
Selection and Market Reallocation: Productivity Gains from Multinational Production

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Introduction

- Nations with greater multinational activity exhibit, on average, higher productivity. (Borensztein et al. 1998, Alfaro et al. 2004, Harrison and Rodriguez-Clare, 2010, Kose et al. 2010;).

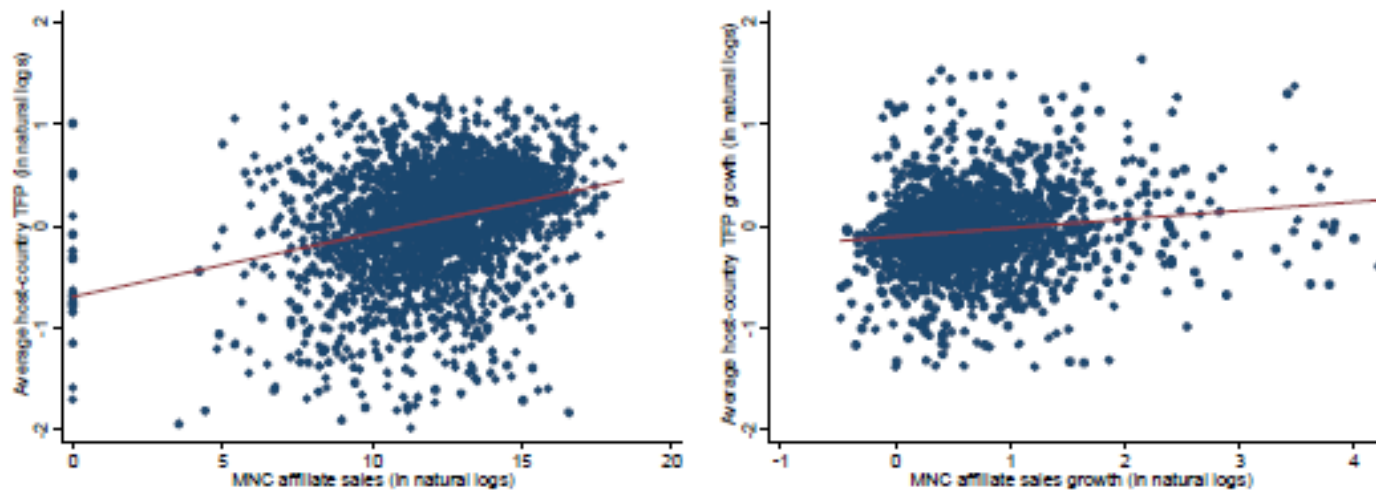


Figure 1: Multinational production and host-country TFP

Introduction

- This positive correlation, when established casual, is often attributed to *within-firm productivity gains*, e.g. when foreign multinationals generate positive productivity externalities to domestic firms:
 - Knowledge transfer through partnerships, sharing inputs, interaction and movement in labor markets, etc.
- There is, however, a less stressed, alternative explanation, centering on *between firm selection and market reallocation*
 - Greater multinational activity leads to tougher competition and market reallocation, and allows only the most productive domestic firms to survive (Melitz, 2003).

Introduction

- All imply a positive relationship between MP and average host-country productivity; their implications for domestic economies are different.
 - Within-firm productivity (“intensive margin”): foreign firms raise the productivity of continuing domestic firms:
 - expansion of domestic industries; stimulates local tech development;
 - Between firm selection and market reallocation (“extensive margin”)
 - contraction of domestic industries and may hinder domestic entrepreneurship.
- Disentangling the two effects is crucial for evaluating the effects of foreign investment and setting economic policies.
 - If within-firm improvements due to spillovers are the primary source of gains, special treatment to foreign MNCs may be justified;
 - But if productivity increases arise also from firm selection and market reallocation, it would be important to improve domestic factor market conditions to facilitate gains from reallocation.

Introduction

Objective of the Paper

- This paper distinguishes and quantifies the roles of market reallocation and within-firm productivity in determining the aggregate productivity gains from multinational production.
 - This task cannot be accomplished by simply examining the relationship between MP and host-country average productivity.
- We develop an empirical framework based on an augmented model of heterogeneous firms to identify the two effects by exploring their distinct predictions on distributions of domestic productivity and revenues, employment and survival.
 - *Between-firm reallocation*: Greater competition from MP leads to higher factor prices and factor reallocation, an increase in the cutoff productivity and revenue and a leftward shift of revenue;
 - *Within-firm Productivity e.g.* from spillover results in a rightward shift of the productivity and revenue distributions.

Overview of Findings

- Using a large cross-country firm panel dataset (Orbis), we find productivity spillover and market reallocation are two significant but distinct sources of gains of MP.
 - Aggregate weighted domestic TFP increases by 1.6%
 - Between-Firm: Entry of multinationals raises the cutoff productivity and revenue of domestic firms, and shift the revenue distribution leftward (1.4 percent TFP gain);
 - Within-Firm: Surviving domestic firms' productivity increases at different percentiles (0.2 percent TFP gain)
- Robustness: Employment distributions, wage effects; different measures of TFP; subsample of homogenous products; countries with better coverage; analysis of related industries; backward and forward linkages, other controls.

Related Literature: Spillovers and Selection

- Productivity spillovers from multinationals to domestic firms (large number of empirical studies).
 - Aitken and Harrison (1999) find evidence of negative spillovers in Venezuelan manufacturing enterprises (market-stealing effect).
 - Keller and Yeaple (2009) show strong evidence of positive spillovers from foreign multinational to domestic firms in the United States.
 - Javorcik (2004), Arnold, Javorcik and Mattoo (2011), find positive spillover via either backward or shared production linkages;
 - Arnold and Javorcik (2009) and Guadalupe et al. (2011) account for the endogenous acquisition of MNCs and find significant productivity spillover in acquired plants. Fons-Rosen et al. find negative effects.

Related Literature: Factor Markets/Competition Effect

- Evidence on the domestic selection effect of multinational activity and the relative importance of spillovers and selection is scarce.
 - Ramondo (2009) finds foreign plants' entry to be negatively associated with the market shares of domestic firms and positively with the productivity of domestic incumbents in Chile.
 - Kosova (2012) finds consistent evidence in Czech Republic using growth of sales of domestic firms and proxies of technology gap.
- A few studies have taken the step to evaluate MNCs' factor market effects .
 - Labor: Aitken, Harrison, and Lipsey (1996) and Feenstra and Hanson (1997) find foreign multinational activity to increase industry wages and share of non-production workers in wage.
 - Capital: Harrison and McMillan (2003) find borrowing by foreign firms exacerbates the credit constraints of domestic firms. Harrison, Love and McMillan (2004) find FDI inflows to be associated with a reduction in financing constraints using a larger cross-country dataset.

Related Literature

- Spillovers, Competition, Reallocation in Other Fields
 - Trade (e.g., Pavcnick 2002).
 - Agglomeration forces (externalities) versus selection in cities (Combes et al., 2012); Technology spillovers versus market rivalry in R&D (Bloom et al. 2012).
 - Productivity effect of resources allocation across establishments (Hsieh and Klenow, 2009; Alfaro et al, 2009).

Outline

- Introduction and Motivation
- Theoretical Framework and Empirical Strategy
- Data
- Main Results
- Productivity Gains Estimates
- Robusntess
 - Measures of Productivity and Cost-Price Markups
 - The Role of Trade
 - Data Coverage
 - Related Industries
 - Other
- Conclusions

Theoretical Framework: Setup

- Model of monopolistic competition with heterogeneous firms (Melitz, 2003 and Helpman, Melitz and Yeaple, 2004)
- $n+1$ symmetric countries and two sectors, homogeneous (numeraire) and differentiated.
- Continuum of firms in each country, each producing a different variety of the differentiated product and drawing a distinct productivity level θ .

Theoretical Framework: Setup

- Given a CES utility function, the demand function for each variety of the differentiated product:

$$x(\theta) = \frac{E}{P} \left(\frac{p(\theta)}{P} \right)^{-\varepsilon}$$

- $x(\theta)$ = the quantity of demand; $p(\theta)$ = price of the product variety, E = the aggregate expenditure; P = the aggregate price
- Marginal cost: w/θ , where w is the common wage rate;
- Fixed costs of serving foreign markets: cf_M/φ (MP), cf_X/φ (export), where c is the unit capital cost, φ is a firm-specific fixed-cost shifter governed by $H(\varphi)$, Iceberg trade cost: d ; and $d^{\varepsilon-1}f_X < f_M$;
- Profit-maximizing price: $p(\theta)=w/(\alpha\theta)$.

Theoretical Framework: Serving Foreign Markets: MP, Exporting

- Foreign firms may serve the country via MP or exporting.
- Foreign firm profit in country H (Foreign firms investment and produce in the domestic market if $\pi_M(\theta) > \pi_X(\theta)$).

$$\pi_M(\theta_M) = \frac{r_M(\theta)}{\varepsilon} - \frac{cf_M}{\varphi} = \frac{E}{\varepsilon} \left(\frac{\alpha P \theta}{w} \right)^{\varepsilon-1} - \frac{cf_M}{\varphi};$$

- Multinational firm cutoff productivity:

$$\underline{\theta}_M = \left[\frac{\varepsilon c (f_M - f_X)}{E \varphi (1 - d^{1-\varepsilon})} \right]^{\frac{1}{\varepsilon-1}} \left(\frac{w}{\alpha P} \right)$$

- Export profit:

$$\pi_X(\theta_X) = \frac{r_X(\theta)}{\varepsilon} - \frac{cf_X}{\varphi} = \frac{E}{\varepsilon} \left(\frac{\alpha P \theta}{w d} \right)^{\varepsilon-1} - \frac{cf_X}{\varphi}$$

Theoretical Framework: Domestic Cutoffs

- Domestic profit

$$\pi_D(\theta_D) = \frac{r_D(\theta)}{\varepsilon} - cf_D = \frac{E}{\varepsilon} \left(\frac{\alpha P \theta}{w} \right)^{\varepsilon-1} - cf_D;$$

- Domestic cutoff productivity

$$\underline{\theta}_D = \left(\frac{\varepsilon cf_D}{E} \right)^{\frac{1}{\varepsilon-1}} \left(\frac{w}{\alpha P} \right)$$

- Domestic cutoff revenue

$$\underline{r}_D = r_D(\underline{\theta}_D) \varepsilon cf_D$$

Market Clearing Conditions: Labor and Capital

- Firms must make an initial investment cf_E .
 - Free entry condition: expected value of future profits = fixed entry cost.

- Labor
 - Total demand for labor in the domestic market = supply of labor L:

$$N_D \left(\bar{r}_D + n\gamma_M \bar{r}_M + n\gamma_X \bar{r}_X \right) / \alpha^{\varepsilon-1} = L$$

- Domestic firms, N_D , foreign firms N_F , and N_X .

- Capital
 - Firms finance a constant share of their fixed foreign investment cost in home countries and the rest abroad (empirical evidence)

$$N_D \left(f_D + n\gamma_M f_M + n\gamma_X f_X + \delta f_E / \gamma_D \right) = K$$

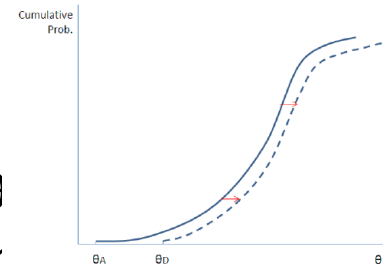
The Impact of Multinational Production

- Productivity Distribution:
 - a) spillovers enhance productivity of domestic firms (rightward shift of the distribution)
 - b) increase in the domestic cutoff productivity level θ_D (assuming spillovers do not offset market reallocation through factor competition).
- The Revenue Distribution.
 - Increase in the average productivity and in the number of firms serving the market: a decrease in the aggregate P and on revenues.
 - while the spillover from foreign firms exerts a positive effect.
 - If spillovers are small, firms incur a loss in domestic sales in the open economy.

The Impact of Multinational Production

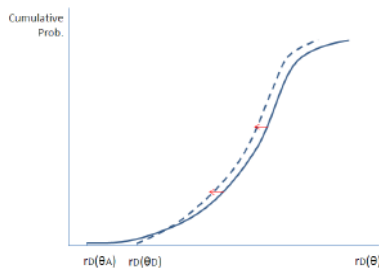
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- The Revenue Distribution.

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- If spillovers are small, firms incur a loss in domestic sales in the open economy.

Data

- Cross-country firm-level panel dataset, drawn from Orbis: comprehensive financial, operation, and ownership information. .
 - Ownership information, time-series financial information; broad country coverage.
- Four categories of information:
 - Industry information Ownership information including domestic and global parents and domestic and foreign subsidiaries;
 - Location information;
 - Financial information including revenue, employment, asset, and material cost.
- Over 1 million manufacturing firms in 33 countries, 36,000 foreign owned manufacturing subsidiaries in NAICS 4-digit industries.
- Two sub-periods: 2002-2004 and 2005-2007: how changes in multinational production between the two periods affect host-country domestic firms.

Digression: Compilation of Firms

- Few comparable cross-country firm-level data sets: Why?
 - Citizen, location, and confidentiality restrictions.
 - Economic census are infrequently collected due to their high cost and institutional restrictions in particular in developing countries.
- Solution:
 - Find other sources of business “compilations” (registries, tax sources).
 - Many sources do this (e.g. UNIDO, Amadeus, D&B, BHS): not census.
 - Orbis: Primary data sources include Tax Authorities, Ministry of Statistics, Provincial Bureau of Legal Entities, Securities and Investments Commissions, National Banks, Municipal Chambers of Commerce, and State Register of Accounts.
- Advantages/Disadvantages.

Orbis: Coverage

- In most of the countries considered, our dataset provides satisfactory coverage (compared to the Structural and Demographic Business Statistics (SDBS) from the OECD).
 - France, SDBS 84% and 91 % firms <10 and <20 employees in 2007. Our data: 80% and 86%.
- The coverage for some countries seems highly satisfactory.
 - Norway and Sweden, SDBS: 88% and 93% <20 employees. Our data: 85% and 95%.
- For others, our data tends to have a lower percentage of small firms.
 - Spain and Portugal < 20 employees in SDBS is 91% and 89%. Our data, 80% and 77%.
- For the U.S., the Census reports close to 80% <20 employees in 2006 (in general SDBS has less information for the U.S.). Our data shows 79%. (Orbis takes data from D&B).
- The SDBS data does not include data for developing countries (other sources to check).
 - Argentina <20 employees was close to 90%. (Indec Buenos Aires, 82%).
- We address potential issues with the data and data sampling in a number of ways in particular redoing our calculations for subsamples of countries with better data.

Productivity Estimates

- A key challenge in the measurement and identification of productivity relates to the endogeneity of the first optimal choice of inputs.
- Akerberg, Caves, and Frazer (2006): use of instruments based on lagged input decisions as the source of identification in structural estimation methods may be associated with collinearity problems.
- Different methods to measure productivity have advantages and limitations.
 - We have compared Levinson and Petrin (2003), Olley Pakes (1996).
 - Van Biesebroeck (2008) and Syverson (2011) show produce similar results.
 - Ghandi et al. (2012) identification strategy and non parametric regressions: explore firm's first order-condition for input's elasticity, productivity shock, and solve collinearity in both gross output and value added functions.
 - Labor productivity estimates.

Empirical Evidence—Stage 1

The Self-Selection of Multinational Firms

- Estimate the following equation:

$$\Pr[\text{entry}_{kij s} = 1] = \Phi \left[\ln \theta_{ki} + \frac{1}{\varepsilon - 1} \ln \varphi_{kij s} + FE_{ij s} > 0 \right]$$

- $\text{entry}_{kij s}$ represents k foreign multinationals' (HQ in country i) binary decision to enter a given host country j in industry s in 2005-2007,
 - θ_{ki} is the lagged productivity of multinational firms (estimated based on headquarters activities in 2002-2004)
 - $\varphi_{kij s}$ is the change in firms k HQ cash flow in host country PPP value.
 - $FE_{ij s}$ is a vector of country-pair industry dummies.
 - Firm level clustering.
- Ex-ante productivity of foreign firms/PPP cash flow financial shock are expected to have an effect on the decision to participate in multinational activity but, unlikely to be directly correlated with the future productivity of host-country firms, Helpman et al. (2004), Yeaple (2006).

Table 1: The Entry Decision of Multinational Firms (Firm-Country Level)

Dependent variable:	(1)	(2)
	MNC entry	MNC entry
HQ TFP	0.002*** (0.001)	0.001* (0.000)
Financial shock	0.002*** (0.001)	0.003*** (0.001)
Host-country-ind FE	Yes	Yes
Country-pair-ind FE	No	Yes
Firm cluster	Yes	Yes
Obs	405,728	405,728
R square	0.04	0.33

Notes: (i) Linear probability (LP) estimates are reported; (ii) standard errors clustered at the firm level are reported in the parentheses; (iii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

- More productive firms/positive cash shock exhibit a greater likelihood of entering foreign countries, consistent with Helpman et al. (2004).

Table 2: Multinational Entry and Change in Average Productivity

Dependent variable:	(1)	(2)
	Change in ave TFP	Change in ave TFP
MNC entry	0.01*** (0.004)	
MNC entry (predicted)		0.02** (0.01)
Beta coefficients	0.05	0.02
Host country FE	Yes	Yes
Industry FE	Yes	Yes
Obs	3,730	3,730
R square	0.52	0.52

Notes: (i) Columns (1) and (2) report OLS and instrumented estimates, respectively; (ii) bootstrapped standard errors are reported in the parentheses; (iii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

- Multinational activity exerts, on average, a positive and significant effect on the average productivity of domestic firms.
- But is the gain due to knowledge spillovers, selections, or both?

Empirical Evidence—Stage 2

Within-Firm Productivity Improvement

- Productivity distribution of domestic firms

$$\ln \theta'_{js}(q) - \ln \theta_{js}(q) = \beta_0 \hat{z}_{Mjs} + FE_j + FE_s$$

Dependent var.:	(1)	(2)	(3)	(4)	(5)
Change in TFP	All	Bin 1 (<25%)	Bin 2 (25-50%)	Bin 3 (50-75%)	Bin 4 (>75%)
MNC entry (predicted)	0.021*** (0.001)	0.029*** (0.002)	0.017*** (0.001)	0.020*** (0.001)	0.019*** (0.002)
Host-country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Obs	397,618	99,997	99,104	100,068	98,449
R square	0.05	0.06	0.07	0.06	0.06

Notes: (i) Bootstrapped standard errors are reported in the parentheses; (ii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

- log change of productivity of the qth bin of domestic firms in host country j and industry s, on the predicted number of new multinational;
- log difference (time invariant); country and industry dummies (time variant); country-industry clustering.
- 0.2, percent rightward shift of the productivity distribution when new entry increases by 10 percentage points.

Empirical Evidence—Stage 2 Between-Firm Selection: Survival

- Survival of individual domestic firms by estimating

$$\Pr[survival_{kjs} = 1] = \Phi[\beta_0 + \beta_1 \ln \theta_{kjs} + \beta_1 \ln \theta_{Djs} + \beta_Z \hat{Z}_{Mjs} + FE_j + FE_x]$$

- $survival_{kjs}$: whether a domestic firm k in industry s and country j continues production in 2005-2007,
- θ_{kjs} is the lagged cutoff productivity in country j and industry s , \hat{Z}_{Mjs} is the predicted number of new multinationals.
- Country and industry dummies to control for time variant and invariant country and industry factors and country-industry clustering to allow for correlations within each cluster.

Table 4: The Survival of Domestic Firms

Dependent variable:	(1) Survival	(2) Survival
MNC entry (predicted)	-0.0004*** (0.0001)	-0.001*** (0.0003)
Cutoff TFP (lagged)	-0.0001*** (0.0000)	-0.0001*** (0.0000)
Firm TFP (lagged)	0.001*** (0.0001)	
Firm Revenue (lagged)		0.003*** (0.0001)
Host country FE	Yes	Yes
Industry FE	Yes	Yes
Obs	407,975	616,270
R square	0.06	0.10

Notes: (i) Linear probability estimates are reported; (ii) bootstrapped standard errors are reported in the parentheses; (iii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

- Domestic firms are more likely to exit the market in the presence of new multinational entry.

Empirical Evidence—Stage 2

Between-Firm Selection: Cutoff Productivity

Dependent variable:	(1) Change in cutoff TFP
MNC entry (predicted)	0.83*** (0.09)
Host country FE	Yes
Industry FE	Yes
Obs	3,730
R square	0.37

$$\ln \theta'_{Djs} - \ln \theta_{djs} = \beta_D \hat{z}_{Mjs} = \left(\frac{1}{\varepsilon - 1} \ln \frac{c'}{c} + \ln \frac{P}{P'} \right) \hat{z}_{Mjs}$$

- c'/c and P/P' capture, respectively, the effects of new multinational entry on capital price and aggregate real price. The model suggests $c'_j > c_j$ and $P'_j < P_j$, $\ln \theta'_{Dj} > \ln \theta_{Dj}$.
- Higher probability of multinational entry leads to a significant increase of the cutoff productivity: $\beta_D = 0.83$.

Empirical Evidence—Stage 2 Between-Firm Selection: Revenue

Table 6: Changes in Cutoff TFP and Revenue (Country-Industry Level)

Dependent variable:	(1)	(2)
	Change in cutoff TFP	Change in cutoff revenue
MNC entry (predicted)	0.83*** (0.09)	0.49*** (0.07)
Host country FE	Yes	Yes
Industry FE	Yes	Yes
Obs	3,730	5,300
R square	0.37	0.36

Notes: (i) Weighted least square estimates are reported; (ii) bootstrapped standard errors are reported in the parentheses; (iii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

$$\frac{\ln r'_{Djs}}{\ln r_{Djs}} = \beta_c \hat{z}_{Mjs} = \left(\ln \frac{c'}{c} \right) \hat{z}_{Mjs}$$

- 10% in MNC entry is associated with 4.9 percent change in cutoff revenue.

Empirical Evidence—Stage 2

Between–Firm Market Reallocation: Revenue Distribution

Table 7: The Shift of Domestic Revenue Distribution

Dependent var.:	(1)	(2)	(3)	(4)	(5)
Change in revenue share	All	Bin 1 (<25%)	Bin 2 (25-50%)	Bin 3 (50-75%)	Bin 4 (>75%)
MNC entry (predicted)	-0.035*** (0.006)	-0.069*** (0.017)	-0.021*** (0.006)	-0.035*** (0.011)	-0.009 (0.008)
Host-ountry FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Obs	407,145	103,233	101,245	102,181	100,486
R square	0.20	0.24	0.10	0.26	0.14

Notes: (i) Bootstrapped standard errors are reported in the parentheses; (ii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

$$\ln\left(\frac{r'_{Dks}(q)}{E}\right) - \ln\left(\frac{r_{Dks}(q)}{E}\right) = \beta_c \hat{z}_{Mjs} = (\varepsilon - 1) \left(\ln \frac{P^A}{P} + \ln \tau_\theta \right) \hat{z}_{Mjs} = (\varepsilon - 1) (\beta_P + \beta_\theta) \hat{z}_{Mjs}$$

- 10% in MNC entry is associated with lower revenue share.

Between-Firm Market Reallocation: Labor Market Reallocation-Employment Distribution

Table 8: The Shift of Domestic Employment Distribution

Dependent var.:	(1)	(2)	(3)	(4)	(5)
Change in employment share	All	Bin 1 (<25%)	Bin 2 (25-50%)	Bin 3 (50-75%)	Bin 4 (>75%)
MNC entry (predicted)	-0.037*** (0.007)	-0.067*** (0.022)	-0.027*** (0.008)	-0.038*** (0.013)	0.002 (0.008)
Host-country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Obs	388,704	98,498	97,089	97,839	95,278
R square	0.22	0.29	0.19	0.22	0.16

Notes: (i) Bootstrapped standard errors are reported in the parentheses; (ii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

Shifts of the employment distribution. Relatively smaller domestic firms are crowded out in the labor market by the new multinational firms: evidence of labor market reallocation.

Between-Firm Market Reallocation: Labor Market Reallocation-Wages

Table 9: Changes in the Average Wage Rate of Domestic Firms (Country-Industry Level)

Dependent variable:	(1) Change in ave wage
MNC entry (predicted)	0.033*** (0.003)
Host country FE	Yes
Industry FE	Yes
Obs	3,407
R square	0.33

Notes: (i) Weighted least square estimates are reported; (ii) bootstrapped standard errors are reported in the parentheses; (iii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

Increase in wage rate as a result of increased labor demand by foreign firms.

Discussion: Measures of Productivity, and Markups

- Firm productivity based on the output value produced by each firm given its inputs: (we do not observe firm-level physical output quantities and prices).
 - Similar estimate using shift in the productivity distribution or exploring domestic survival and changes in revenues distribution moments.
 - BUT overestimation of spillovers if not considering both sources even with q , p data.
- Estimates of within firm productivity could be biased downward if the distribution of productivity partly reflects the distribution of markups: More productive, higher markup firms survive, distributions shifts downward (Melitz and Ottaviano, 2008).
- Re-estimate spillover equations for industries with homogeneous products (shifts more likely to reflect changes in productivity) using country-industry-specific import demand elasticities > 75th percentile in each country (Broda, et al., 2006)

Robustness Analysis: Data Coverage

- Potential Issues: Large company bias; censoring
 - Both make it more difficult to identify the market reallocation effect
- Strategies
 - Subsamples of countries with better coverage.
 - We restrict the analysis to the top 5 countries with the largest number of domestic firms.
- Falsification test by truncating the data at the left tail in both time periods and including only firms with more than 10 employee.

Additional Robustness: Role of Trade

- Control for all time-invariant country-industry factors by taking first differences of the key outcome equations between the two sub-periods and all time-variant country factors as well as time-variant industry characteristics through the use of fixed effects.
- Still, a possible concern that could arise is that observed changes in domestic productivity and revenue distributions might be driven by other factors such as export and import growth.
 - We accounted for the endogeneity of multinational entry in the first stage by instrumenting with multinationals. ex-ante headquarters productivity.
 - Our analysis shows that foreign multinational entry exerts significant market reallocation and knowledge spillover effects even when we take into account the potential endogeneity issue.
 - We also explicitly controlled for export and import growth in host-country industries. (UN COMTRADE): similar results.

Additional Evidence: Within and Between Industry Reallocations

- Reallocation channel: increased MP in one industry causes increased demand for capital and labor and subsequently higher factor prices.
- Labor similarity_{ij}: industry pair's similarity in occupational labor requirements
 - Industries with greater similarity in occupational labor structure are expected to share greater externality in labor markets.
 - BLS National Industry-Occupation Employment Matrix: industry-level employment across detailed occupations counts converted into occupational percentages and industry pair correlation in occupational percentages.
- Capital similarity_{ij}: measure of industries' similarity in capital-good demand,
 - Correlation of investment flows (capita flow data from BEA).

Within and Between Industry Reallocation II

Table 14: Robustness: Within- and Between-Industry Reallocations

Dependent var.:	(1)	(2)
	Change in cutoff TFP	Change in cutoff rev
MNC entry (predicted)	0.727***	0.379***
in the same industry	(0.105)	(0.076)
in related industries		
- Labor similarity	0.024***	0.007
	(0.009)	(0.006)
- Capital similarity	0.005	0.012**
	(0.009)	(0.006)
Host-country FE	Yes	Yes
Industry FE	Yes	Yes
Obs	3,751	5,300
R square	0.37	0.36

Notes: (i) Weighted least square estimates are reported; (ii) bootstrapped standard errors are reported in the parentheses; (iii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

Within and Between Industry Reallocation

- Knowledge spillovers across industries.
- Backward linkage $_{ij}$ and Forward linkage $_{ij}$ to measure the extent of the input-output relationships between each pair of industries (Javorcik, 2004).
 - Backward linkage $_{ij}$: measures the share of a downstream industry j 's inputs that come from an upstream industry i and
 - Forward linkage $_{ij}$: measures the share of a downstream industry i 's inputs that come from an upstream industry j .

Within and Between Industry Reallocation I

Table 13: Robustness: Within- and Between-Industry Productivity Spillovers

Dependent var.:	(1)	(2)	(3)	(4)	(5)
Change in TFP	All	Bin 1 (<25%)	Bin 2 (25-50%)	Bin 3 (50-75%)	Bin 4 (>75%)
MNC entry (predicted) in the same industry	0.015*** (0.001)	0.026*** (0.033)	0.012*** (0.002)	0.015*** (0.002)	0.010*** (0.002)
in related industries					
- Backward linkage	0.119*** (0.019)	0.284*** (0.049)	0.126*** (0.031)	0.047 (0.030)	0.002 (0.038)
- Forward linkage	0.109*** (0.021)	-0.039 (0.053)	0.092*** (0.034)	0.128*** (0.033)	0.259*** (0.041)
Host-country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Obs	397,618	99,997	99,104	100,068	98,449
R square	0.05	0.06	0.07	0.06	0.06

Notes: (i) Bootstrapped standard errors are reported in the parentheses; (ii) ***, **, and * represent statistical significance at 1, 5, and 10 percent, respectively.

Summary of Estimated Effects

Table 10: Estimated Effects of Multinational Entry

Variable	Est. parameter
Within-firm productivity (bin 1)	0.03
Within-firm productivity (bin 2)	0.02
Within-firm productivity (bin 3)	0.02
Within-firm productivity (bin 4)	0.02
Cutoff productivity	0.83
Cutoff revenue	0.49
Revenue share (bin 1)	-0.07
Revenue share (bin 2)	-0.02
Revenue share (bin 3)	-0.03
Revenue share (bin 4)	0.00
Employment share (bin 1)	-0.07
Employment share (bin 2)	-0.03
Employment share (bin 3)	-0.04
Employment share (bin 4)	0

Notes: The table summarizes the estimated effects of multinational entry.

Decomposition

$$\theta_t^w = \sum_i s_{it} \theta_{it} = \bar{\theta}_t + \sum_i (s_{it} - \bar{s}_{it})(\theta_{it} - \bar{\theta}_t)$$

$$\Delta \theta_t^w = \Delta \bar{\theta}_t + \Delta \sum_i (s_{it} - \bar{s}_{it})(\theta_{it} - \bar{\theta}_t)$$

$$\Delta \theta_t^w = \frac{(\bar{\theta}_t^{\text{surviving}} - \bar{\theta}_{t-1}^{\text{surviving}})}{\text{within-firm}} + \frac{(\bar{\theta}_t^{\text{surviving}} - \bar{\theta}_{t-1}^{\text{all}})}{\text{selection}} + \frac{\Delta \sum_i (s_{it} - \bar{s}_{it})(\theta_{it} - \bar{\theta}_t)}{\text{reallocation}}$$

- Change in weighted average productivity (θ^w): unweighted aggregate productivity + total covariance between a firm's share of the industry output (s_{it}) and its productivity (θ_{it})
 - 10-percent point higher probability of multinational entry leads to on average 0.2 increase in within-firm productivity.
 - Average productivity of surviving firms is 1.2 percent higher than that of exiting firms.
 - Covariance at country-industry level, 0.2 greater when there is 10 percentage higher probability of MNC entry.

FDI Promotion Policy

Table 9: Correlations between Estimated TFP Gains and FDI Promotion Policies

	Aggregate	Multinational	Domestic	Spillover	Reallocation
Any incentives	0.001 (0.01)	-0.23** (0.11)	0.01 (0.01)	0.01 (0.01)	-0.001* (0.00)
Financial incentives	0.01 (0.02)	0.08 (0.12)	0.01 (0.02)	0.001 (0.01)	-0.001* (0.00)
Tax holiday	0.03 (0.03)	-0.35*** (0.11)	0.04* (0.02)	0.04** (0.02)	-0.001* (0.00)
Tax reduction	-0.003 (0.01)	-0.22* (0.12)	-0.001 (0.01)	0.01 (0.01)	-0.000 (0.00)
Regulation exemption	-0.02** (0.01)	-0.17* (0.10)	-0.01 (0.01)	-0.001 (0.004)	-0.001* (0.00)
Number of incentives	-0.004 (0.01)	-0.06** (0.03)	-0.001 (0.01)	-0.000 (0.004)	-0.0002* (0.00)

Notes: The table reports the correlations between estimated TFP gains, including both the aggregate and the decomposed, and countries' FDI promotion policies. The first 5 policy variables are dummies that indicate the existence of any or a specific type of incentives and the last policy variable measures the number of types of incentives offered by a country.

Conclusion

- The impact of multinational activity on host-country productivity has been a major topic of economic research.
 - A primary challenge in evaluating productivity gains from multinational production is to distinguish between the roles of within firm productivity gains and market reallocation.
- We develop a theoretical and empirical framework to distinguish effects:
 - Within firm productivity, e.g. spillovers, induce a rightward shift of the productivity distribution; the selection effect, in contrast, causes a weaker, or even leftward, shift of the revenue distribution and an increase in the cutoff productivity and revenue.
- Using a large cross-country panel dataset of manufacturing firms, we find significant evidence of selections, market reallocations as well as knowledge spillovers.
 - Ignoring the role of reallocation can lead to significant bias in understanding the nature of gains from multinational production.