***	0.034***	0.035***	0.042***	0.023**
	(0.011)	(0.011)	(0.011)	(0.012)	(0.005)	(0.012)	(0.013)	(0.009)
$t=2$	0.043***	0.042***	0.041***	0.035***	0.043***	0.044***	0.052***	0.032***
	(0.011)	(0.010)	(0.010)	(0.011)	(0.006)	(0.011)	(0.012)	(0.009)
$t=3$	0.045***	0.043***	0.042***	0.038***	0.045***	0.044***	0.056***	0.035***
	(0.012)	(0.011)	(0.012)	(0.013)	(0.007)	(0.013)	(0.014)	(0.010)
MNC Network FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the event-study coefficients of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1) obtained using the estimator of Nagengast and Yotov (2025). 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. $MNC\ Network_{cp}$ 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)-(4) and (6)-(8), and by firm-country in column (5). Column (2) includes binary indicators for the set of export (import) countries that share a common border and a common language with countries with which firms were already trading in at least one of the five years before being acquired. Column (3) excludes firms whose GUO is also ever their DP. Column (4) excludes countries that belong both to the DP and GUO network. Column (5) reproduces column (1) but shows cluster standard errors by firm-country. Column (6) excludes tax havens as classified by Dharmapala and Hines (2009). Column (7) excludes firms with multiple GUOs. Column (8) includes include firms with more than one DP upon acquisition.

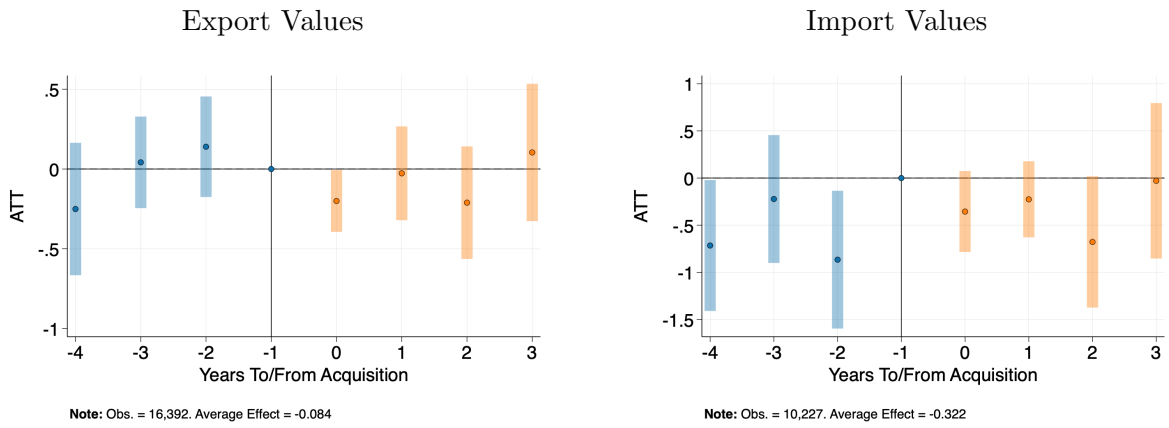
The results of all these event studies confirm that MNC ownership increases the probability that new affiliates start exporting to and importing from countries in which their global parent has a presence. One may be concerned that these effects are driven by new affiliates changing their trade participation 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 6 and Table A-7).

Intensive Margin

To analyze the intensive margin, 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 increase in countries in which its parent has other affiliates.[30]

Figure 3

MNC Network Effects at The Intensive Margin



Note: The figure reports the event study coefficients of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1) obtained using the estimator of Nagengast and Yotov (2025). 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. In the right panel, the sample is restricted to countries firm i was already exporting to before being acquired. In the left panel, the sample is restricted to countries firm i was already importing from before being acquired. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

[30] As in column 2 of Table 1, 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.

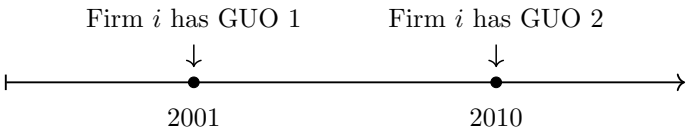
4.2 Network Effects from Exogenous GUO Changes

In this subsection, 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 trade participation in Figure 2. Our strategy aims to identify changes in affiliates' trade participation resulting from quasi-random changes in their MNC network.[31]

As before, 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. We identify a subset of these firms whose GUO changed during the period and exploit these ownership changes to identify network effects.[32]

Figure 4 provides an example of a firm i whose GUO changed. 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. 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. In general, the key assumption is that the change in GUO is not driven by the trade patterns of a Belgian affiliate that is controlled indirectly by these global companies.

Figure 4
An Example



[31] 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.

[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.

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

$$Entry^{j}_{i(p)ct} = \beta_j(New\ MNC_{i(p)t} \times Only\ In\ New\ MNC_{cp}) + \lambda^{j}_{i(p)t} + \lambda^{j}_{ct} + \lambda^{j}_{i(p)cp} + \varepsilon^{j}_{i(p)ct}, \quad j \in \{x, m\}. \tag{2}$$

$Entry^{j}_{i(p)ct}$ is a binary indicator equal to 1 from 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 (1). To inspect how firms adjust trade participation in response to quasi-random changes in their MNC network, we define two variables: $New\ MNC_{i(p)t}$, 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 β_j coefficient 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 (2). 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).

4.3 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 network effects apply to both export and import participation, but only at the extensive margin: new affiliates are more likely to start exporting to and importing from 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).

One potential mechanism behind these results is that knowledge flows within an MNC hierarchy reduce the fixed costs of obtaining market-specific information, fostering affiliate

[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, since we would have fewer than 30 clusters (Cameron *et al.*, 2008).

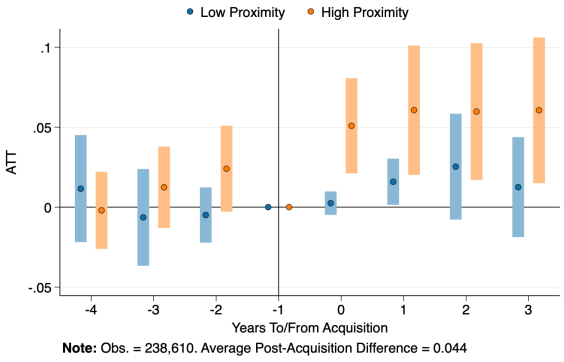
export and import entry. Various studies show that within hierarchical organizations, information flows through the vertical channels of management, with members communicating with the tiers immediately above and below (e.g., Liberti and Mian, 2009; Skrastins and Vig, 2019). There are also studies showing that geographical and cultural proximity facilitate communication within firms (e.g., Giroud, 2013; Keller and Yeaple, 2013; Gumpert, 2018; Bahar, 2020; Guillouët *et al.*, 2024). Together, these streams of literature suggest Belgian affiliates in our sample may obtain knowledge about the local regulations and market conditions in countries in which the GUO has a presence by interacting with their DP and the size of the effects should depend on the distance between Belgian affiliates and their DP.

Figure 5

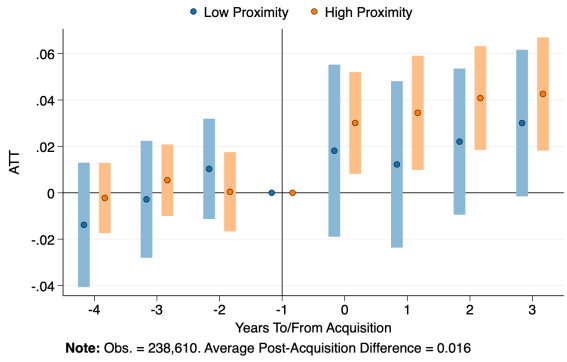
MNC Network Effects at The Extensive Margin

Proximity Between Affiliate and DP

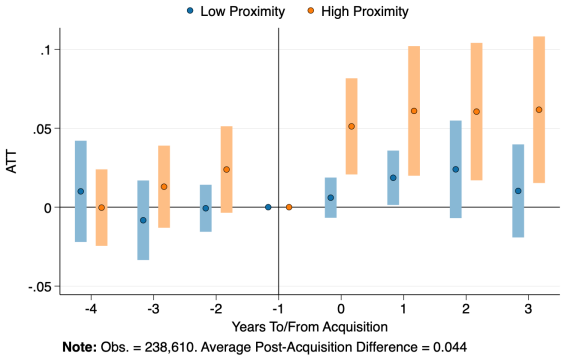
Export Probability - Physical Proximity



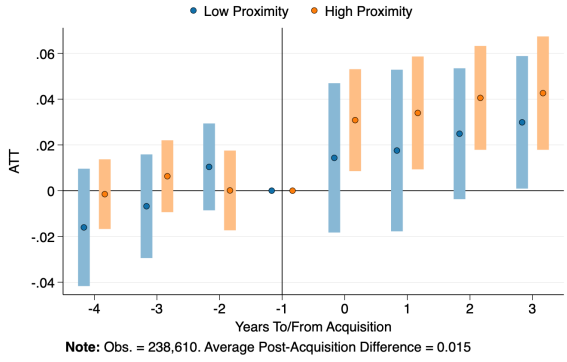
Import Probability - Physical Proximity



Export Probability - Cultural Proximity



Import Probability - Cultural Proximity



Note: The figure presents event-study estimates of $MNC_{i(p)t} \times MNC\ Network_{cp}$ from equation (1), interacted with $Distance\ to\ Parent_i$. 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 $MNC\ Network_{cp}$ is a dummy equal to 1 if country c is part of the global parent p's network. In the top (bottom) panels, $Distance\ to\ Parent_i$ 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). ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

To explore this mechanism, we measure geographic and cultural proximity between acquired firm i and its DP by constructing two versions of the variable *Distance to Parent*$_i$: 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 (1) again, interacting MNC network effects (captured by $MNC^{s}_{i(p)t} \times$ *MNC Network*$_{cp}$) with the two versions of the variable *Distance to Parent*$_i$. Figure 5 shows the results. We find that MNC network effects increase with the ease of intra-MNC communication: new Belgian 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 $MNC_{i(p)t} \times$ *MNC Network*$_{cp}$ are always positive and significant for affiliates whose DP is located in a country in the same time zone as Belgium or speaks one of its official languages.

4.4 Network Effects Beyond the Multinational Boundaries

The results presented above show that, post-acquisition, new affiliates are more likely to start trading with countries in which their global parent has a presence. In principle, these effects could be driven by a reduction in trade frictions between affiliates of the same firm, implying that MNC network effects operate only within the boundaries of the multinational. 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. Counter to this presumption, we find that the intensity of their pre-existing trade participation is unaffected, 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: post acquisition, 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 Network*$_{cp}$ being 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.[35] To verify whether MNC ownership has extended network effects, we drop the countries affiliate i was already

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

[35] This definition mirrors the one we use in column 2 of Table 1, as 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.

exporting to (when looking at export choices) or importing from (when looking at import choices) before the acquisition. We then estimate the following regression:

$$\begin{aligned} Entry^{j}_{i(p)ct} = &\sum_{g \in G} \sum_{s=-k_l}^{k_u} \alpha_{g,s} \mathbf{1}\{(ic) \in g\}(MNC^{s}_{i(p)t} \times Close\ to\ MNC\ Network_{cp}) \\ &+\theta(MNC^{s}_{i(p)t} \times MNC\ Network_{cp}) \\ &+\lambda^{j}_{i(p)t} + \lambda^{j}_{ct} + \lambda^{j}_{i(p)cp} + \delta^{j}_{i(p)cp} + \varepsilon^{j}_{i(p)ct}, \qquad j \in \{x, m\}. \end{aligned} \tag{3}$$

In this regression, we control for MNC network effects (captured by the interaction $MNC_{i(p)t} \times MNC\ Network_{cp}$), and estimate the leads and lags $\alpha_{g,s}$ associated with the interaction term $(MNC_{i(p)t} \times Close\ to_{cp})$.[36] The definition of cohorts is similar to that in equation (1), except that cohorts now refer to firm-country pairs where each firm i is acquired in the same year T, and country c both shares a common border and a common language with a country in the parental network but is not itself part of the GUO's network of countries. $Entry^{j}_{i(p)ct}$ is a binary indicator equal to 1 from the first year firm i, owned by parent p, starts exporting to or importing from country c. The notation of the fixed effects $\lambda^{j}_{i(p)t}$, λ^{j}_{ct}, and $\lambda^{j}_{i(p)cp}$ follows from equation (1). 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 to—but not in—their parental network.

Figure 6 shows the results of estimating (3), revealing that MNC ownership boosts affiliates' entry into countries that are close to the parental network. This finding echoes 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.

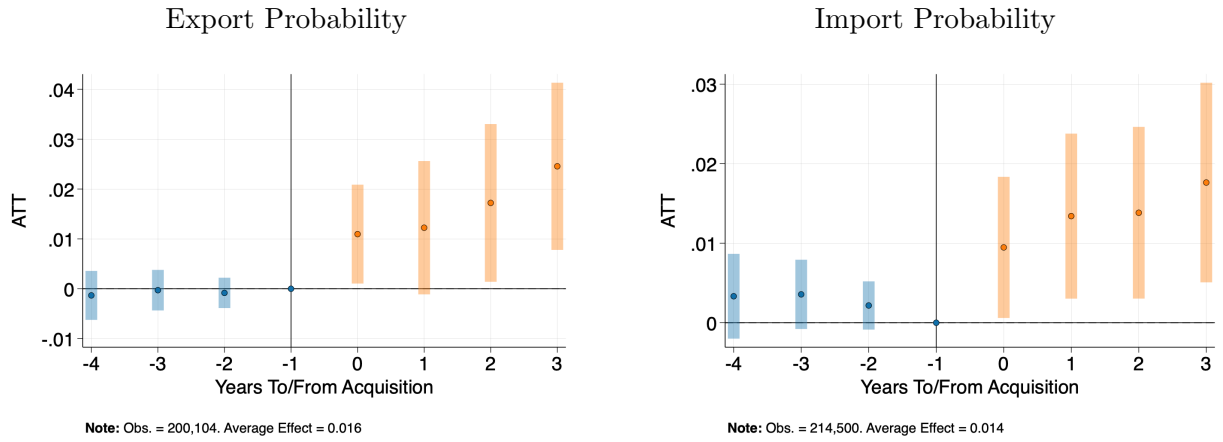
A possible concern is that the extended MNC network effects captured in Figure 6 are driven by the GUO adding countries to its network after affiliate i's acquisition. If this were the case, some countries coded as close to the GUO's network could actually become part of this network. Figure A-11 shows that the results are robust to excluding countries added to the GUO's network after firm i is acquired.

Finally, Figure A-12 shows that our results are robust to controlling for whether a country shares a common border and a common language with a country that affiliate i was already exporting to (or importing from) in at least one of the five years prior to acquisition, without itself being part of the GUO network. This suggests that our findings hold even after

[36] We estimate equation (3) using the estimator in Nagengast and Yotov (2025). However, since we are interested in $(MNC_{i(p)t} \times Close\ to\ MNC\ Network_{cp})$ and cannot identify the lags and leads of both $(MNC_{i(p)t} \times Close\ to\ MNC\ Network_{cp})$ and $(MNC_{i(p)t} \times MNC\ Network_{cp})$, we estimate a single parameter for $(MNC_{i(p)t} \times MNC\ Network_{cp})$ and a matrix of cohort-time-specific coefficients associated with $(MNC_{i(p)t} \times Close\ to\ MNC\ Network_{cp})$, which we then aggregate for the event-study specification.

accounting for more conventional extended gravity effects (Morales *et al.*, 2019).

Figure 6
Extended Network Effects



Note: The figure reports the event-study coefficients of $MNC^{s}_{i(p)t} \times Close\ to\ MNC\ Network_{cp}$ in equation (3) obtained using the estimator in Nagengast and Yotov (2025). 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. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

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.

5 Theoretical Framework

This section provides a theoretical model that can be used to derive equation (1), the key estimating equation in Section 3. It illustrates how we can isolate network-specific mechanisms from the affiliate-level mechanisms highlighted in the existing literature that affect affiliates' trade with all countries (e.g., productivity increases due to technological or managerial transfers from the parent). Together with the reduced-form estimates from the previous section, the model also offers guidance for assessing the overall impact of MNC network effects on firm growth, which we explore further in Section 6.

5.1 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:

$$Q_{ct} = \left[\sum_{i \in N_{ct}} \left(\bar{\zeta}_{ct} \zeta_{ict} q_{ict} \right)^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, \quad \eta > 1, \tag{4}$$

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 individual firm's products and their attractiveness to buyers in market c. 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 (4) as P_{ct}.

Production

Firms produce output q_{it} combining labor with intermediates following a CES technology:

$$q_{it} = z_{it} \left[\left(\bar{\xi}_{Lt} \xi_{iLt} L_{it} \right)^{\frac{\sigma-1}{\sigma}} + \sum_{c \in S_{it}} \left(\bar{\xi}_{ct} \xi_{ict} x_{ict} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad \sigma > 1, \tag{5}$$

where z_{it} is firm i's Hicks-neutral productivity at time t. 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. We denote the elasticity of substitution between inputs of production by $\sigma > 1$. S_{it} is the endogenous set of countries firm i sources material inputs from at time t, $\bar{\xi}_{Lt}$ and $\bar{\xi}_{ct}$ are labor- and source-country-specific shifters common to all firms at time t, ξ_{iLt} is a firm-level labor-shifter, such as factor-biased productivity, and ξ_{ict} is a firm-source-country-specific shifter at time t. This variable captures, for example, input quality in c together with i's home bias in input demand. The cost function associated with equation (5) is given

by:

$$c_{it}\left(S_{it}\right)=\frac{B_{it}\left(S_{it}\right)}{z_{it}}, \qquad B_{it}(S_{it})=\left[\left(\frac{w_t}{\bar{\xi}_{Lt}\xi_{iLt}}\right)^{1-\sigma}+\sum_{c\in S_{it}}\left(\frac{b_{ict}}{\bar{\xi}_{ct}\xi_{ict}}\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}}, \tag{6}$$

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:

$$\pi_{it}=\max_{\substack{L_{it},S_{it},\mathbf{x_{ict}},\\ C_{it},\mathbf{p_{ict}}}}\sum_{c\in C_{it}}\underbrace{\left(p_{ict}-\tau_{ict}c_{it}\left(S_{it}\right)\right)q_{ict}}_{\equiv\pi_{ict}}-\sum_{c\in C_{it}}w_tF^x_{ict}-\sum_{c\in S_{it}}w_{ct}F^m_{ict} \tag{7}$$

where p_{ict} is the price set by firm i in country c at time t. π_{ict} and F^x_{ict} denote the 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 or input sourcing and normalize domestic wages w_t to one from now on.[37] w_{ct} is the labor wage in source country c at time t and F^m_{ict} denotes the fixed cost faced by firm i when sourcing from country c at time t.[38]

Each period, 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.[39] We solve the firm's problem using backward induction.

5.2 Equilibrium

This framework delivers equilibrium expressions for the extensive and intensive margins of firms' export and sourcing choices. Each expression includes the firm-country-time terms of

[37] This assumption leads to all firms serving and sourcing material inputs from the home country.

[38] 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 4.4.

[39] 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 as in Antràs *et al.* (2017), making our estimation approach unfeasible.

interest that are separable from firm and country factors. We characterize the four expressions below:

Export Probability

Equation (4) implies that firm i's demand from country c at time t is 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 (7) 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 the fixed costs of exporting, i.e., $\pi_{ict} \geq F_{ict}^x$. We can express the probability that this inequality holds as:

$$\Pr\left(\underbrace{\log(\bar{\eta}-1)\bar{\eta}^{-\eta}}_{k^x} + \underbrace{\log E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}}_{\varphi_{ct}^x} + \underbrace{(1-\eta)\log c_{it}(S_{it})}_{\varphi_{it}^x} + \underbrace{(\eta-1)\left(\log\zeta_{ict} - \log\tau_{ict}\right)}_{\varphi_{ict}^x} \geq \underbrace{\log F_{ict}^x}_{f_{ict}^x}\right), \tag{8}$$

which 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), and two firm-country-year terms. These two terms reflect firm i's demand shifter and variable costs (φ_{ict}^x) in country c and the fixed cost i faces when selling to country c at time t (f_{ict}^x).

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:[40]

$$\log r_{ict} = \underbrace{(1-\eta)\log\bar{\eta}}_{\tilde{k}^x} + \underbrace{\log E_{ct}(\bar{\zeta}_{ct}P_{ct})^{\eta-1}}_{\tilde{\varphi}_{ct}^x} + \underbrace{(1-\eta)\log c_{it}(S_{it})}_{\tilde{\varphi}_{it}^x} + \underbrace{(\eta-1)\left(\log\zeta_{ict} - \log\tau_{ict}\right)}_{\tilde{\varphi}_{ict}^x}. \tag{9}$$

so 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 ($\tilde{\varphi}_{ct}^x$), and a firm-year component common across destinations ($\tilde{\varphi}_{it}^x$). It also depends on a firm-country-year component

[40] The tildes used for the components of equation (9) 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 (8), we can use all country-year observations.

reflecting firms' demand shifters and variable costs ($\tilde{\varphi}^x_{ict}$).

Import Probability

Unlike export choices, sourcing decisions are not separately additive across origins in equation (5), 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:

$$\Pr\left(-\underbrace{\log w_{ct}}_{\varphi^m_{ct}} - \underbrace{\log z_{it}}_{\varphi^m_{it}} + \underbrace{\log\left(B_{it}(S_{it}\backslash\{c\}) - B_{it}(S_{it})\right)}_{\varphi^m_{ict}} \geq \underbrace{\log F^m_{ict}}_{f^m_{ict}} \right). \tag{10}$$

Equation (10) 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.[41] 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 term captures the fixed cost faced by firm i when sourcing from country c at time t (f^m_{ict}).

Import Values

Conditional on sourcing from a country, applying Shephard's lemma to the cost function in equation (6) 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.[42] Taking logs delivers the following equation for the intensive margin of imports:

$$\log m_{ict} = \underbrace{(\sigma-1)\log\bar{\xi}_{ct}}_{\tilde{\varphi}^m_{ct}} + \underbrace{\log M_{it} + (\sigma-1)\log B_{it}}_{\tilde{\varphi}^m_{it}} + \underbrace{(\sigma-1)(\log\xi_{ict} - \log b_{ict})}_{\tilde{\varphi}^m_{ict}}, \tag{11}$$

so 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 ($\tilde{\varphi}^m_{ict}$).

[41] 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 (10).

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

5.3 The Role of MNC Ownership

MNC ownership can affect firm outcomes post acquisition (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 outlines the multiple channels through which these mechanisms can affect trade outcomes.

Specifically, the following model components can depend on whether firm i is owned by an MNC in t:

$$\{z_{it}, \xi_{iLt}, S_{it}, C_{it}, F^m_{ict}, F^x_{ict}, \zeta_{ict}, \xi_{ict}, \tau_{ict}, b_{ict}\}. \tag{12}$$

Firm-specific effects of MNC ownership are captured by the four it-varying terms in set (12). The first component (z_{it}) represents traditional effects: 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 sales and the probability to enter particular markets, (as in Melitz, 2003). Acquisition might also affect labor productivity (ξ_{iLt}) through such transfers, as well as the set of source and destination countries (S_{it} and C_{it}).

Our main goal is to evaluate the contribution of network-specific effects of MNC ownership, summarized in the six ict-varying terms in set (12). MNC ownership may: reduce the fixed costs of exporting to and importing from network countries (F^m_{ict}, F^x_{ict}); 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; and lower input prices (b_{ict}), e.g., by improving access to higher quality/lower price suppliers.

In Section B-3 of the Theoretical Appendix, we show that after imposing a linear parametrization, our model delivers four gravity equations that allow us to isolate network effects of MNC ownership from firm-year effects. These correspond to the static version of equation (1) for the different trade outcomes.

The results reported in Section 4.1 show that MNC network effects operate only at the extensive margin: after a firm is acquired by a multinational, the probability it starts exporting to (and importing from) a country depends on whether the parent already has a presence in that country; in contrast, 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.

These results suggest that MNC ownership reduces fixed trade costs with countries that belong to the parental network, fostering new affiliates' entry to those countries. For example,

the multinational acquiring firm i may have knowledge of the local regulations and red tape in all the countries in which it already has a presence. Post-acquisition, i may thus face lower fixed costs of exporting to and importing from those network countries (F^m_{ict}, F^x_{ict}), thereby increasing its probability of market entry. This is consistent with the model of Antràs *et al.* (2024), in which all establishments of a firm share the country-specific export and import fixed costs.

The lack of significant coefficients on the intensive margin suggests that MNC network effects do not operate through shocks that affect demand for affiliates' goods in network countries or affiliates' demand for imports from network countries. If these mechanisms were at work, we would expect new affiliates to increase the value of trade with countries in which their parent has a presence, even if they were already trading with these countries before being acquired.

6 MNC Network Effects and Firm Growth

In this section, we combine the estimates from Section 4 and the structure of the model in Section 5 to 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. First, we calculate the share of the total post-acquisition changes in export and import values attributable to MNC network effects. Second, we estimate the elasticity of total sales with respect to export revenues and of labor demand with respect to import expenditures. Finally, we infer the share of the total post-acquisition changes in sales and labor demand that can be explained by MNC network effects. We describe each step below.

6.1 Trade Growth and MNC Network Effects

We start by estimating the total change in export and import values due to MNC acquisitions. We estimate the following equation on the sample of acquired and non-acquired firms:

$$log(y_{it}) = \theta MNC_{it} + \delta_i + \delta_t + u_{it}, \tag{13}$$

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 the error term.

Acquired firms are systematically different from non-acquired firms: even before acquisition, future affiliates outperform always-domestic firms in many dimensions (see 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.[43]

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.[44] Table A-6 shows that re-weighting makes treated firms 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 (13) are reported in Table 2. Columns 1 and 2 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 export and import values increase by 32.1% and 43.6%, respectively. It is interesting to compare these results with the corresponding estimates in columns 3 and 4, in which we estimate equation (13) without re-weighting the sample. These coefficients are significantly larger, emphasizing the importance of accounting for selection effects.

Table 2

MNC Ownership and Trade Values

	Log Export Value	Log Import Value	Log Export Value	Log Import Value
	EB Reweighting		No Reweighting	
	(1)	(2)	(3)	(4)
MNC_{it}	0.321*	0.436**	0.556***	0.579***
	(0.175)	(0.185)	(0.195)	(0.180)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	72,349	74,246	90,928	97,738

The table reports the results of estimating equation (13). In columns 1 and 2, we compute the entropy balance weights as a function of all the observables in Table A-6. Standard errors clustered by firm in parentheses. Significance levels: *** 0.01, ** 0.05, * 0.1.

We also examine the effects of MNC ownership on the total number of countries a firm

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

[44] 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 22,453 firms. 5,391 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, with w_f being the entropy balance weight.

exports to and imports from. For this purpose, we estimate equation (13) using the number of countries a firm exports to and imports from as the outcome.[45] 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 4.1 imply that new affiliates add new destination and source countries, rather than simply diverting trade from non-network to network countries.

Combining the results from Table 2 with the estimates in Section 4.1 allows us to quantify the growth in export and import values attributable to MNC network effects. Section 4.1 shows that, on average, Belgian affiliates acquired by a multinational increase their probability of start exporting to (importing from) a GUO network country by 33% (42%). Multiplying these probabilities by the estimates in the first two columns of Table 2 yields an approximate (33% $\times$ 32.1% =) 10% increase in export values and a (42% $\times$ 43.6% =) 18% increase in import values attributable to MNC network effects.

6.2 Elasticity of Sales and Employment to Exports and Imports

The model in Section 5 assumes that firms decide on sales after selecting the optimal mix of production inputs. Building on this assumption, we next infer changes in affiliates' sales from their export decisions and changes in labor demand from their import behavior.

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

$$p_{it}y_{it} = \sum_{c \in C_{it}} p_{ict}q_{ict}. \tag{14}$$

In words, total sales change proportionally with changes in export sales. As established above, adding an MNC network country to the set of export destinations leads to an approximate 10% increase in export values, which implies an equal increase in total sales.

Next, applying Shepard's Lemma to equation (6) yields firm i's material input demand from country $c \in S_{it}$ and labor demand at time t:

$$b_{ict}x_{ict} = M_{it}B_{it}^{\sigma-1}\xi_{ict}^{\sigma-1}b_{ict}^{1-\sigma}, \qquad w_tL_{it} = M_{it}B_{it}^{\sigma-1}\xi_{iLt}^{\sigma-1}w_t^{1-\sigma}. \tag{15}$$

Taking the ratio of these two expressions gives the material input expenditure share for

[45] 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).

country $c \in S_{it}$ and the expenditure share on labor at time t:

$$s_{ict} = \frac{\xi_{ict}^{\sigma-1} b_{ict}^{1-\sigma}}{\sum_{c \in S_{it}} \xi_{ict}^{\sigma-1} b_{ict}^{1-\sigma} + \xi_{iLt}^{\sigma-1} w_t^{1-\sigma}}, \qquad s_{iLt} = \frac{\xi_{iLt}^{\sigma-1} w_t^{1-\sigma}}{\sum_{c \in S_{it}} \xi_{ict}^{\sigma-1} b_{ict}^{1-\sigma} + \xi_{iLt}^{\sigma-1} w_t^{1-\sigma}}. \tag{16}$$

Thus, firm i's labor demand at time t can be expressed as:

$$w_t L_{it} = \frac{s_{iLt}}{s_{ict}} b_{ict} x_{ict}. \tag{17}$$

In words, a unit change in $b_{ict}x_{ict}$ translates into a $\frac{s_{iLt}}{s_{ict}}$ change in $w_t L_{it}$. On average, this ratio equals 34% among affiliates post-acquisition. Therefore, after being acquired, firms increase labor demand by approximately (34% × 18% =) 6% as a result of MNC network effects.

6.3 Impact of MNC Ownership on Firm Size

In a final step, we assess the contribution of MNC network effects to the overall changes in firm-level sales and employment following the acquisition. As in Section 6.1, we first calculate total post-acquisition effects by estimating equation (13) with total sales and employment as outcome variables. Then, we calculate the proportion of these changes attributable to MNC network effects using the results from Section 6.2.

Table 3 shows the estimates from equation (13) using total sales and employment as outcomes. The coefficients for MNC_{it} in columns 1-2 are positive and statistically significant, indicating that following the acquisition, a firm's sales and employment increase by 31.8% and 12.1%, respectively. Consistent with the results reported in Table 2, we observe larger coefficients in columns 3 and 4 when the data are not re-weighted.

Table 3
MNC Ownership and Firm Size

	Sales	Employment	Sales	Employment
	EB Reweighting		No Reweighting	
	(1)	(2)	(3)	(4)
MNC_{it}	0.318***	0.121*	0.428***	0.136**
	(0.103)	(0.062)	(0.098)	(0.064)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	75,645	71,988	272,549	236,513

The table reports the results of estimating equation (13). In columns 1 and 2, we compute the entropy balance weights as a function of all the observables in Table A-6. Standard errors clustered by firm in parentheses. Significance levels: *** 0.01, ** 0.05, * 0.1.

Dividing the estimates of how MNC network effects increase total sales and labor demand (from Section 6.2) by the coefficients in the first two columns of Table 4 shows that approximately one-third of the total sales increase (10%/31.8%) and half of the increase in labor demand (6%/12.1%) observed in affiliates after acquisition can be attributed to MNC network effects. 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 4 summarizes the three steps described in this Section.

Table 4
Contribution of MNC Network Effects to Firm Growth

	Increase due to MNC Network Effects (Model & Data) (1)	Post-Acquisition Increase (EB Estimates) (2)	Post-Acquisition Share due to MNC Network Effects (Back-of-the-Envelope) (3)
Sales	10%	31.8%	30%
Employment	6%	12.1%	50%

The table reports the share of the post-acquisition increase in firm sales and labor demand attributable to MNC network effects. The estimates in column 1 are computed using the procedure described in Sections 6.1 and 6.2. The estimates in columns 2 and 3 are computed using the procedure described in Section 6.3.

7 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 leverage unique firm-level administrative data from Belgium with rich data on multinational networks constructed from various datasets from Moody's. 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. In terms of magnitude, the probability of exporting to (importing from) network countries increases by 5.7 (3.8) percentage points in the 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. These results hold in a battery of robustness checks (e.g., using different samples of affiliates and network countries, controlling for extended gravity effects, clustering standard errors at different levels, exploit plausibly exogenous changes in affiliates' MNC networks). We also show that MNC network effects at the extensive margin 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 information flows transmitted through the hierarchy of the multinational.

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 the structural firm-level gravity equations that we estimate to identify the network effects of multinational ownership. Combining the structure of our theoretical model with our estimates, we find that MNC network effects account for a large share of affiliates' growth in terms of sales and employment: approximately one-third of the increase in total sales and half of the increase in labor demand observed in affiliates after acquisition can be attributed to MNC network effects.

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 2. 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 2.2. 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 89.094% and the median is 99.98%).

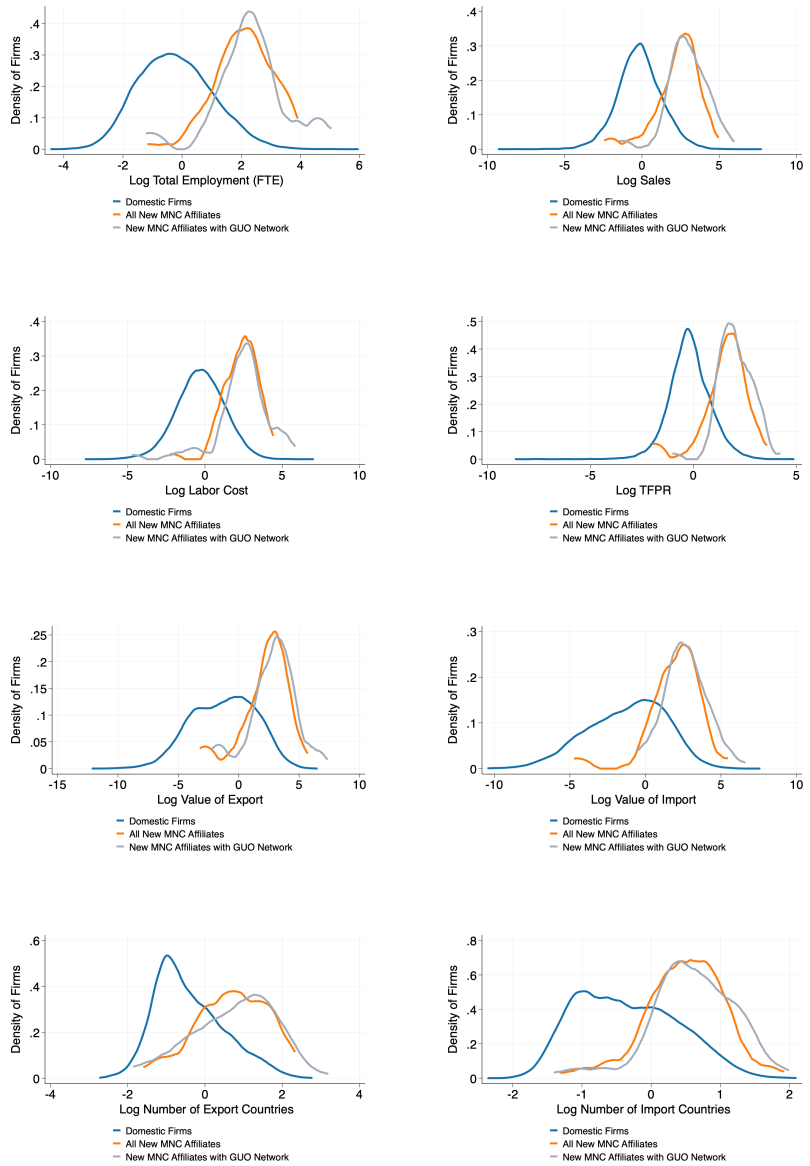
Table A-2
Distribution of Foreign Equity

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 they differ systematically from 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 each foreign affiliate's GUO, 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

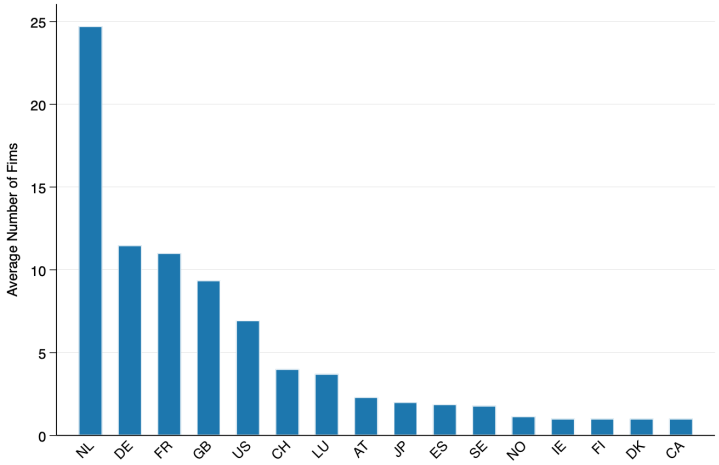
Mean	Median	Min	Max	Std. Dev.
34.15	25.00	1.00	142.00	32.76

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

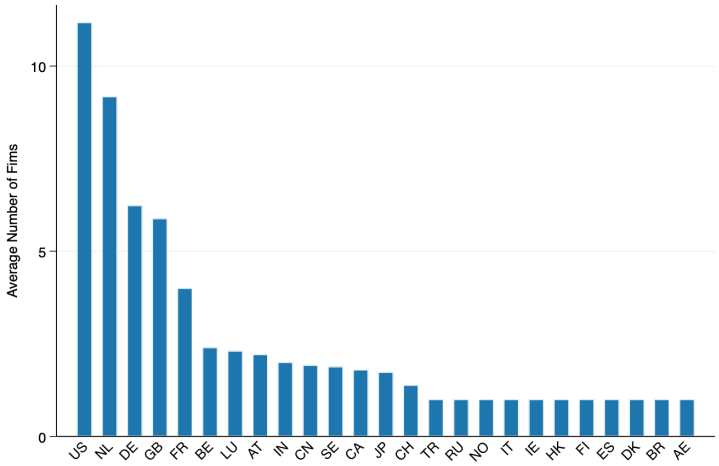
Number of New Foreign Affiliates by Country of the DP



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

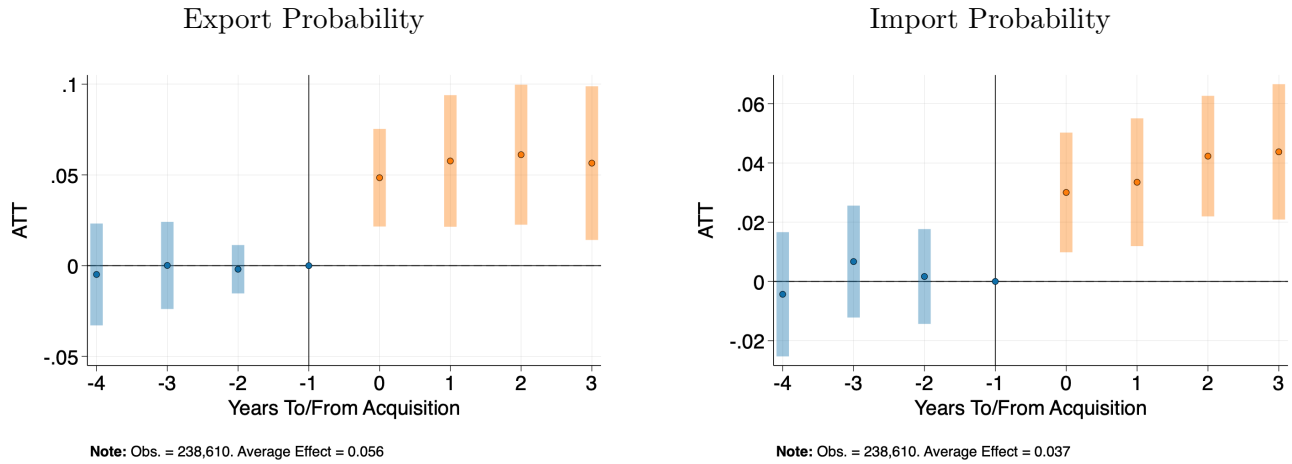


The figure shows the number of new Belgian foreign affiliates by GUO country of origin.

A-1.2 Additional Results and Robustness Checks

Figure A-4

MNC Network Effects at The Extensive Margin
(Controlling for Extended Gravity)

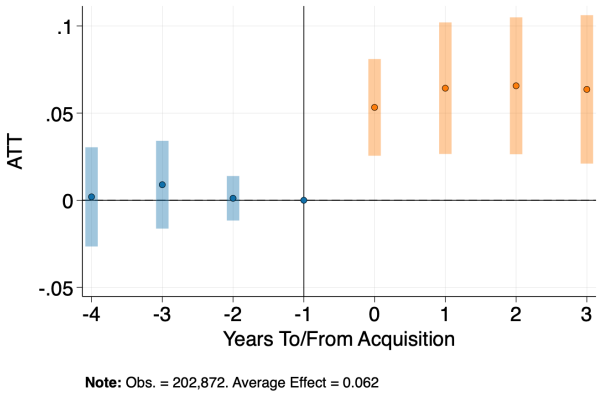


Note: The figure reports the event-study estimates of $MNC^{s}_{it} \times MNC\ Network_{cp}$ in equation (1) after we add two additional controls: a dummy for whether affiliate i was already exporting to (importing from) country c in at least one of the five years before being acquired, and a dummy for whether a country shares a border and a common language with one of these incumbent countries.. 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. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

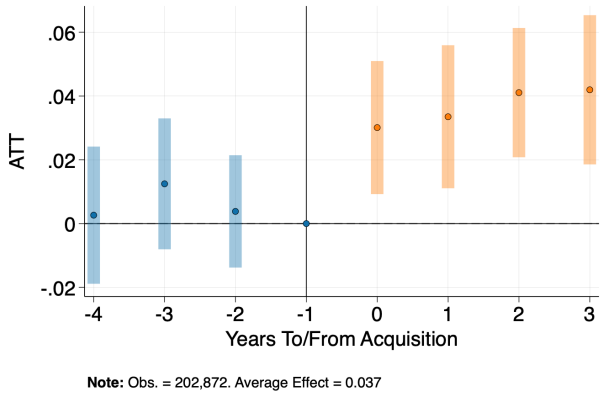
Figure A-5

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

Export Probability



Import Probability

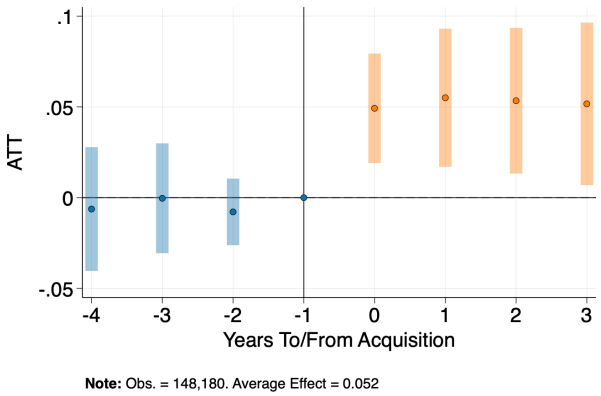


Note: The figure reports the event-study estimates of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

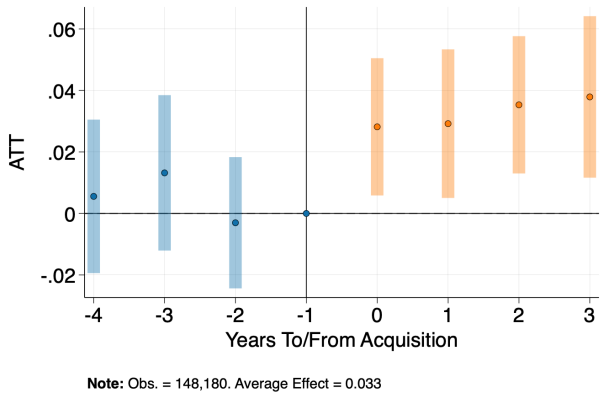
Figure A-6

MNC Network Effects at The Extensive Margin
(Excluding Countries both in the DP and GUO Network)

Export Probability



Import Probability

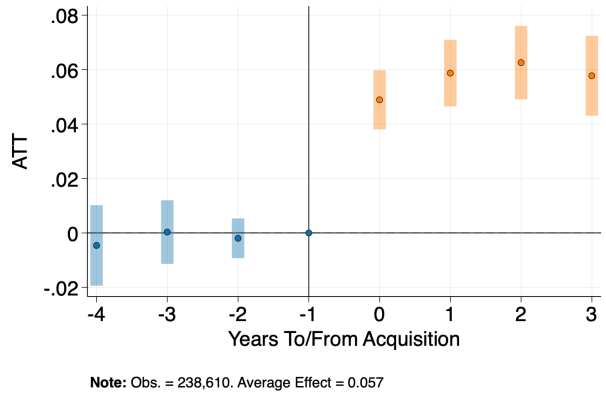


Note: The figure reports the event-study estimates of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $MNC\ Network_{cp}$ 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. We exclude countries that belong both to the DP and GUO networks. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

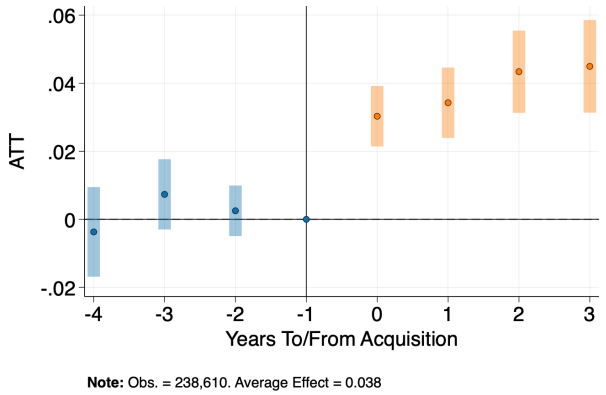
Figure A-7

MNC Network Effects at The Extensive Margin
(Alternative Clustering of Standard Errors)

Export Probability



Import Probability

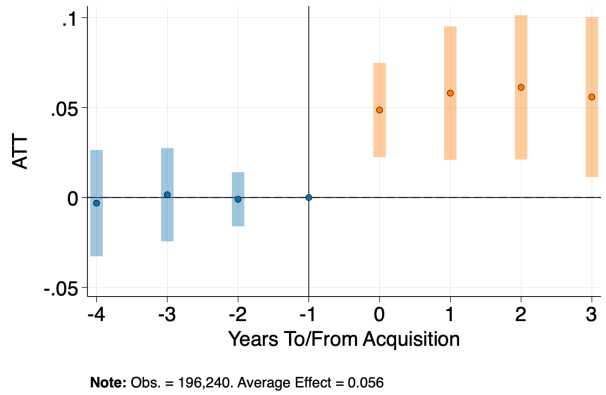


Note: The figure reports the event-study estimates of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm-country.

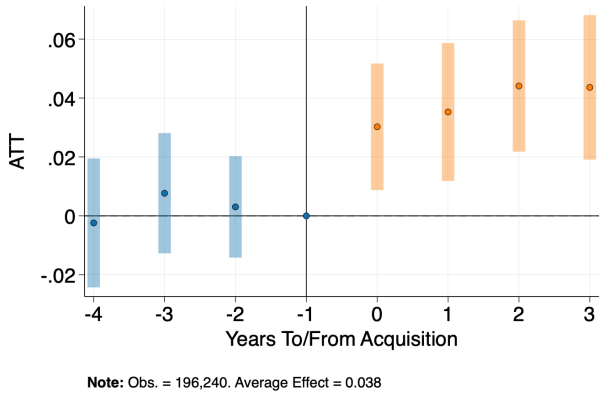
Figure A-8

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

Export Probability



Import Probability

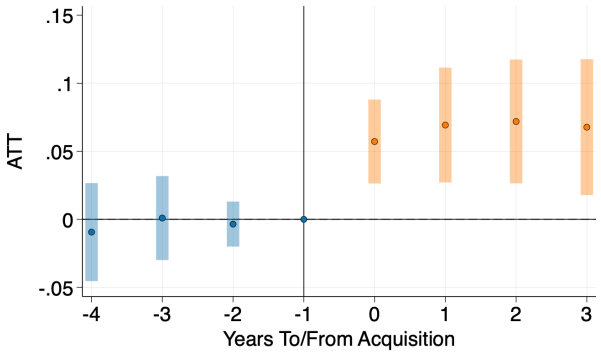


Note: The figure reports the event-study estimates of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $MNC\ Network_{cp}$ 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). ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

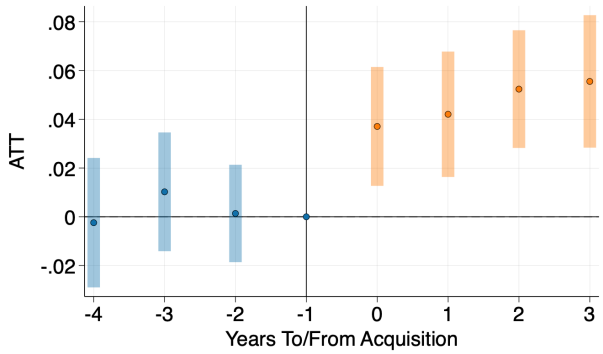
Figure A-9

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

Export Probability



Import Probability

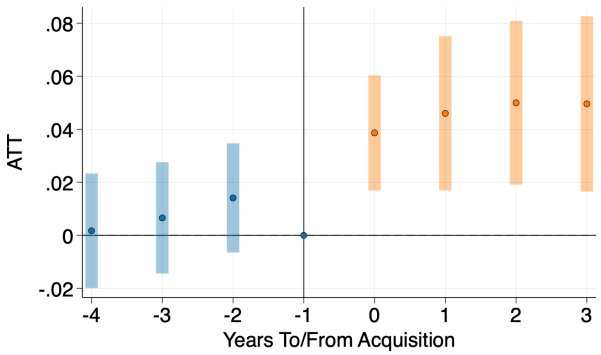


Note: The figure reports the event-study estimates of $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a dummy variable equal to 1 from the first year t in which firm i (owned by parent p) exports to (imports from) country c. $MNC_{i(p)t}$ is a dummy variable equal to 1 after firm i is acquired. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

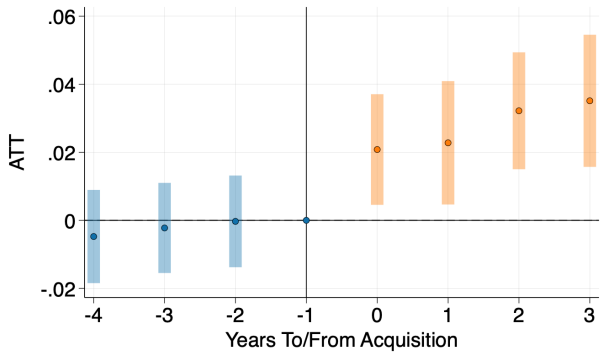
Figure A-10

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 $MNC^{s}_{i(p)t} \times MNC\ Network_{cp}$ in equation (1). 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. $MNC\ Network_{cp}$ 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. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

Table A-4

Network Effects of MNC Ownership (Exogenous Network Changes)

	(1)	(2)
	Export Entry	Import Entry
$New\ MNC_{i(p)t} \times Only\ In\ New\ MNC_{ic}$	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 (2). 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

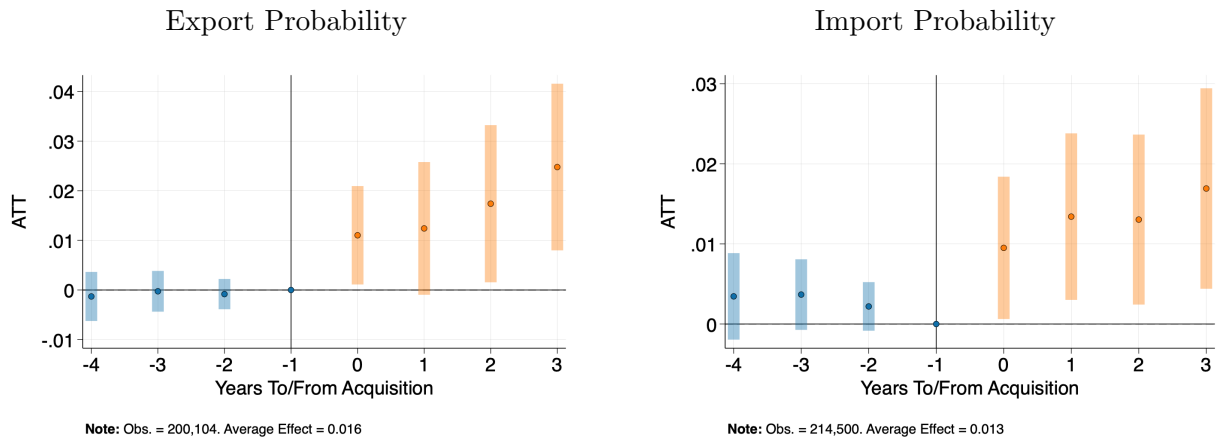
MNC Ownership and Trade Participation

	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 (13). 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-11

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

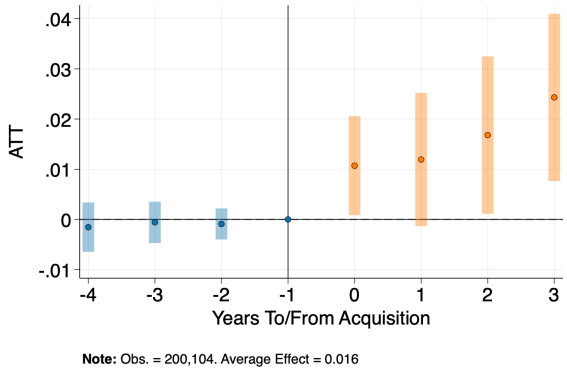


Note: The figure reports the event-study coefficients of $MNC^{s}_{i(p)t} \times Close\ to\ MNC\ Network_{cp}$ in equation (3) obtained using the estimator in Nagengast and Yotov (2025). In the left panel (right panel), the dependent variable is $Export\ Entry_{i(p)ct}$ ($Import\ Entry_{i(p)ct}$), a 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. $MNC\ Network_{cp}$ 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. We exclude countries added to the GUO's network after the acquisition year. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

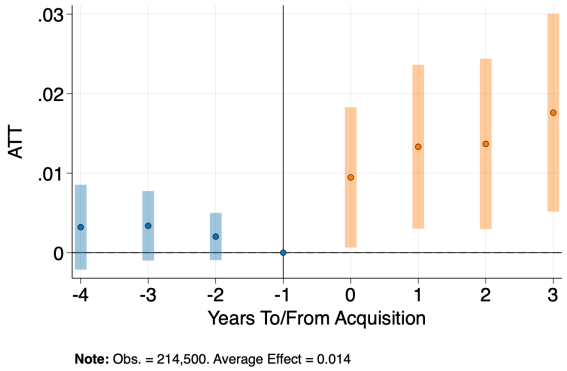
Figure A-12

Extended Network Effects
(Controlling for Extended Gravity)

Export Probability



Import Probability



Note: The figure reports the event-study coefficients of $MNC^{s}_{i(p)t} \times Close\ to\ MNC\ Network_{cp}$ in equation (3) obtained using the estimator in Nagengast and Yotov (2025). 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. $MNC\ Network_{cp}$ 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. Differently from the baseline specification, we include a dummy variable indicating whether a country shares a common border and a common language with a country to which affiliate i was already exporting (or from which it was importing) in at least one of the five years prior to acquisition, without itself being part of the GUO network. ATT stands for "average treatment effect on the treated." Standard errors are clustered by firm.

Theoretical Appendix

In the theoretical framework set out in Section 5, MNC ownership can affect firm i's trade outcomes via various channels, reflected in the terms in set (12). This appendix describes how we can parametrize firm-level and network-level effects of MNC ownership to derive the firm-level gravity equations corresponding to the static version of equation (1) for export and import outcomes, at the extensive and intensive margin.

B-1 MNC Firm-Level Effects

We let MNC ownership affect firm-year variables at the extensive margin (equations (8) and (10)) as:

$$\varphi^j_{i(p)t} = \overline{\psi}^j_{i(p)t} + h_j(MNC_{i(p)t}) + \epsilon^j_{i(p)t} \quad \text{for } j \in \{x, m\}. \tag{18}$$

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 (9) and (11), respectively.

Equation (18) 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.

B-2 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:

$$\varphi^j_{i(p)ct} - f^j_{ict} = \psi^j_{i(p)cp} + g_j(MNC_{i(p)t}, MNC\ Network_{cp}) + \epsilon^j_{i(p)ct} \text{ for } j \in \{x, m\}, \tag{19}$$

$$\tilde{\varphi}^j_{i(p)ct} = \tilde{\psi}^j_{i(p)cp} + \tilde{g}_j(MNC_{i(p)t}, MNC\ Network_{cp}) + \tilde{\epsilon}^j_{i(p)ct} \text{ for } j \in \{x, m\}. \tag{20}$$

In words, firm-country-year variables governing the extensive margin of export and import choices in equation (19) 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 $g_j(MNC_{i(p)t}, MNC\ Network_{cp})$, 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 (20).

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 $g_j(MNC_{i(p)t}, MNC\ Network_{cp})$ and $\tilde{g}_j(MNC_{i(p)t}, MNC\ Network_{cp})$ 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.

B-3 Deriving Firm-Level Gravity Equations

Equations (8) to (11) together with equations (18) to (20) 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:[46]

$$g_j(\cdot) = \beta^j_1 MNC_{i(p)t} + \beta^j_2 MNC\ Network_{cp} + \beta^j_3 (MNC_{i(p)t} \times MNC\ Network_{cp}) \quad \text{for } j \in \{x, m\}, \tag{21}$$

$$\tilde{g}_j(\cdot) = \tilde{\beta}^j_1 MNC_{i(p)t} + \tilde{\beta}^j_2 MNC\ Network_{cp} + \tilde{\beta}^j_3 (MNC_{i(p)t} \times MNC\ Network_{cp}) \quad \text{for } j \in \{x, m\}. \tag{22}$$

We obtain an expression for the probability of exporting by substituting equation (21) into equation (19) and plugging the resulting expression together with equation (18) into equation (8). We approximate the probability function using a linear model:

$$\Pr(i \text{ exports to } c \text{ in } t) = \beta^x_3 (MNC_{i(p)t} \times MNC\ Network_{cp}) + k^x + \lambda^x_{ct} + \lambda^x_{i(p)t} + \lambda^x_{i(p)cp} + \varepsilon^x_{i(p)ct}. \tag{23}$$

Where:

- $\lambda^x_{ct} = \varphi^x_{ct}$,
- $\lambda^x_{i(p)t} = \varphi^x_{i(p)t} + \overline{\psi}^x_{i(p)t} + h_x(MNC_{i(p)t}) + \beta^x_1 MNC_{i(p)t}$,
- $\lambda^x_{i(p)cp} = \psi^x_{i(p)cp} + \beta^x_2 MNC\ Network_{cp}$,

[46] 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.

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

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

Substituting equation (22) into equation (20) and plugging the resulting expression together with equation (18) into equation (9) delivers the following estimating equation for the intensive margin of exports:

$$\log r_{i(p)ct} = \tilde{\beta}^x_3(MNC_{i(p)t} \times MNC\ Network_{cp}) + \tilde{k}^x + \tilde{\lambda}^x_{ct} + \tilde{\lambda}^x_{i(p)t} + \tilde{\lambda}^x_{i(p)cp} + \tilde{\varepsilon}^x_{i(p)ct}, \tag{24}$$

Where:

- $\tilde{\lambda}^x_{ct} = \tilde{\varphi}^x_{ct}$,
- $\tilde{\lambda}^x_{i(p)t} = \overline{\tilde{\varphi}}^x_{i(p)t} + \overline{\tilde{\psi}}^x_{i(p)t} + \tilde{h}_x(MNC_{i(p)t}) + \tilde{\beta}^x_1 MNC_{i(p)t}$,
- $\tilde{\lambda}^x_{i(p)cp} = \tilde{\psi}^x_{i(p)cp} + \tilde{\beta}^x_2 MNC\ Network_{cp}$,
- $\tilde{\varepsilon}^x_{i(p)ct} = \tilde{\epsilon}^x_{i(p)ct} + \tilde{\epsilon}^x_{i(p)t}$.

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:

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

Where:

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

The estimating equation for the intensive margin of imports is:

$$\log m_{i(p)ct} = \tilde{\beta}^m_3(MNC_{i(p)t} \times MNC\ Network_{cp}) + \tilde{\lambda}^m_{ct} + \tilde{\lambda}^m_{i(p)t} + \tilde{\lambda}^m_{i(p)c(p)} + \tilde{\varepsilon}^m_{i(p)ct}, \tag{26}$$

where:

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

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