Multinational Ownership and Trade Participation

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Introduction

Motivation

- **Multinational corporations** (MNCs) are disproportionately active in **international trade**
  - MNC affiliates account for 2/3 of global trade flows (Miroudot and Rigo, 2021)
  - 1% of US firms, but account for 72% (69%) of US exports (imports) (Antràs *et al.*, 2022)
  - 1% of all firms in Belgium, but account for 60% (65%) of Belgian exports (imports)
- Existing explanations for this dominance focus on **firm-level effects** of MNC ownership (e.g. increased affiliates' productivity through technology transfers, alleviation of credit constraints)
- We highlight a novel **network channel**: MNCs ownership can boost affiliates' trade participation by alleviating trade frictions in countries in which the multinational parent has a presence

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This Paper

- We document that **MNC ownership increases overall trade participation**: new affiliates are more likely to trade, trade with more countries, have higher exports and imports values
- We develop of a novel **theoretical model** in which MNC ownership can affect export and import decisions of new affiliates through **firm-specific channels** and **network-specific channels**
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Main Findings

- We find robust evidence of **network effects**: new affiliates are more likely to start trading with countries that belong – or are endogenously added – to their parent's network
- These effects **persist** in former network countries and **increase with distance** from the affiliates
- MNC ownership has also **extended network effects**: new affiliates are more likely to enter countries that are close to (but do not belong to) their parent's network
- Our analysis suggests that, through their networks, **MNCs alleviate country-specific trade frictions** that operate at the extensive margin and are related to gravity

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Related Literature

- **Effects of MNCs**
  - Productivity/technology (e.g. Javorcik, 2004; Arnold and Javorcik, 2009); Keller and Yeaple, 2009; Guadalupe *et al.*, 2012; Bloom *et al.*, 2012; Halpern *et al.*, 2015; Bircan, 2019)
  - Financial frictions (e.g. Harrison *et al.*, 2004; Manova *et al.*, 2015)
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- **Cross-border mergers and acquisitions (M&A)**
  - Ashenfelter and Hosken (2010), Blonigen and Pierce (2016), Miller and Weinberg (2017), Alviarez *et. al* (2020)

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Data

Data

- Three datasets from the **National Bank of Belgium**:

  1. **Foreign Trade**: firms' participation in international trade (imports and exports at the product-country-year level) from 1993

  2. **Foreign Direct Investment (FDI)**: information on foreign ownership (foreign parent, parent's equity share, location, name and year of acquisition) from 1997

  3. **Annual Accounts**: firms characteristics (e.g. sales, employment, NACE code) from 1997

Sample Selection

- The **sample of acquired and non-acquired firms** used in our empirical analysis excludes firms

  Reporting **no employees**

  Operating in **non-tradable sectors** (i.e. $\notin$ agriculture, manufacturing, mining)

  Engaging in **outward FDI** (Belgian multinationals)

- We identify new affiliates (firms that switched **from domestic to foreign ownership**)

domestic and acquired firms affiliates by sector equity shares affiliates by country of the parent affiliates by network of the parent

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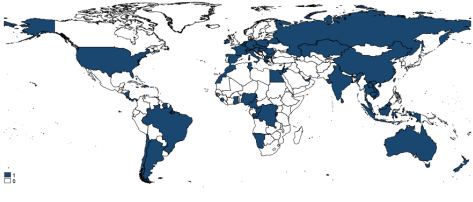
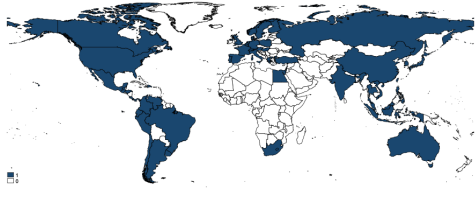
MNC Network Variation

- Combining NBB data with data from **Bureau van Dijk** (Orbis, Historical Orbis, Orbis M&A), we construct the **multinational network** of Belgian affiliates of foreign MNCs

Example: Networks of two Belgian Affiliates with a Dutch Parent



(a) Affiliate *A*



(b) Affiliate *B*

The figure illustrates the countries in which the direct parents of two Belgian affiliates have a presence.

Stlylized Facts

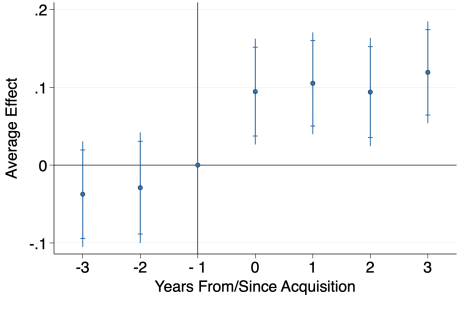
Event Studies

We estimate **dynamic treatment effects** using the methodology of Sun and Abraham (2021):

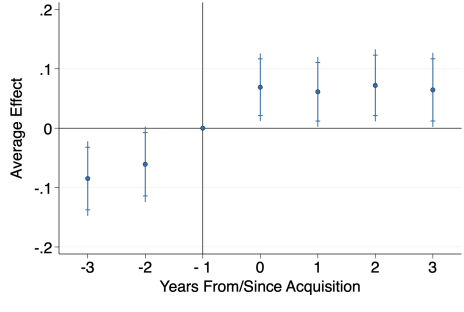
$$y_{it} = \sum_{s=-k}^{k} \theta_s MNC_{it}^{s} + \delta_i + \delta_t + \varepsilon_{it}$$

- y_{it}: value of exports/imports, number of export/import countries export/import status
- MNC_{it}^{s}: dummy identifying periods before and after the acquisition
- δ_i: firm fixed effects
- δ_t: year fixed effects

Exporter and Importer Status



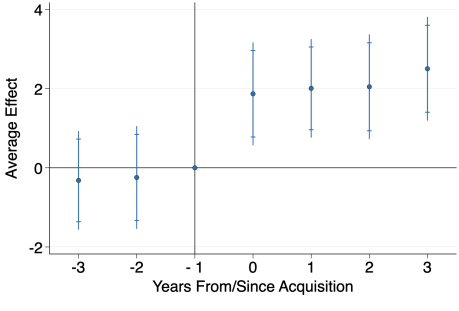
Exporter



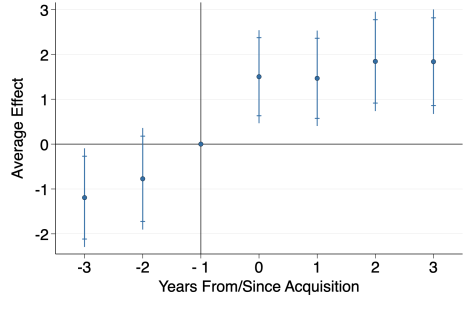
Importer

- Acquired firms increase the probability of being exporters (importers) by $\approx$ 10 p.p. (7 p.p.)

Export and Import Values



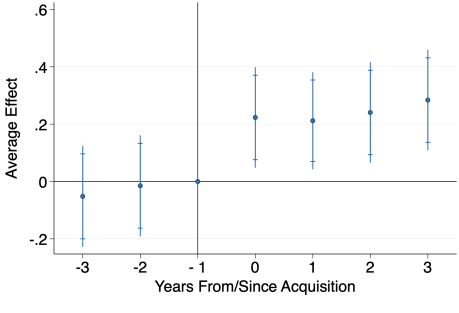
Export Values



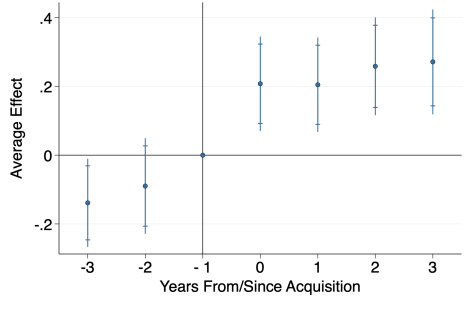
Import Values

- Acquired firms increase the average value of their exports (imports) by ≈ 6 (3.5) times

Number of Export and Import Countries



Export Countries



Import Countries

- Acquired firms increase the number of countries they export to (import from) by $\approx$ 22% (25%)

Accounting for Selection Effects

- The estimates of the event studies are likely to be biased due to **selection effects**
- We use **re-weighting methods** to show that, even after accounting for selection effects, multi-national ownership increases overall trade participation
- We use a **large set of observables** to compare acquired and non-acquired firms: statistics
  - **Domestic characteristics** (sales, employment, capital), in levels and growth rates
  - **Trade participation** (export and import values, number of export and import destinations), in levels and growth rates
  - **Trade network** (average distance, GDP per capita, latitude, longitude)

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Two-Step Re-Weighting Procedure

1. Use **entropy balance re-weighting algorithm** of Hainmueller (2012) to compute weights $w_i = w(\boldsymbol{X_i}), w_i \in (0,1)$ such that **acquired** and **domestic** firms have the same 1^{st}, 2^{nd}, and 3^{rd} moment of the distribution of all covariates in $\boldsymbol{X_i}$ Distribution of covariates, after re-reweighting Non-targeted moments

2. Estimate the following equation on the **weighted sample**:

$$y_{it} = \theta MNC_{it} + \delta_i + \delta_t + \varepsilon_{it}$$

Identification assumption: after re-weighting, and conditional on δ_f and δ_t, treatment is random

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MNC Ownership and Trade Participation
(Entropy Balance Reweighting)

	(1) Exporter dummy	(2) Export values	(3) Export countries
MNC_{it}	0.046***	0.788***	0.108**
	(0.013)	(0.266)	(0.045)
	(4) Importer dummy	(5) Import values	(6) Import countries
MNC_{it}	0.038***	0.819***	0.122***
	(0.010)	(0.229)	(0.033)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Estimator	OLS	OLS	OLS
Re-weighting	Yes	Yes	Yes
Observations	93,171	93,171	93,171

MNC ownership increases the probability of exporting (importing) by 4.6 (3.8) p.p., the number of export (import) countries by 10 (12)%, and nearly doubles the average value of exports and imports

no reweighting IPW

Model

A Model of MNC Ownership and Trade

Our stylized facts show that **MNC ownership increases new affiliates' overall trade**

We next develop a theoretical model of firm-level trade to disentangle two **channels through which MNC ownership can affect trade participation**:

- **Firm-specific** (e.g. increase in productivity through technology transfers from the parent)
- **Firm-country specific** (e.g. boost in local demand or reduction in entry costs in countries belonging to the **parent's network**)

Setup

- Infinite sequence of periods, each denoted by t
- With each period, each firm i makes two sequential decisions:

  1) Chooses to **import** from country c if doing so minimizes its overall **production costs**

  2) Choose to **export** to country c if doing so generates positive **profits**

- We solve the model by backward induction

Production

- Firms combine **domestic labor** and a **bundle of foreign inputs** with Cobb-Douglas technology

- Unit cost function of firm i at time t:

$$c_{it} = \frac{w_t^{\alpha} \omega_{it}^{1-\alpha}}{A_{it}}, \quad \alpha \in (0,1)$$

  - w_t: cost of domestic inputs, including labor (common across firms)
  - ω_{it}: cost of bundle of imported inputs (varying by firm)
  - A_{it}: Hicks-neutral productivity

Preferences and Market Structure

- Firm i exporting to country c at time t faces the following **CES demand** for its products:

$$q_{ict} = D_{ct} p_{ict}^{-\eta} \exp\{\varphi_{ict}\}$$

  - p_{ict}: price that firm i charges to costumers in country c at time t
  - $|\eta|$: elasticity of demand
  - D_{ct}: demand shifter common to all firms exporting to c at time t
  - ϕ_{ict}: firm-country-year specific demand shifter

- Firms face **iceberg trade costs** τ_{ct}, so their marginal cost of selling in c at time t is $\tau_{ct}\omega_{it}$

- Firms are **monopolistically competitive** in each market and charge fixed markups $\eta/(\eta-1)$

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Export Entry Decision

- Firm i faces **entry costs** $F_{ict} = \bar{F}_{ict} \exp\{v_{ict}\}$ to export to country c at time t
- Firm i's **variable profits from exporting** to country c at time t:

$$\pi_{ict} = (p_{ict} - \tau_{ct} c_{it}) q_{ict} = \Omega_{ct} c_{it}^{1-\eta} \exp\{\phi_{ict}\}$$

where $\Omega_{ct} = \bar{\eta} D_{ct} \tau_{ct}^{1-\eta}$

- Firm i exports to country c at time t iff

$$\underbrace{\log \Omega_{ct}}_{\varphi_{ct}} + \underbrace{(1-\eta) \log c_{it}}_{\varphi_{it}} + \varphi_{ict} \geq \log F_{ict} + v_{ict}$$

- **MNC ownership** can lead firm i to start exporting to a country c in the parental network, if it leads to a **positive demand shock** (φ_{ict}) and/or **lower the entry costs** (F_{ict})

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- **MNC ownership** can lead firm i to start exporting to a country c in the parental network, if it leads to a **positive demand shock** (φ_{ict}) and/or **lower the entry costs** (F_{ict})

- The **extensive margin of exports** can be written as

$$\Pr\left(i \text{ exports to } c \text{ in } t\right) = \frac{\exp\left\{\varphi_{ct} + \varphi_{it} + \varphi_{ict} - f_{ict}\right\}}{1 + \exp\left\{\varphi_{ct} + \varphi_{it} + \varphi_{ict} - f_{ict}\right\}}$$

- Conditional on exporting to it, firm i's revenues in country c at time t are:

$$p_{ict} q_{ict} = \tilde{\Omega}_{ct} c_{it}^{1-\eta} \exp\{\varphi_{ict}\}$$

where $\tilde{\Omega}_{ct} = \tilde{\eta} D_{ct} \tau_{ct}^{1-\eta}$

- Taking logs, the value of i's exports to c is given by

$$\log r_{ict} = \underbrace{\log \tilde{\Omega}_{ct}}_{\tilde{\varphi}_{ct}} + \underbrace{(1-\eta)\log c_{it}}_{\varphi_{it}} + \varphi_{ict}$$

- **MNC ownership** can affect the **intensive margin of exports** via **demand shocks** (φ_{ict})

Import Decisions

- Bundle of foreign inputs used in production is a CES aggregator of a measure one of inputs ν
- Inputs are produced by perfectly competitive firms with labor under CRS technology
- **Productive efficiency** of input ν sourced by firm i from country c at time t:

$$\omega_{ict}(\nu) = \frac{\exp\{\psi_{ict}\}\exp\{a_{ict}(\nu)\}}{w_{ct}\tau_{ct}}$$

  w_{ct}: cost of inputs produced in c at t
  τ_{ct}: (iceberg) trade cost of shipping inputs from c at t
  $a_{ict}(\nu)$: input-specific idiosyncratic cost shock
  ψ_{ict}: efficiency shifter to all inputs that firm i sources from country c at time t

- **MNC ownership** can affect import decisions at the extensive and intensive margin by generating **positive efficiency shocks** (ψ_{ict}) in countries in which the parent operates

- The **extensive margin of imports** can be written as

$$\Pr\left(i \text{ imports from } c \text{ in } t\right) = \frac{\exp\left\{-\vartheta_{ct} + \psi_{ict}\right\}}{\sum_k \exp\left\{-\vartheta_{kt} + \psi_{ikt}\right\}} \quad \vartheta_{ct} = \log w_{ct}\tau_{ct}$$

- The unit cost of a bundle of foreign inputs can be written as

$$\omega_{it} = \left(\int_0^1 \omega_{it}(\nu)^{1-\beta} \mathrm{d}\nu\right)^{\frac{1}{1-\beta}}, \quad \omega_{it}(\nu) = \max_k \omega_{ikt}(\nu), \quad \beta > 1$$

- Denoting with m_{it} be the total quantity of inputs that firm i sources at time t, its expenditure on inputs from country c is given by

$$i_{ict} = \frac{\exp\left\{-\vartheta_{ct} + \psi_{ict}\right\}}{\sum_k \exp\left\{-\vartheta_{kt} + \psi_{ikt}\right\}} \omega_{it} m_{it}$$

- Taking logs, delivers the following expression for the **intensive margin of imports**:

$$\log i_{ict} = \underbrace{-\vartheta_{ct}}_{\psi_{ct}} + \underbrace{\sum_k \exp\left\{-\vartheta_{kt} + \psi_{ikt}\right\}}_{\psi_{it}} + \psi_{ict}$$

From Theory to Estimation

- Our model delivers **firm-level gravity equations** to estimate the effects of MNC ownership
- Effects on the **extensive margin**:

$$\mathbf{1}\left(i \text{ exports to } c \text{ in } t\right) = \varphi_{ct} + \varphi_{it} + \varphi_{ic} + s\Big(MNC_{i(p)t} \times In\ MNC\ Network_{cp}\Big) + \epsilon_{ict}$$

$$\mathbf{1}\left(i \text{ imports from } c \text{ in } t\right) = \psi_{ct} + \psi_{it} + \psi_{ic} + f\Big(MNC_{i(p)t} \times In\ MNC\ Network_{cp}\Big) + \varepsilon_{ict}$$

- Effects on the **intensive margin**:

$$\log r_{ict} = \varphi_{ct} + \varphi_{it} + \varphi_{ic} + g\Big(MNC_{i(p)t} \times In\ MNC\ Network_{cp}\Big) + \epsilon_{ict}$$

$$\log i_{ict} = \psi_{ct} + \psi_{it} + \psi_{ic} + f\Big(MNC_{i(p)t} \times In\ MNC\ Network_{cp}\Big) + \varepsilon_{ict}$$

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$$\log i_{ict} = \psi_{ct} + \psi_{it} + \psi_{ic} + f\Big(MNC_{i(p)t} \times In\ MNC\ Network_{cp}\Big) + \varepsilon_{ict}$$

Identification

- **Acquisitions must create value** for the multinational (e.g. synergies across affiliates)
- Our model can accommodate **different motives for FDI** (horizontal, vertical, export-platform)
- **Key identification assumption**: in the absence of the acquisition, i would have not increased trade participation in countries belonging to p's network relative to the control group
- Bilateral selection effects are the **main threat to identification**, i.e. i is acquired because, independently of the acquisition, it would have increased trade with countries in p's network
- To deal with this concern, we will exploit **exogenous changes in the MNC network** of affiliates

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Network Effects

MNC Network Effects

- **Anecdotal evidence** in our data suggests the existence of **network effects**:
  - A firm was acquired in 1999 by a (global and direct) parent located in Japan
  - Before 2000, the firm was not exporting at all
  - As of 2000, it started exporting to Japan and other countries in parental network

- To provide systematic evidence, we estimate

$$Entry_{i(p)ct} = \beta_1 (MNC_{i(p)t} \times In\ MNC\ Network_{cp}) + \delta_{it} + \delta_{ic} + \delta_{ct} + \varepsilon_{i(p)ct}$$

  $Entry_{i(p)ct}$: dummy equal to 1 from first year i (owned by p) exports to/imports from country c

- β_1 should be positive if MNC ownership fosters entry in countries in the parental network

Network Effects of MNC Ownership

	Export Entry	Import Entry
	(1)	(2)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp}$	0.029***	0.016***
	(0.007)	(0.006)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	236,256	236,256
Estimator	OLS	OLS

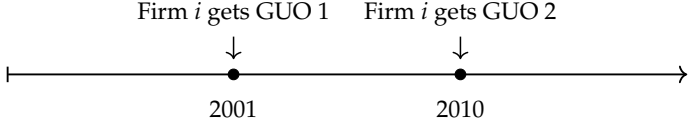
Post-acquisition, the **probability that an affiliate starts exporting to (importing from) a country in its parent's network increases** by 2.9 (1.6) p.p., a 17 (16)% increase in unconditional probability of export (import) entry

intensive margin GUO logit no tax havens

Effects of Exogenous Changes in MNC Network

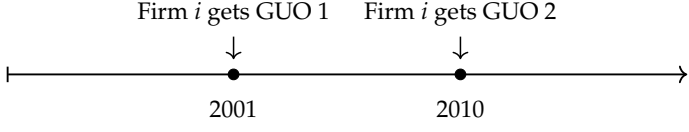
- Main results: network effects identified by **changes between domestic and foreign ownership**
- We exploit **changes in the identity of the GUO**, which give rise to **network changes** that are arguably **exogenous to the trade patterns of Belgian affiliates**
- Focus on changes in GUO **between 2007** (first year of Orbis M&A) **and 2011** (so we can still observe affiliates' trade in the subsequent three years)

Figure: An Examples



- In 2001, i is acquired by DP, which is controlled by GUO1
- In 2010, a subsidiary of GUO2 acquires GUO1
- Several countries are added to i's GUO network (e.g. US, China, South Korea, India, Colombia)
- Key assumption: GUO2 (which had 1039 subsidiaries) did not acquire GUO1 (which had 42 subsidiaries, including i's DP) to trade with some countries through DP's affiliate i

Figure: An Examples



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- Key assumption: GUO2 (which had 1039 subsidiaries) did not acquire GUO1 (which had 42 subsidiaries, including i's DP) to trade with some countries through DP's affiliate i

- We can define the following ownership variables:
  - *Old MNC*$_{i,t}$: dummy equal to 1 in the years in which firm *i* has GUO1
  - *New MNC*$_{i,t}$: dummy equal to 1 in the years in which firm *i* has GUO2

- After coding the networks of GUO1 and GUO2, we can define the following network variables:
  - *In Old MNC Network*$_{ic}$: dummy equal to 1 if country *c* belongs to the network of GUO1
  - *In New MNC Network*$_{ic}$: dummy equal to 1 if country *c* belongs to the network of GUO2
  - *Only in Old MNC Network*$_{ic}$: dummy equal to 1 if country *c* belongs to the network of GUO1, but does not belong to the network of GUO2
  - *Only in New MNC Network*$_{ic}$: dummy equal to 1 if country *c* belongs to the network of GUO2, but does not belong to the network of GUO1

Back

- To identify exogenous network effects, we include all affiliates that changed GUO and **drop countries that belong to the old GUO's network** (i.e. $\textit{In Old MNC Network}_{cp} = 1$)

- We estimate

$$\textit{Entry}_{ict} = \alpha_1(\textit{New MNC}_{i,t} \times \textit{Only In New MNC Network}_{cp}) + \delta_{it} + \delta_{ic} + \delta_{ct} + \varepsilon_{ict}$$

  $\textit{Entry}_{ict}$: dummy equal to 1 from the first year i exports to/imports from country c

- α_1 captures the **probability that, after changing GUO, firm i starts trading with countries only new GUO's network** (relative to countries that belong to neither network)

- If α_1 is positive and significant, this would indicate that our main results about MNC network effects are robust to addressing concerns about the endogeneity of the networks

Network Effects of Exogenous Changes in MNC Ownership

	Export Entry	Import Entry
	(1)	(2)
$New\ MNC_{i(p)t} \times Only\ In\ New\ MNC\ Network_{cp}$	0.024***	0.061***
	(0.008)	(0.009)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	58,674	58,674
Estimator	OLS	OLS

After changing GUO, an affiliate is more likely to starts exporting to (importing from) countries added to its MNC network relative to countries never in the network

The Role of Trade Frictions

- If MNC ownership fosters entry by reducing country-specific trade frictions, **MNC network effects should be stronger in more distant countries**, in which these frictions are larger

- To verify this, we interact $In\ MNC\ Network_{cp}$ with two **measures of distance**:
  - **Geographic**: distance between country c and Belgium
  - **Cultural**: 1 - share of population in country c that speaks one of the languages of Belgium

- We then estimate

$$\begin{aligned} Entry_{i(p)ct} = \; & \beta_1 (MNC_{i(p)t} \times In\ MNC\ Network_{cp}) \\ & + \beta_2 (MNC_{i(p)t} \times In\ MNC\ Network_{cp} \times \log Distance_c) \\ & + \beta_3 (MNC_{i(p)t} \times \log Distance_c) + \delta_{it} + \delta_{ic} + \delta_{ct} + \varepsilon_{i(p)ct} \end{aligned}$$

- If MNC ownership reduces trade frictions related to gravity, β_2 should be positive

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- If MNC ownership reduces trade frictions related to gravity, β_2 should be positive

Network Effects of MNC Ownership

	Export Entry		Import Entry	
	Geographical distance	Common language	Geographical distance	Common language
	(1)	(2)	(3)	(4)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp}$	0.044***	0.039***	0.034***	0.027***
	(0.008)	(0.008)	(0.008)	(0.007)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp} \times \log Distance_c$	0.019***	0.017***	0.028***	0.027***
	(0.004)	(0.006)	(0.004)	(0.005)
$MNC_{i(p)t} \times \log Distance_c$	-0.010***	-0.006***	-0.015***	-0.008***
	(0.002)	(0.001)	(0.002)	(0.001)
Firm-Country FE	Yes	Yes	Yes	Yes
Firm-Year FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Observations	194,847	194,847	194,847	194,847
Estimator	OLS	OLS	OLS	OLS

- **Stronger network effects** in **more distant countries**, in which trade frictions prior to acquisition are higher

Network Effects Beyond Firm Boundaries

- Network effects could be driven by **intra-firm trade**: Belgian affiliates may export their products to (import their inputs from) more downstream (upstream) affiliates in other countries

- Several of findings suggest that the effects of MNC ownership on affiliates' trade participation extend **beyond the boundaries of the multinational**:

  - **Network effects increase with distance** (new Belgian affiliates should be *less* likely to start trading with other affiliates, if these are geographically and culturally more distant)

  - **Extended network effects**: acquired firms are more likely to start trading with countries that are close — but do not belong — to their parents' network extended network

  - **Persistence of network effects** following changes in GUO divestitures

  - **Upstreamness** of Belgian affiliates relative to other affiliates in the network upstreamness

Conclusion

- Why are **MNCs disproportionately active in international trade**?

- Our analysis shows that MNCs can boost trade participation **through their networks**: new affiliates are **more likely to enter countries in which their parent has a presence, particularly if they are** geographically or culturally **more distant**

- We also find evidence of an **extended network effect**: new affiliates are more likely to start exporting to/importing from **countries close to their parent's network**

- Our findings suggests that **multinational ownership alleviates country-specific trade frictions** that operate **at the extensive margin** and are **related to gravity**

Next Steps

- **Placebo tests** (randomization of parental networks)
- **Heterogeneous network effects** by product (e.g. differentiated vs homogeneous)
- **Counterfactual exercises** and **variance decomposition** to quantify network effects

Thank you!

Descriptive Statistics by Sector

Back

Number of Acquisitions 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

Number of foreign acquisitions by sector (1998-2014). Surviving foreign affiliates are excluded.

Equity Shares of Foreign Parents

Back

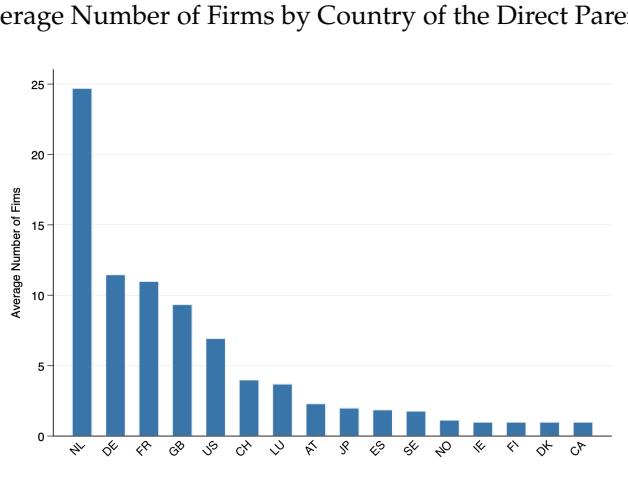
Table

Distribution of Foreign Equity

Mean	1st Pctile	25th Pctile	Median	75th Pctile	99th Pctile
89.2%	23.0%	88.3%	100%	100%	100%

Descriptive Statistics by Country

Back

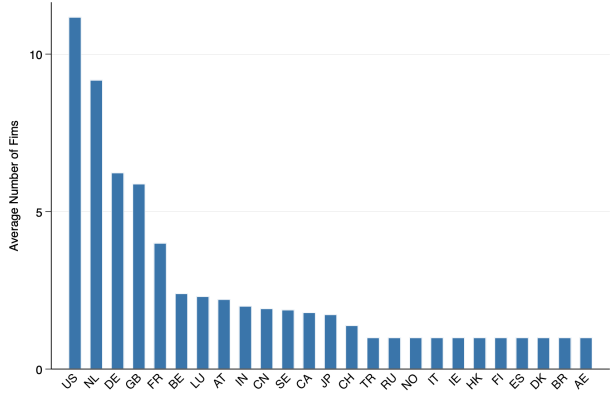


Average number of firms by country of the direct parent over the period 1998-2014

Descriptive Statistics by Country

Back

Average Number of Firms by Country of the Global Ultimate Owner

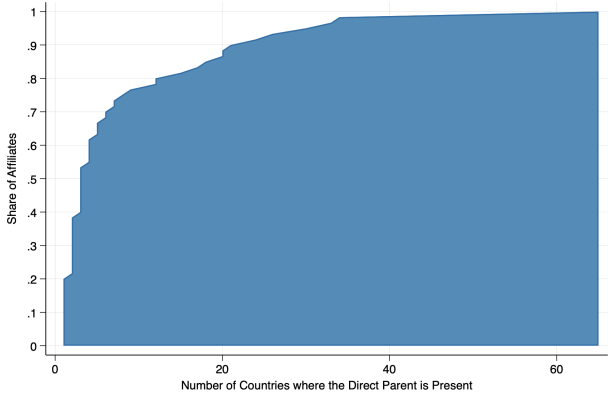


Average number of firms by country of the GUO over the period 1998-2014

Descriptive Statistics by Parent

Back

Number of Countries where the DPs of Belgian Affiliates have a presence

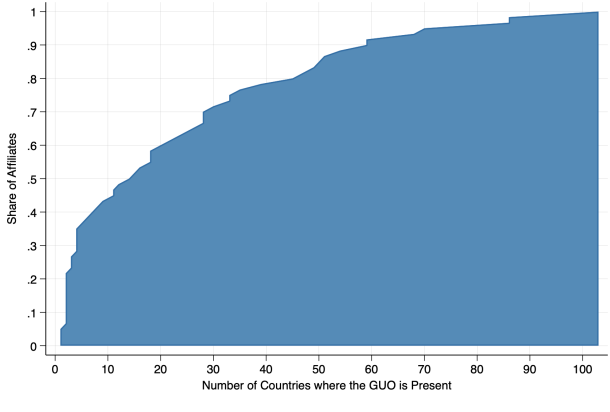


Share of affiliates, by number of countries in the network of the DP

Descriptive Statistics by Parent

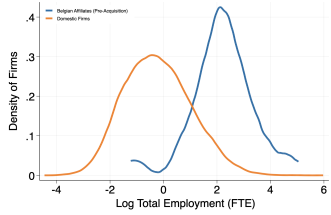
Back

Number of Countries where the GUOs of Belgian Affiliates have a presence

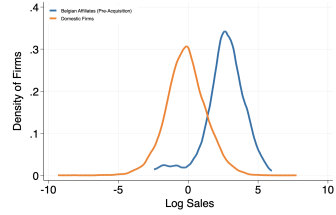


Share of affiliates, by number of countries in the network of the GUO

Acquired and Non-Acquired Firms (Domestic Variables)



(a)



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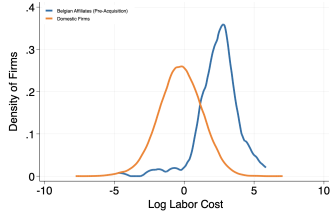
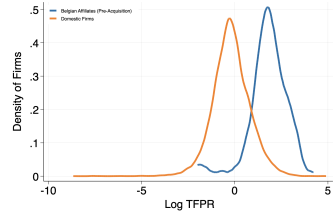


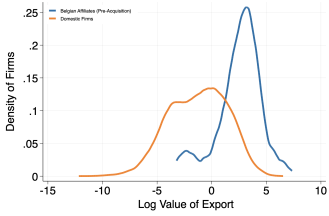
(c)



(d)

Back

Acquired and Non-Acquired Firms (Trade Variables)



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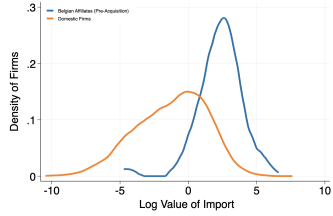

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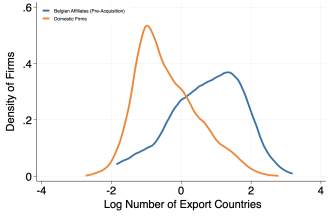

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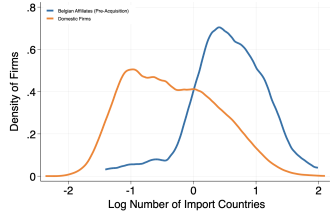

(d)

Back

Before Re-Weighting

Back

Distributions of Covariates of Treated and Untreated Firms, Pre-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 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	13.85	12.00	2.19	3.86	–0.88	–1.11
Lag Log Imports	13.46	11.56	1.75	3.64	0.08	–1.10
Growth Rate Sales	0.08	0.00	0.15	0.10	0.68	–3.11
Growth Rate Exports	–0.09	–0.03	1.45	1.15	–3.25	–0.09
Growth Rate Imports	0.02	–0.04	0.49	1.09	–1.02	–0.30
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

After Re-Weighting (Entropy Balance)

Back

Distributions of Covariates of Treated and Untreated Firms, After Re-Weighting (Entropy Balance)

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
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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	13.85	13.85	2.19	2.19	–0.88	–0.88
Lag Log Imports	13.46	13.46	1.75	1.75	0.08	0.08
Growth Rate Sales	0.08	0.08	0.15	0.15	0.68	0.68
Growth Rate Exports	–0.09	–0.09	1.45	1.45	–3.25	–3.25
Growth Rate Imports	0.02	0.02	0.49	0.49	–1.02	–1.02
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

After Re-Weighting (IPW) Back

Distributions of Covariates of Treated and Untreated Firms,
After Re-Weighting (Inverse Probability Reweighting)

Covariates	Mean Treat	Mean Control	Var. Treat	Var. Control	Skew. Treat	Skew. Control
Lag Log Fixed Assets	16.20	16.26	1.60	2.32	–0.03	0.56
Lag Log Employees	4.93	4.95	1.08	1.27	–0.23	0.29
Lag Log Sales	17.44	17.45	1.32	2.08	–0.09	–1.01
Lag Log No. Export Countries	2.64	2.67	0.95	1.10	–0.35	–0.37
Lag Log No. Import Countries	2.32	2.34	0.30	0.37	–0.36	–0.56
Lag Log Exports	13.85	13.83	2.19	2.08	–0.88	–0.89
Lag Log Imports	13.46	13.45	1.75	1.80	0.08	–0.04
Growth Rate Sales	0.08	0.10	0.15	0.29	0.68	7.75
Growth Rate Exports	–0.09	–0.08	1.45	0.82	–3.25	–3.17
Growth Rate Imports	0.02	0.01	0.49	0.45	–1.02	–1.24
Growth Rate No. Export Countries	0.01	0.02	0.15	0.15	0.82	0.64
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	0.46	–1.16	–0.98
Lag Log GDP Per Capita (PPP)	20.84	20.85	0.19	0.26	–0.13	–0.78
Longitude	15.22	15.26	160.77	164.61	–0.22	0.05
Latitude	39.90	39.85	72.95	69.86	–0.86	–0.54

After Re-Weighting, Non-Targeted Covariates

Back

Distributions of Non-Targeted Covariates of Treated and Untreated Firms, After Re-Weighting (Entropy Balancing)

Covariates	Mean Treat	Mean Control	Var Treat	Var. Control	Skew. Treat	Skew. Control
Lag Log No. Import Products	1.48	1.36	0.81	0.72	–0.17	–0.16
Lag Log No. Export Products	0.76	0.77	0.68	0.83	–0.25	0.14
Lag Log No. Import Products (DE)	2.79	2.76	1.20	1.22	–0.00	–0.26
Lag Log No. Import Products (FR)	2.12	2.32	1.32	1.16	–0.06	–0.21
Lag Log No. Import Products (GB)	1.74	1.46	1.11	1.05	0.02	0.44
Lag Log No. Import Products (NL)	2.95	3.00	1.46	1.31	–0.56	–0.22
Lag Log No. Import Products (US)	1.75	1.48	1.47	1.72	0.21	0.52
Lag Log No. Import Products (JP)	0.82	1.20	0.92	2.07	1.24	1.30
Lag Log No. Export Products (DE)	1.38	1.46	1.22	1.35	0.54	0.59
Lag Log No. Export Products (FR)	1.46	1.65	1.49	1.46	0.34	0.44
Lag Log No. Export Products (GB)	1.21	1.24	1.12	1.17	0.57	0.70
Lag Log No. Export Products (NL)	1.70	1.70	1.67	1.44	0.43	0.53
Lag Log No. Export Products (US)	1.18	1.22	0.83	1.26	0.38	0.95
Lag Log No. Export Products (JP)	0.71	0.95	0.48	1.10	0.51	1.00
Lag Log Imports (DE)	14.44	14.35	3.88	4.14	–0.38	–0.60
Lag Log Imports (FR)	13.42	13.87	6.13	4.68	–0.88	–0.75
Lag Log Imports (GB)	12.67	12.30	4.20	6.68	–0.27	–0.32
Lag Log Imports (NL)	14.05	14.31	5.14	4.75	–0.23	–0.59
Lag Log Imports (US)	12.21	11.93	7.19	10.13	–0.09	–0.12
Lag Log Imports (JP)	11.50	11.79	8.09	12.67	–0.39	0.16
Lag Log Exports (DE)	14.04	14.33	8.90	6.15	–1.13	–0.91
Lag Log Exports (FR)	14.42	14.96	7.59	4.66	–1.83	–1.02
Lag Log Exports (GB)	13.43	13.92	8.07	6.45	–1.16	–0.95
Lag Log Exports (NL)	14.65	14.67	6.39	5.09	–0.95	–1.03
Lag Log Exports (US)	12.41	13.05	8.88	8.52	–0.43	–0.06
Lag Log Exports (JP)	11.78	12.15	4.10	7.77	–0.23	–0.02

Post-Reweighting, Non-Targeted Covariates

Back

Equality of Mean between Groups, Non-Targeted Moments

Covariates	P-Value (Equality of Mean between Groups)
Lag Log No. Import Products	0.53
Lag Log No. Export Products	0.72
Lag Log No. Import Products (DE)	0.93
Lag Log No. Import Products (FR)	0.93
Lag Log No. Import Products (GB)	0.65
Lag Log No. Import Products (NL)	0.94
Lag Log No. Import Products (US)	0.87
Lag Log No. Import Products (JP)	1.00
Lag Log No. Export Products (DE)	0.94
Lag Log No. Export Products (FR)	0.91
Lag Log No. Export Products (GB)	1.00
Lag Log No. Export Products (NL)	0.96
Lag Log No. Export Products (US)	1.00
Lag Log No. Export Products (JP)	0.81
Lag Log Imports (DE)	0.93
Lag Log Imports (FR)	0.97
Lag Log Imports (GB)	0.95
Lag Log Imports (NL)	0.94
Lag Log Imports (US)	0.94
Lag Log Imports (JP)	0.97
Lag Log Exports (DE)	1.00
Lag Log Exports (FR)	0.97
Lag Log Exports (GB)	0.98
Lag Log Exports (NL)	0.95
Lag Log Exports (US)	1.00
Lag Log Exports (JP)	1.00

MNC Ownership and Export Participation (No Reweighting)

	(1) Exporter dummy	(2) Export values	(3) Export countries
MNC_{it}	0.127***	2.259***	0.263***
	(0.010)	(0.206)	(0.034)
	(4) Importer dummy	(5) Import values	(6) Import countries
MNC_{it} Foreign Owned$_{ft}$	0.095***	1.904***	0.319***
	(0.009)	(0.190)	(0.026)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Estimator	OLS	OLS	OLS
Re-weighting	No	No	No
Observations	93,171	93,171	93,171

Back

MNC Ownership and Export Participation (Inverse Probability Reweighting)

	(1) Exporter dummy	(2) Export values	(3) Export countries
MNC_{it}	0.043***	0.722***	0.099**
	(0.013)	(0.268)	(0.046)
	(1) Importer dummy	(2) Import values	(3) Import countries
MNC_{it}	0.034***	0.743***	0.112***
	(0.010)	(0.229)	(0.034)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Estimator	OLS	OLS	OLS
Re-weighting	Yes	Yes	Yes
Observations	93,171	93,171	93,171

Back

Network Effects of MNC Ownership (Logit Model)

	Export Entry	Import Entry
	(1)	(2)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp}$	0.066***	0.058**
	(0.022)	(0.023)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	236,256	236,256
Estimator	Logit	Logit

Back

Network Effects of MNC Ownership (Excluding Tax Havens)

	Export Entry	Import Entry
	(1)	(2)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp}$	0.027***	0.013**
	(0.007)	(0.007)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	194,304	194,304
Estimator	OLS	OLS

Back

Network Effects of MNC Ownership (Network of GUO)

	Export Entry	Import Entry
	(1)	(2)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp}$	0.033***	0.027***
	(0.004)	(0.004)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	202,924	202,924
Estimator	OLS	OLS

Back

Network Effects of MNC Ownership: Intensive Margin

	Export Entry	Import Entry
	(1)	(2)
$MNC_{i(p)t} \times In\ MNC\ Network_{cp}$	0.040	-0.157
	(0.090)	(0.098)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	15,942	10,448
Estimator	OLS	OLS

- The **parental network** has **no significant effect on the intensity of trade** with countries the firm was already exporting to/importing from before the acquisition

Back

Estimating Extended Network Effects of MNC Ownership

- The literature on **extended gravity** (e.g., Albornoz, *et al.*; 2012; Morales *et al.*, 2019; Alfaro-Ureña *et al.*, 2023) shows that reducing entry barriers in one country can lead to entry in other "close" countries (e.g. those that share a common border or membership in a regional trade agreement)

- MNC ownership may thus trigger entry in countries that are close to the parent's network

- To verify whether MNC ownership has **extended network effects**, we include an interaction between $MNC_{i(p)t}$ and *Close to MNC network*$_{ct}$

- Two definitions of **proximity to the network**:
  - dummy equal to 1 if c has **common border** with a country in the parental network (but does not belong to the network)
  - dummy equal to 1 if c is in a **regional trade agreement** (RTA) with a country in the parental network (but does not belong to the network)

Back

Estimating Extended Network Effects of MNC Ownership

- The literature on **extended gravity** (e.g., Albornoz, *et al.*; 2012; Morales *et al.*, 2019; Alfaro-Ureña *et al.*, 2023) shows that reducing entry barriers in one country can lead to entry in other "close" countries (e.g. those that share a common border or membership in a regional trade agreement)

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  - dummy equal to 1 if c has **common border** with a country in the parental network (but does not belong to the network)
  - dummy equal to 1 if c is in a **regional trade agreement** (RTA) with a country in the parental network (but does not belong to the network)

Back

Extended Network Effects of MNC Ownership

	(1) Common Border	(2) RTA
	Export Entry	
$MNC_{(i(p)t}$ $\times In\ MNC\ Network_{cp}$	0.039***	0.040***
	(0.007)	(0.007)
$MNC_{(p)it}$ $\times Close\ to\ MNC\ Network_{cp}$	0.024***	0.011***
	(0.005)	(0.003)
	Import Entry	
	(3)	(4)
$MNC_{i(p)t}$ $\times In\ MNC\ Network_{cp}$	0.022***	0.028***
	(0.007)	(0.007)
$MNC_{i(p)t}$ $\times Close\ to\ MNC\ Network_{cp}$	0.026***	0.017***
	(0.004)	(0.002)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	194,847	194,847
Estimator	OLS	OLS

- The probability of exporting to countries that have a common border (an RTA) with those in the parental network increases by 2.4 (1.1) p.p, a 14% (6%) relative to the unconditional probability of exporting
- The probability of importing from countries that have a common border (an RTA) with those in the parental network increases by 2.6 (1.7) p.p, a 26% (17%) relative to the unconditional probability of importing

Back

Extended Network Effects of MNC Ownership

	(1) Common Border	(2) RTA
	Export Entry	
$MNC_{(i(p)t}$ ×*In MNC Network*$_{cp}$	0.039***	0.040***
	(0.007)	(0.007)
$MNC_{(p)it}$ ×*Close to MNC Network*$_{cp}$	0.024***	0.011***
	(0.005)	(0.003)
	Import Entry	
	(3)	(4)
$MNC_{i(p)t}$ ×*In MNC Network*$_{cp}$	0.022***	0.028***
	(0.007)	(0.007)
$MNC_{i(p)t}$ ×*Close to MNC Network*$_{cp}$	0.026***	0.017***
	(0.004)	(0.002)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	194,847	194,847
Estimator	OLS	OLS

- The probability of exporting to countries that have a common border (an RTA) with those in the parental network increases by 2.4 (1.1) p.p, a 14% (6%) relative to the unconditional probability of exporting
- The probability of importing from countries that have a common border (an RTA) with those in the parental network increases by 2.6 (1.7) p.p, a 26% (17%) relative to the unconditional probability of importing

Back

Persistence of Network Effects

- **Changes in GUOs** can be used to study whether the **network effects are persistent**
- Focus on **divestitures** (GUO1 sells i's DP to GUO2) $\rightarrow$ countries dropped from the network
- Example:
  - In 2005, Belgian firm i is acquired by DP controlled by GUO1
  - In 2011, i's GUO1 sells DP to GUO2
  - Several countries are dropped from i's GUO network (e.g. Japan, Indonesia, Tunisia)

- We first focus on countries in the old GUO's network (i.e. $\textit{In Old MNC Network}_{cp} = 1$) and **compare countries dropped with those still in the network**

$$\textit{Trade}_{ict} = \alpha_1(\textit{New MNC}_{i,t} \times \textit{Only on Old MNC Network}_{ic}) + \delta_{it} + \delta_{ic} + \delta_{ct} + \varepsilon_{ict}$$

$\textit{Trade}_{ict}$: dummy equal to 1 if firm i trades with country c in year t

- α_1 insignificant if network effects are **persistent and not confined to MNC boundaries**

Persistence of Network Effects of MNC Ownership (Dropped vs Retained Network Countries)

	Export Entry (1)	Import Entry (2)
$New\ MNC_{i(p)t} \times Only\ In\ Old\ MNC\ Network_{ic}$	-0.050	-0.022
	(0.038)	(0.035)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	5,460	5,460
Estimator	OLS	OLS

- Affiliates are **not significantly less likely to trade with countries dropped from their network** compared to countries still in their network

Back

- If network effects are take time for manifest, we would expect affiliates to be more likely to enter **countries dropped from their network compared to countries never in their network**

- We exclude countries added to the network (i.e. *Only in New MNC Network*$_{cp} = 1$) and estimate

$$Entry_{ict} = \alpha_1(New\ MNC_{i,t} \times Only\ on\ Old\ MNC\ Network_{ic}) + \delta_{it} + \delta_{ic} + \delta_{ct} + \varepsilon_{ict}$$

- $\alpha_1 > 0$ would confirm that network effects are persistent and **not confined to MNC boundaries**

Persistence of Network Effects of MNC Ownership (Countries Dropped vs Never in the Network)

	Export Entry	Import Entry
	(1)	(2)
New MNC$_{it}$ × *Only In Old MNC Network*$_{ic}$	0.039**	0.036**
	(0.019)	(0.006)
Firm-Country FE	Yes	Yes
Firm-Year FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	14,383	14,383
Estimator	OLS	OLS

- Even after changing GUO, affiliates are **more likely to start trading with countries that belong to their old network** relative to countries never in the their network

Back

The Role of Upstreamness

- If the network effects are driven by supply chain linkages within MNCs, we would expect them to be stronger when the activities of affiliates are vertically-related

- Using the methodology of Alfaro *et al.* (2018), we construct the measure $Upstreamness_{i(p)c}$ which measures the upstreamness of i's sector relative to the sector(s) of p's affiliates in country c

$$\begin{aligned} Entry_{i(p)ct} = \; & \beta_1 (MNC_{i(p)t} \times In\ MNC\ Network_{cp}) \\ & + \beta_2 (MNC_{i(p)t} \times In\ MNC\ Network_{cp} \times Upstreamness_{i(p)c}) \\ & + \beta_3 (MNC_{i(p)t} \times Upstreamness_{i(p)c}) + \delta_{it} + \delta_{ic} + \delta_{ct} + \varepsilon_{i(p)ct} \end{aligned}$$

- If network effects are not driven by supply chain linkages, β_2 should not be significant

Back