

International Economics I

Foreign Direct Investment (Multinationals)

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Introduction

- Trade is concentrated in **very large firms**: export more quantity, more products and to more countries.
 - ▶ In the US the top 1% exporters account for 81% of US exports! (in 2000)
- More importantly, a lot trade is accounted by **multinational firms**:
 - ▶ 90% of US exports and imports are made by multinationals
 - ▶ similar number in other developed countries
- One-half of US imports are transacted **within** the boundaries of multinational firms!

Introduction

- **Multinationals:** An enterprise that controls and manages production establishments located in at least two countries.
- It is usually defined by:
 - ▶ the *parent* firm or the *headquarter*, located in the source country,
 - ▶ and the *affiliates*, located in the host country.
- The expansion of multinationals are done basically by **foreign direct investment** (FDI).
 - ▶ “greenfield”: set up a new firm abroad
 - ▶ “brownfield”: invest in existing plants (mergers and acquisitions)

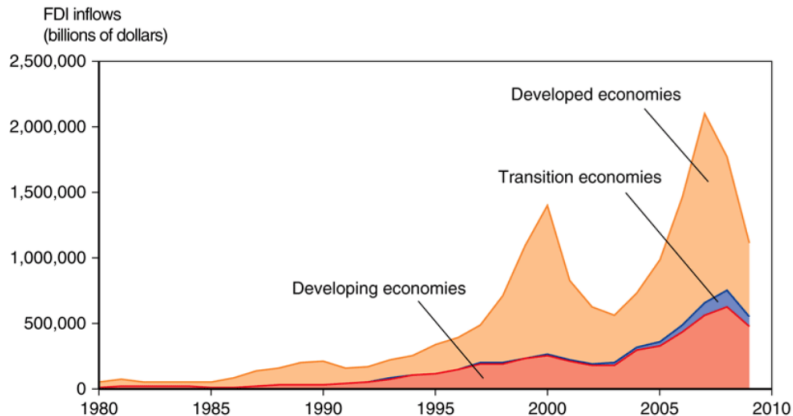
Outline

1. Data Facts about FDI and Multinationals
2. Horizontal FDI
3. Vertical FDI
4. Offshoring, FDI and Licensing/Outsourcing

FDI in General

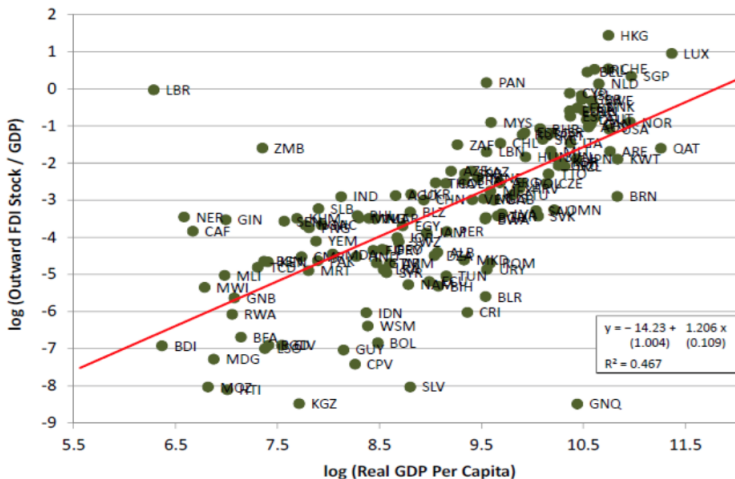
- features of FDI and MNCs' activities:
 - ▶ level of development of source and destination country: different patterns
 - ▶ which are the sectors with more MNCs activity?
 - ▶ which are the characteristics of Multinationals?
 - ▶ what do MNCs' subsidiaries do?
 - ▶ how much greenfield and brownfield FDI in advanced countries vs LDC?

FDI over time



Large increase in FDI inflows over time, mostly to developed countries.

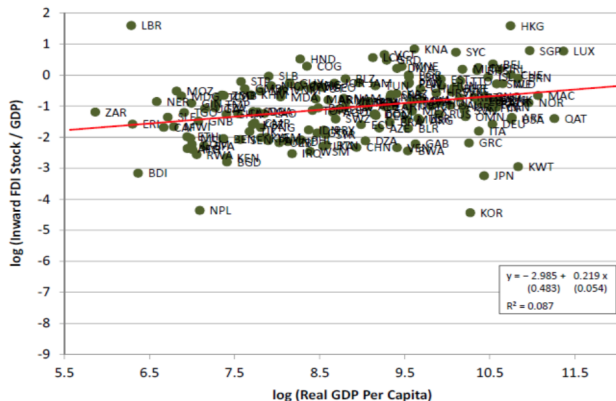
Advanced Countries Do More FDI



Sources: UNCTAD and World Bank

Advanced Countries Receive (Slightly) More FDI

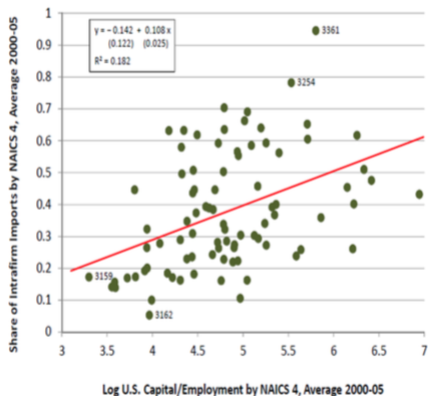
- high FDI inflows and outflows between advanced countries
- developing countries are more likely to receive FDI than to do it



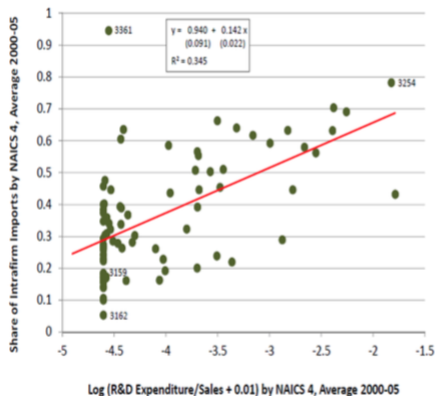
Sectors and Activity of Multinationals

- where there are MNCs there's intra-firm trade
 - ▶ headquarters to subsidiaries and back
- the share of import captured by intra-firm import
 - ▶ is higher in capital and R&D intensive sectors
 - ★ intermediate goods for low capital intensive sectors (textiles and shoes) are imported from external firms
 - ★ intermediate goods for high capital intensive sectors (pharmaceuticals and machinery) are imported from a subsidiary
- lots of intra-industry FDI
- higher in capital intensive sectors

Intra-firm Import and Capital and R&D Intensity



Sources: U.S. Census Related-Party Trade Database and NBER-CES Manufacturing Industry Database



Sources: U.S. Census Related-Party Trade Database and Nunn and Trefler (2008)

What Distinguishes Multinationals?

- MNCs' subsidiaries, relative to local firms:
 - ▶ are larger (by employment and sales)
 - ▶ are more productive
 - ▶ invest more in R&D
 - ▶ are more export oriented

What Distinguishes Multinationals?

Percentage accounted by multinational affiliates:

Table 1. Affiliates Relative to Local Firms

	Finland	France	Ireland	Holland	Poland	Sweden
Enterprises	1.6	2.0	13.4	3.4	16.0	2.8
Employment	17.2	26.2	48.0	25.1	28.1	32.4
Sales	16.2	31.8	81.1	41.1	45.2	39.9
R&D Expenditure	13.1	27.4	77.3	35.8	20.9	52.0
Exports	17.5	39.5	92.3	60.0	69.1	45.8

Source: OECD (2007).

What Do US MNCs' Subsidiaries Do?

- headquarters specialize in R&D and product design
- subsidiaries:
 - ▶ mainly sell in their own markets (horizontal FDI)
 - ▶ second, export to other countries (hub for horizontal FDI)
 - ▶ third, export back to the US (vertical FDI)

What Do US MNCs' Subsidiaries Do?

Table 2. Destination of Affiliate Sales by Industry

	Host Country	Other Foreign	United States
Total Manufacturing	55	34	11
Textile and Apparel	45	35	19
Metals and Minerals	60	32	8
Chemicals and Plastics	58	36	6
Machinery	49	36	15
Computers and Electronics	40	43	16
Electronic Equipment	47	40	13
Transport Equipment	47	35	19
Other	66	26	8

Source: 2009 Benchmark Survey of U.S. Direct Investment Abroad, BEA.

Greenfield vs Brownfield

- Recall:
 - ▶ “greenfield”: set up a new firm abroad
 - ▶ “brownfield”: invest in existing plants (mergers and acquisitions)
- mergers and acquisitions represent (UNCTAD data for 2007)
 - ▶ 50% of FDI flows at world level
 - ▶ 68% of FDI flows in advanced countries
 - ▶ 18% of FDI flows in LDCs

Multinationals

- Why do some firms find it optimal to operate in more than one country?
- The answer depends on the production activities that the affiliate carry on.
- **Horizontal FDI:**
 - ▶ Firms replicate the entire production profit in a affiliate to sell in a foreign market.
 - ▶ Usually done between similar countries: North-North FDI.
- **Vertical FDI:**
 - ▶ Firms break-up the production in different countries to save cost.
 - ▶ Usually done between different countries: North-South FDI.
 - ▶ Production sometimes is exported back to headquarter countries.

Outline

1. Data Facts about FDI and Multinationals
2. Horizontal FDI
3. Vertical FDI
4. Offshoring, FDI and Licensing/Outsourcing

Horizontal FDI

- Exporting can be potentially costly: high transportation costs, tariffs, etc.
- Alternative: set up production closer to the consumer base.
 - ▶ save the “iceberg costs”!
- Problem: it is costly to set a plant in a new country
 - ▶ high fixed cost: new factory, bureaucracy, etc.
 - ▶ we lose “scale” (recall increasing returns to scale).
- This is called: **proximity-concentration trade-off**.

Exporters vs Multinationals

- modeling the alternative to export: horizontal FDI
 - ▶ firms settle in the foreign country to produce & sell there
- Extension of Melitz model: Helpman, Melitz and Yeaple (2004)
 - ▶ formalize the choice between export and FDI within the same model
- horizontal FDI entails
 - ▶ a fixed cost $f_I > f_X$ to settle production in the foreign country
 - ▶ no additional variable cost (i.e. no τ) $\rightarrow$ marginal cost $1/\varphi$

Exporters vs Multinationals: Choice

- profits from FDI:

$$\pi_I = A_x \varphi^{\alpha/(1-\alpha)} - f_I$$

- profits from export:

$$\pi_X = A_x (\varphi/\tau)^{\alpha/(1-\alpha)} - f_X$$

- proximity vs concentration trade-off:

- ▶ multinationals face higher fixed costs, but save transportation costs
- ▶ a firm chooses FDI rather than exporting when $\pi_I > \pi_X$

- p.s. we assume that price of factors (i.e. wages) are the same since countries are similar (North-North FDI).

Multinationals, Exporting and Non-Exporting Firms

- profits from:

- ▶ domestic sales, export, FDI

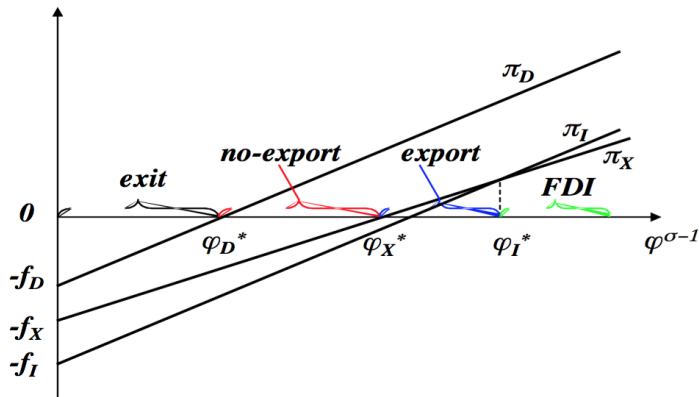
$$\pi_D = A\varphi^{\alpha/(1-\alpha)} - f_D \quad \pi_X = A(\varphi/\tau)^{\alpha/(1-\alpha)} - f_X$$

$$\pi_I = A\varphi^{\alpha/(1-\alpha)} - f_I$$

- firms partition in groups (under the assumption that f_I is large enough):

- ▶ firms with productivity below φ_D^* exit
- ▶ firms between φ_D^* and φ_X^* produce in the domestic market only
- ▶ firms above φ_X^* export too
- ▶ firms above φ_I^* become multinationals

Multinationals, Exporting and Non-Exporting Firms



$$\pi_D = A\varphi^{\alpha/(1-\alpha)} - f_D$$

$$\pi_X = A(\varphi/\tau)^{\alpha/(1-\alpha)} - f_X$$

$$\pi_I = A\varphi^{\alpha/(1-\alpha)} - f_I$$

Exporters vs Multinationals: Productivity

- productivity of multinationals, exporters and non-exporters is such that
 - ▶ $\varphi_I^* > \varphi_X^* > \varphi_D^*$
 - ▶ Helpman et al. (2004) estimate on US data for firms of 52 sectors:

$$\log \left(\frac{Y}{L} \right)_{ij} = \alpha + \beta MNE_{ij} + \gamma EXP_{ij} + controls + \epsilon_{ij}$$

- ★ $(Y/L)_{ij}$ = labor productivity of firm j in sector i
- ★ $MNE_{ij} = 1$ if j is multinational
- ★ $EXP = 1$ if j is exporter $\rightarrow$
- ★ control group = non-exporters
- ★ $\beta \approx \varphi_I - \varphi_D$, $\gamma \approx \varphi_X - \varphi_D$ and $\beta - \gamma \approx \varphi_I - \varphi_X$

Exporters vs Multinationals: Productivity

TABLE 1—PRODUCTIVITY ADVANTAGE OF MULTINATIONALS
AND EXPORTERS

Multinational	0.537 (14.432)
Nonmultinational exporter	0.388 (9.535)
Coefficient difference	0.150 (3.694)
Number of firms	3,202

- Multinationals are 53.7% more productive than non-exporters.
- Exporter (nonmultinational) are 38.8% more productive than non-exporters.

Exporters vs Multinationals: Sales

- more export relative to multinational sales if:
 - ▶ trade iceberg cost (τ) is low
 - ▶ fixed FDI cost (f_I) is high
- empirical evidence:
 - ▶ Helpman et al. (2004) estimate on the same data + subsidiaries in 38 countries:

$$\ln \frac{S_{jk}^X}{S_{jk}^I} = \alpha_k + \alpha_1 \ln FP_j + \beta_1 \ln FREIGHT_{jk} + \beta_2 \ln TARIFF_{jk} + \gamma Z_j + \varepsilon_{jk}$$

- ★ S_{jk}^X = sales in sector j in country k by export
- ★ S_{jk}^I = sales in sector j in country k by subsidiaries (FDI)
- ★ FP_j = plant-level fixed costs in sector j (represents f_I)
- ★ $FREIGHT$ = transport costs to country k (represents τ)
- ★ $TARIFF$ = tariff rate for sector j in country k (represents τ)
- ★ Z = controls

Exporters vs Multinationals: Sales

TABLE 3—EXPORTS VERSUS FDI

Narrow sample (N = 961)					
	U.S. std. dev.	Europe std. dev.	France std. dev.	Europe reg. coeff.	France reg. coeff.
FREIGHT	-1.040 (-7.392)	-0.959 (-6.749)	-1.019 (-7.328)	-0.935 (-6.526)	-0.944 (-6.594)
TARIFF	-0.365 (-2.644)	-0.512 (-3.636)	-0.421 (-3.917)	-0.545 (-3.781)	-0.539 (-3.775)
FP	1.177 (10.159)	0.932 (7.827)	0.927 (8.059)	0.947 (7.453)	0.934 (7.450)
DISPERSE	-2.343 (-8.374)	-2.153 (-5.250)	-2.061 (-6.664)	-1.503 (-4.535)	-1.491 (-4.470)
KL	-0.868 (-7.790)	-0.495 (-4.529)	-0.456 (-4.256)	-0.628 (-5.876)	-0.626 (-5.859)
RD	-0.104 (-2.197)	0.007 (0.150)	0.007 (0.144)	0.006 (0.125)	-0.002 (-0.047)
R ²	0.373	0.340	0.364	0.332	0.334

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Multinationals and Vertical FDI

- multinationals (MNCs) do not see FDI only as a substitute of trade!
- vertical FDI: firms move part of the production process to another country
- costs & benefits of vertical FDI:
 - ▶ fixed cost of setting a subsidiary abroad
 - ▶ lower variable production cost
 - ★ exploit comparative advantage
- we extend Melitz model to analyze the choice of vertical FDI

Multinationals and Vertical FDI: Costs

- same set-up with heterogeneous firms, but different technology:
- production requires
 - ▶ $1 - \beta$ share of “headquarters” tasks (e.g., R& D, marketing, design, etc.)
 - ★ can be performed only in the headquarters in the North with local labor (wage $w_N = 1$)
 - ▶ β share of manual production tasks
 - ★ can be performed also in a subsidiary in the South with local labor (wage $w_S < 1$)
 - ★ sometimes, we also think that we have to send the task “back” to the headquarters, cost is $\tau \times w_S$
 - ▶ marginal cost of producing in North (N) vs South (S):

$$MC_N = \frac{w_N^{1-\beta} w_N^\beta}{\varphi} \quad \text{vs} \quad MC_S = \frac{w_N^{1-\beta} w_S^\beta}{\varphi}$$

Multinationals and Vertical FDI: Costs

- Fixed cost of producing North f_N and (partially) in South f_S : $f_S > f_N$
- Total cost of one unit of q , if produced only in North (taking $w_N = 1$):

$$TC_N = \left(q \frac{w_N^{1-\beta} w_N^\beta}{\varphi} + f_N w_N \right) = \left(\frac{q}{\varphi} + f_N \right)$$

- Total cost of one unit of q , if production is partially in South (taking $w_N = 1$):

$$TC_S = \left(q \frac{w_N^{1-\beta} w_S^\beta}{\varphi} + f_S w_N \right) = \left(q \frac{w_S^\beta}{\varphi} + f_S \right)$$

- ▶ where $\beta \in (0, 1)$ = share of physical production cost in variable cost

Multinationals and Vertical FDI

- trade-off between variable and fixed cost

- ▶ profits N vs S :

$$\pi_N = A\varphi^{\alpha/(1-\alpha)} - f_N \text{ vs } \pi_S = A(\varphi/w_S^\beta)^{\alpha/(1-\alpha)} - f_S$$

- ▶ firms choose FDI if it saves in variable cost more than in fixed cost
- ▶ chooses vertical FDI if: $\pi_S > \pi_N$
- ▶ we can find a cutoff such that if $\varphi > \varphi_{VI}^*$ do it FDI: $\pi_S(\varphi_{VI}^*) = \pi_N(\varphi_{VI}^*)$.

$$A(\varphi_{VI}^*)^{\alpha/(1-\alpha)} \left(w_S^{-\beta\alpha/(1-\alpha)} - 1 \right) = f_S - f_N$$

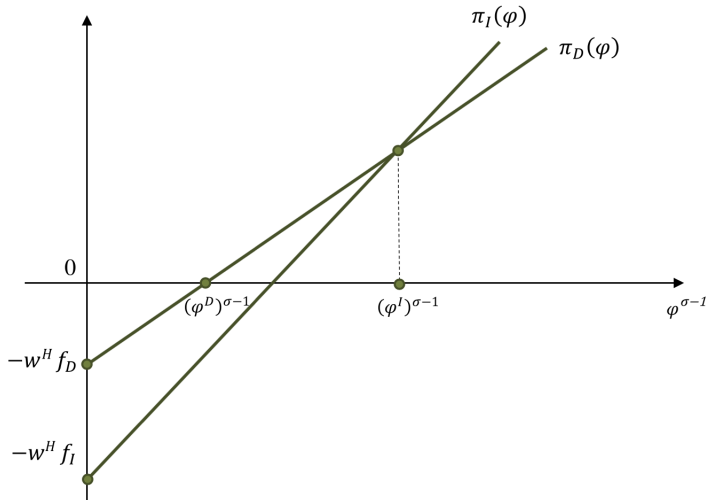
- ▶ multinationals are more productive ($\varphi > \varphi_{VI}^*$).

Multinationals and Vertical FDI

$$A(\varphi_{VI}^*)^{\alpha/(1-\alpha)} \left(w_S^{-\beta\alpha/(1-\alpha)} - 1 \right) = f_S - f_N$$

- vertical FDI more likely ($\varphi_{VI}^* \downarrow$) if
 - ▶ comparative advantage is strong (low w_S)
 - ▶ set-up cost abroad is relatively low (low $f_S - f_N$)
 - ▶ share of variable cost in production cost is high (high β)

Vertical FDI: cutoff



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Offshoring, FDI and Licensing/Outsourcing

- previously, we discussed the **location** decision:
 - ▶ the decision to produce in the home country or in the foreign country **when the parent firm owns the affiliate**
- instead the domestic firm could write a contract with a foreign firm
- this is the **internalization** decision
- The firm can decide to externalize the decision:
 - ▶ licensing (instead of horizontal FDI)
 - ▶ outsourcing (instead of vertical FDI)

Offshoring: FDI vs Licensing/Outsourcing

- how to choose licensing vs horizontal FDI? trade-off
 - ▶ save in fixed production cost
 - ▶ risk of imitation/loss of exclusive technology
 - ▶ in general, risk overweighs cost saving
 - ★ we observe little licensing
 - ★ risk of imitation/loss of exclusive technology
- how to choose outsourcing vs vertical FDI? trade-off
 - ▶ cost saving: foreign providers can specialize and serve more customers (economies of scale)
 - ▶ critical factors/processes: more likely costly ex-post renegotiation with the provider (hold-up problem)

Offshoring, FDI and Licensing/Outsourcing

- Note: offshoring = acquiring intermediate goods and/or services from abroad
- offshoring groups together both outsourcing and vertical FDI
 - ▶ trade in intermediate goods = 40% of world trade in manufacturing
- Few firms do licensing, but the decision of outsourcing vs vertical FDI is challenging
- Seems to be highly sector dependent
 - ▶ lot of FDI in sectors with high capital and R&D intensity
 - ▶ lot of outsourcing in textiles, accessories, shoes...

Taking Stock

- Multinationals are larger and more productive than usual exporters
- We extended the Melitz model to account for this regularity
- The model predicts that large firms do more horizontal and vertical FDI
 - ▶ Determinants of horizontal FDI: transportation costs/tariffs and fixed cost of production in the foreign country
 - ▶ Determinants of vertical FDI: differences of factor price (w_S), technology (β) and the fixed cost of production in the foreign country