



Topic 9 – Foreign Direct Investment

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Introduction

- In the previous lecture, we took a first look at firms in international trade but implicitly confined attention to domestic firms only
- In this lecture, we will take a closer look at multinational firms and their foreign direct investment (FDI)
- Rather than focusing on one particular model, we will provide an overview of the literature in this area following the excellent survey of Antras and Yeaple (2014)
- Our main questions are: Why do some firms operate in more than one country while others do not? What determines in which countries production facilities are located? Why do firms own foreign facilities rather than simply contract with local producers or distributors?



Introduction (contd.)

- The value added of all multinational firms accounts for around 25 percent of world GDP. The value added of their foreign affiliates alone accounts for around 10 percent
- The 700 largest multinational firms account for around 50 percent of world spending on research and development (R&D)
- Around one-third of world trade is intra-firm trade. Around another one-third involves multinational firms in one of the two sides of the exchange
- The total sales of foreign affiliates of multinational firms in their host countries are around 40 percent larger than total world exports



Overview of the lecture

- Definitions
- Stylized facts
- Horizontal FDI
- Vertical FDI
- Internalization



Definitions – Multinational firm

- Following Caves (2007), we define a **multinational firm** as an enterprise that controls and manages plants located in at least two countries
- According to this definition, plants in at least two countries must be involved in the production process and these plants must be controlled and managed by the same firm
- The controlling plants in the source country are referred to as **parents** while the subsidiary plants in the host country are referred to as **affiliates**
- The notion of control is a judgmental one but it is usually associated with ownership stakes of at least 10 percent in government statistics



Definitions – FDI

- Recall that a firm must acquire a controlling stake in a foreign plant in order to become a multinational firm
- It can do so either by newly creating a foreign plant (greenfield investment) or by acquiring an existing foreign plant (cross-border mergers and acquisitions)
- Either method involves an international capital flow referred to as **foreign direct investment (FDI)**. Any further capital flow between parents and existing affiliates is also classed as FDI
- FDI differs from foreign portfolio investment (FPI) which summarizes all foreign investment in financial assets that is not aimed at acquiring a controlling stake

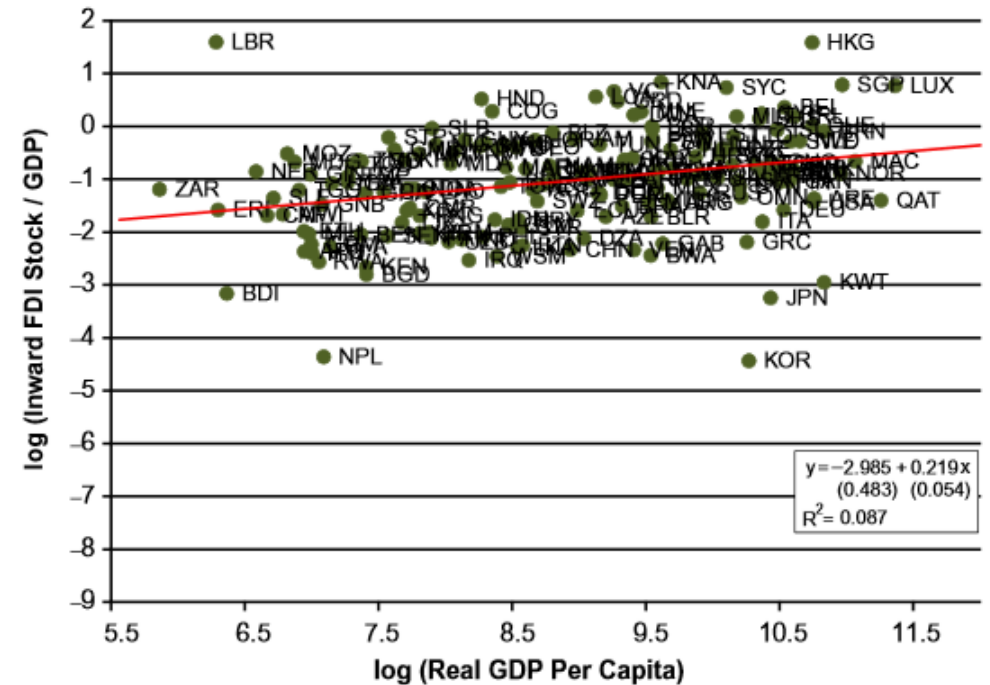
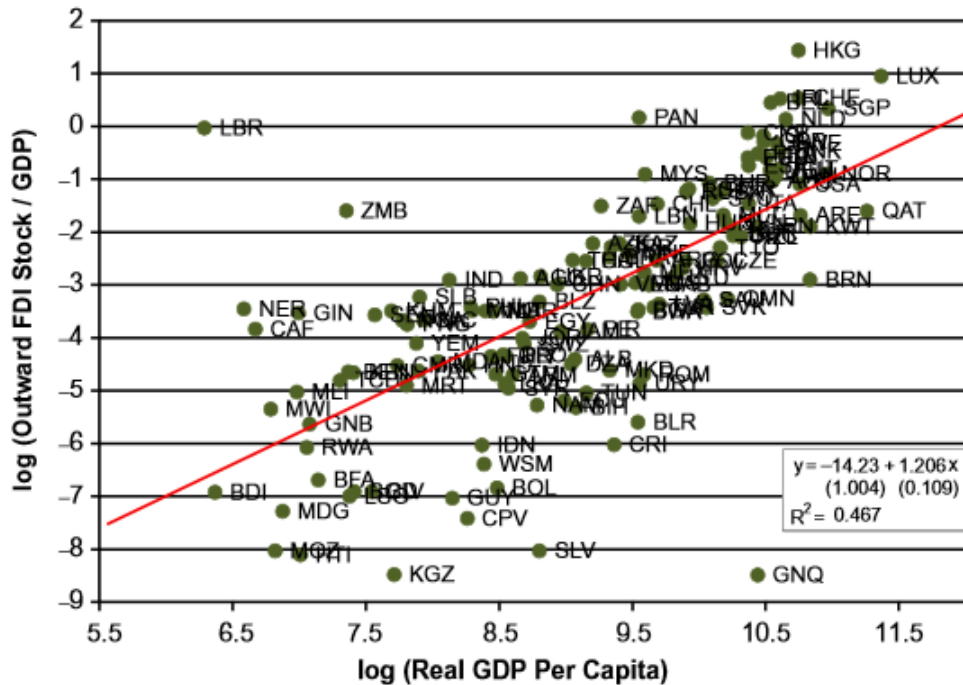


Definitions – FDI (contd.)

- In this lecture, we will focus on the two most common forms of FDI, namely **horizontal FDI** and **vertical FDI**
- Horizontal FDI occurs if a firm invests in the same industry abroad in which it operates domestically in order to serve the foreign market – e.g. Toyota builds an auto manufacturing plant in the US
- Vertical FDI occurs if a firm invests in a supplier industry abroad in order to source intermediate inputs – e.g. Intel builds a chip assembly plant in Malaysia

Stylized facts – Fact One

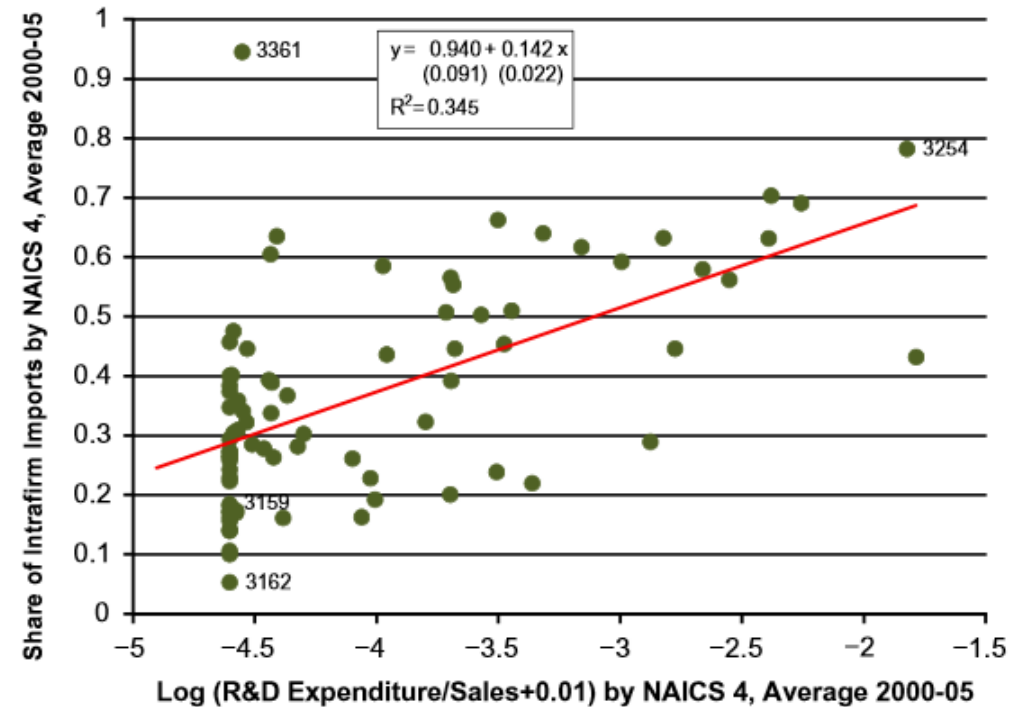
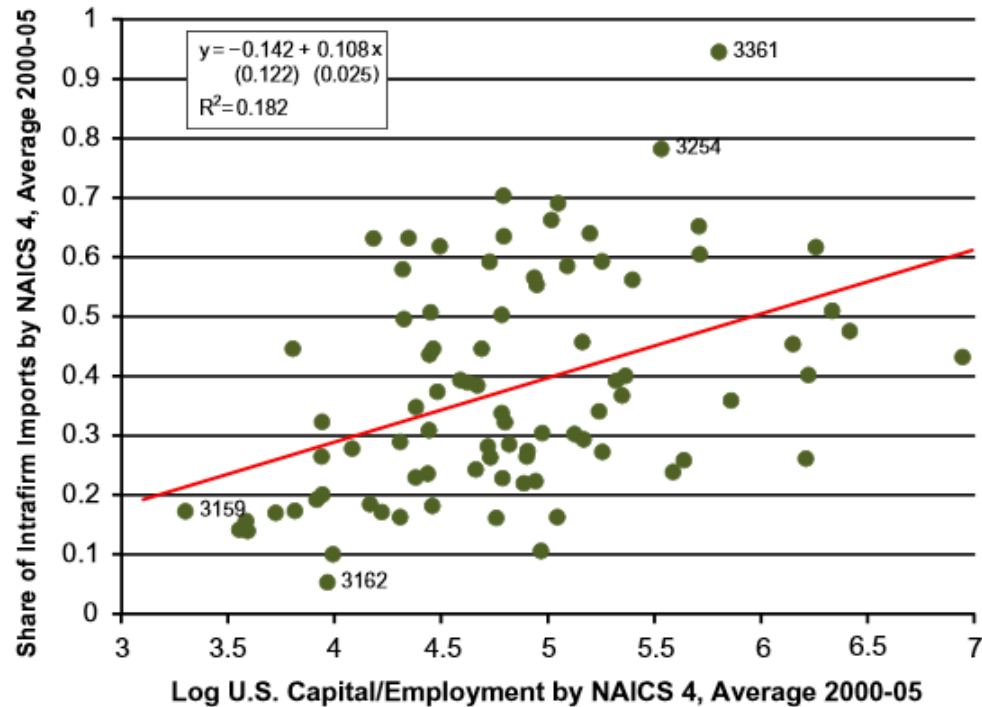
Fact One: Multinational activity is primarily concentrated in developed countries where it is mostly two-way. Developing countries are more likely to be the destination of multinational activity than the source



Source: Antras and Yeaple (2014)

Stylized facts – Fact Two

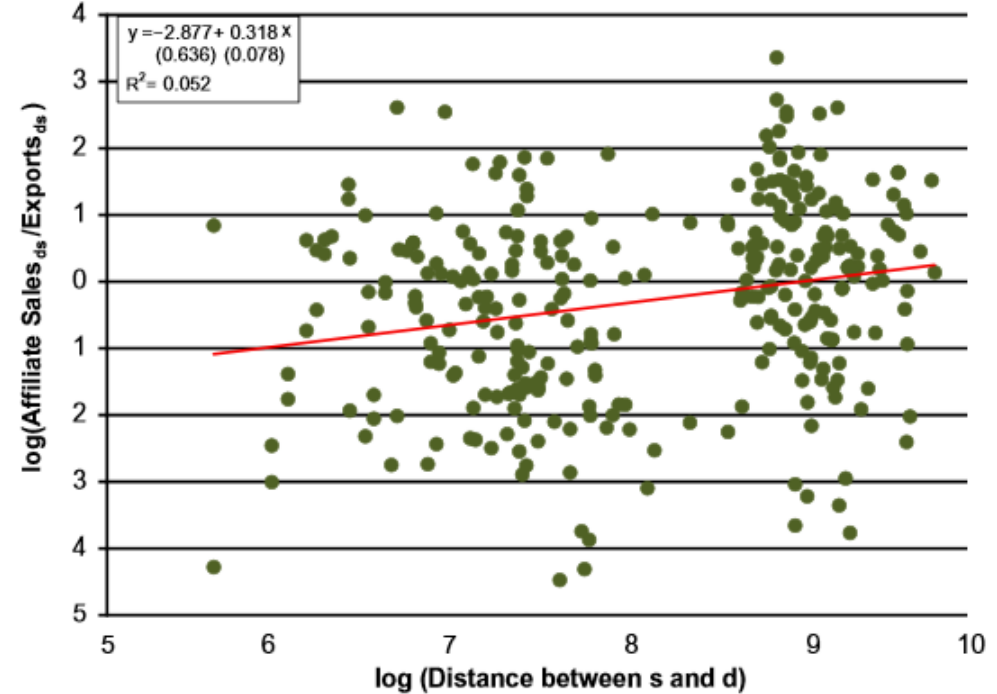
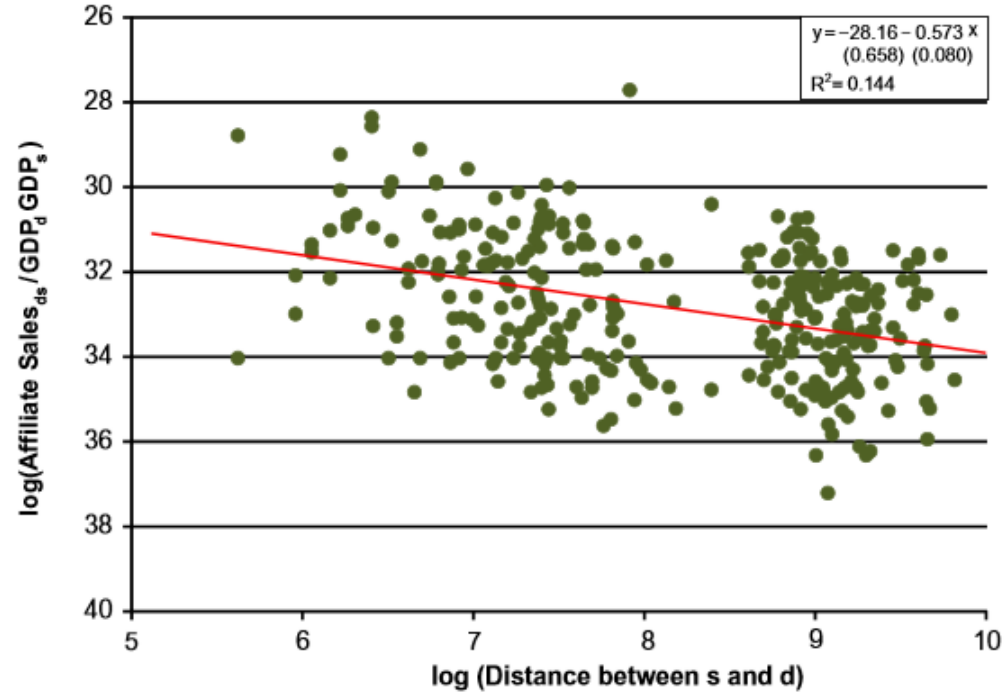
Fact Two: The relative importance of multinationals in economic activity is higher in capital-intensive and R&D intensive goods, and a significant share of two-way FDI flows are intra-industry in nature



Source: Antras and Yeaple (2014)

Stylized facts – Fact Three

Fact Three: *The production of the foreign affiliates of multinationals falls off in distance, but at a slower rate than either aggregate exports or parent exports of inputs to their affiliates*



Source: Antras and Yeaple (2014)



Stylized facts – Facts Four, Five, and Six

Fact Four: *Both the parents and the affiliates of multinational firms tend to be larger, more productive, more R&D intensive, and more export oriented than non-multinational firms*

Fact Five: *Within multinational enterprises, parents are relatively specialized in R&D while affiliates are primarily engaged in selling goods in foreign markets, particularly their host market*

Fact Six: *Cross-border mergers and acquisitions make up a large fraction of FDI and are a particularly important mode of entry into developed countries*



Horizontal FDI – Overview

- The literature on horizontal FDI has centered around the so-called **proximity-concentration hypothesis**
- Proximity to foreign consumers is argued to be the main advantage of serving a foreign market through horizontal FDI which matters particularly if trade costs are high
- Concentration of production is argued to be the main advantage of serving a foreign market through exporting which matters particularly if plant-level economies of scale are high
- In the following, we will discuss the main models capturing this hypothesis as well as the associated empirical evidence



Horizontal FDI – Homogeneous firms

- The basic proximity-concentration tradeoff can be captured in a simple extension of the basic Krugman (1980) model we discussed in Topic 7
- In the following, we will just provide an intuitive description of this extension even though it is actually quite easy to work out
- Relative to the basic two-country one-industry Krugman model we discussed earlier, we introduce iceberg trade barriers $\tau > 1$ and distinguish between firm-level and plant-level fixed costs f_F and f_P
- Exporting involves incurring τ , f_F , and f_P while horizontal FDI involves incurring f_F and $2f_P$ which effectively implies a trade-off between fixed and marginal costs



Horizontal FDI – Homogeneous firms (contd.)

- Assuming two identical countries, it can be shown that firms serve the foreign market through horizontal FDI instead of exporting if and only if

$$\frac{2f_P}{f_F} < \tau^{\sigma-1} - 1$$

- This formula clearly captures the proximity-concentration tradeoff: high trade costs (high τ) and low plant-level IRS (low f_P) make horizontal FDI more likely
- It also reveals that high firm-level increasing returns (high f_F) and a high trade elasticity (high $\sigma - 1$) make horizontal FDI more likely
- Higher f_F makes firms larger so that it becomes easier for them to amortize f_P while higher $\sigma - 1$ simply magnifies the effect of trade costs on trade flows



Horizontal FDI – Homogeneous firms (contd.)

- This basic model can already explain two-way FDI flows between countries which are a key feature of the data as summarized by Facts 1 and 2
- Markusen and Venables (2000) have extended this basic analysis to incorporate cross-country differences in factor prices and factor endowments
- Their main message is that horizontal FDI is more likely to arise between countries with similar factor prices
- The reason is simply that concentrating production in the low cost country is more attractive the larger the cost differences

Horizontal FDI – Homogeneous firms (contd.)

- The proximity concentration hypothesis was first formally tested by Brainard (1997) who found strong support
- Antras and Yeaple (2014) extend her specification to also test the additional predictions derived by Markusen and Venables (2000)
- In particular, they estimate the following regression model using US data, where j indexes industries, i indexes countries, and X , S , $Freight$, $Tariff$, $PlantSC$, $CorpSC$, C , and, μ capture exports, affiliate sales, freight costs, tariffs, plant-level IRS, corporation-level IRS, a vector of other controls, and fixed effects

$$\log \left(\frac{X_j^i}{X_j^i + S_j^i} \right) = \alpha_0 + \alpha_1 Freight_j^i + \alpha_2 Tariff_j^i + \alpha_3 PlantSC_j + \alpha_4 CorpSC_j + \alpha_5 C^i + \mu_{ij},$$

Horizontal FDI – Homogeneous firms (contd.)

Dep. Var.: $\log\left(\frac{x_j^i}{x_j^i + s_j^i}\right)$	(1)	(2)	(3)	(4)	(5)	(6)
Freight	-0.28** [0.05]	-0.13** [0.04]	-0.12** [0.04]	-0.13** [0.04]	-0.13* [0.06]	0.01 [0.25]
Tariffs	-0.23** [0.06]	-0.28** [0.05]	-0.27** [0.05]	-0.29** [0.06]	-0.38** [0.10]	-0.04 [0.04]
GDP/POP	0.10 [0.07]	0.04 [0.08]	0.06 [0.08]			
School				0.07 [0.09]		
KL				0.08 [0.06]		
GDP			0.32 [0.17]	0.39* [0.17]		
PlantSc	0.09* [0.04]	0.13* [0.05]	0.13* [0.05]	0.14* [0.05]	0.18 [0.15]	
CorpSc	-0.18** [0.03]	-0.32** [0.04]	-0.31** [0.04]	-0.32** [0.04]	-0.35** [0.14]	
Country Fixed Effects?	No	No	No	No	Yes	Yes
Industry Fixed Effects?	No	No	No	No	No	Yes
Year	1989	2009	2009	2009	2009	2009
Observations	1,762	2,315	2,315	2,315	2,482	2,482
R-Square	0.15	0.09	0.09	0.09	0.16	0.40

Standard errors are in brackets.

*At 1%.

**Significant at 5%.

- Higher trade costs, lower plant-level fixed costs, and higher firm-level fixed costs are indeed associated with significantly less exports relative to horizontal FDI
- This proximity-concentration result is robust to the inclusion of country fixed effects but not country and industry fixed effects
- Per-capita GDP (proxying for wages) is not significant calling into question the importance of the mechanism highlighted by Markusen and Venables (2000)

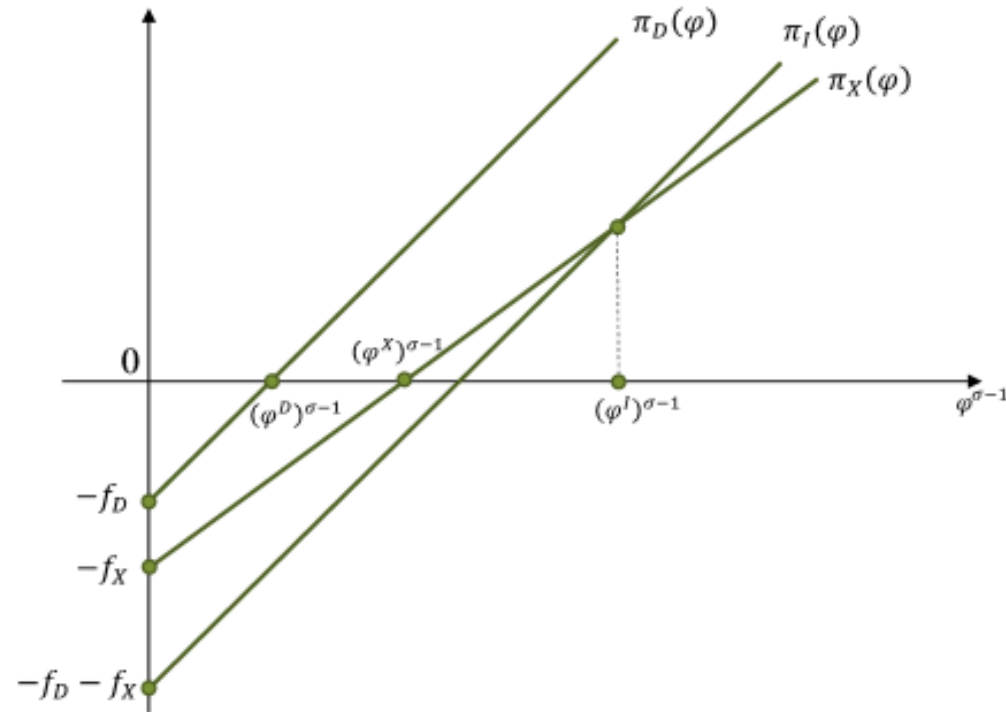
Source: Antras and Yeaple (2014)



Horizontal FDI – Heterogeneous firms

- Recall from Fact 4 that multinational activity is concentrated among a small number of very productive firms which cannot be captured by Krugman-style models
- Motivated by this, Helpman et al (2004) introduce firm heterogeneity building on the Melitz (2003) model we discussed in Topic 8
- The key difference from the basic Krugman-style model is that there is heterogeneity in firm productivity φ and accessing the foreign market involves a fixed marketing cost f_x
- Helpman et al (2004) show that firms then become non-exporters, exporters, and multinationals in increasing order of their productivities

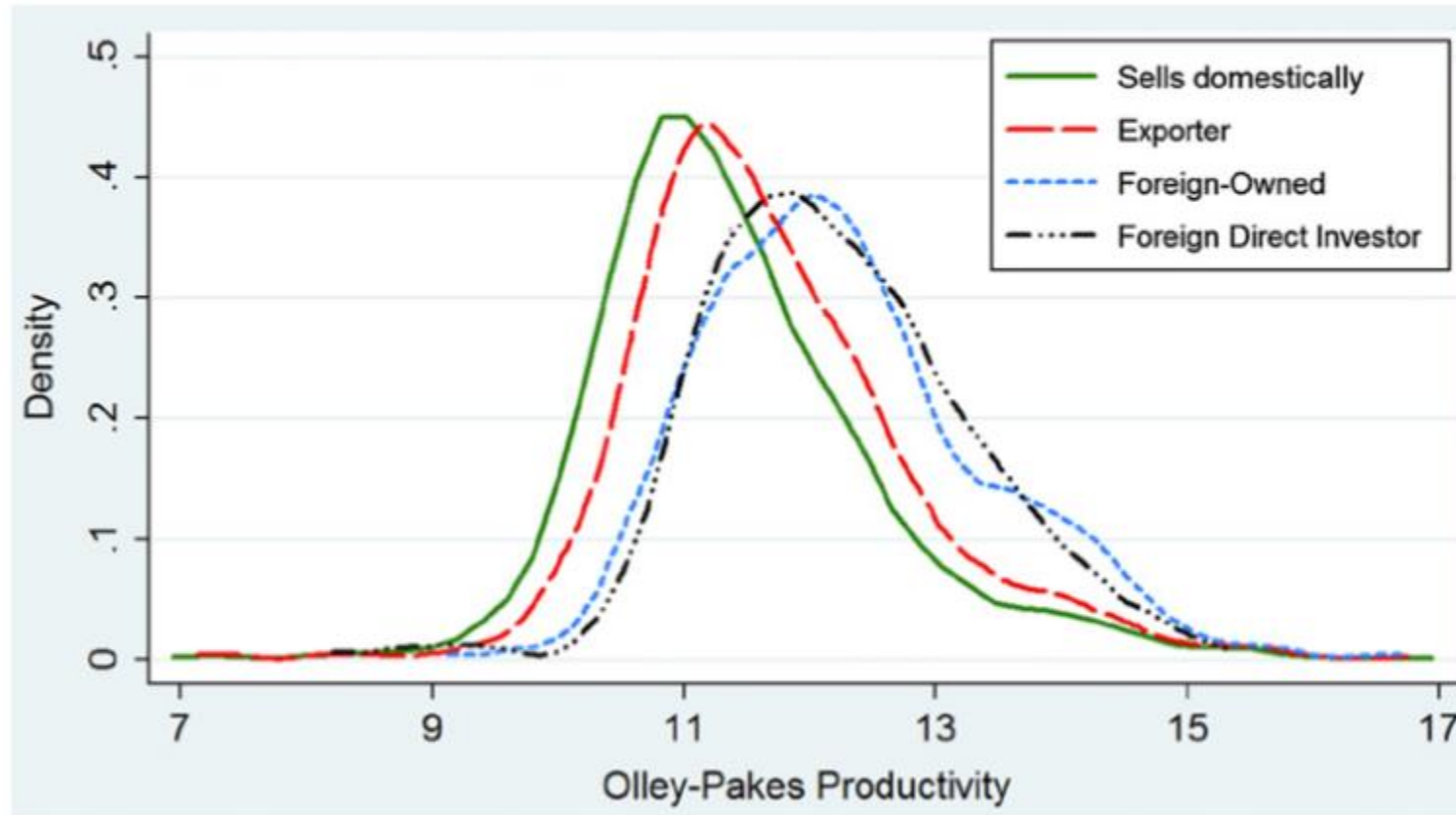
Horizontal FDI – Heterogeneous firms (contd.)



- This graph shows the profits from domestic sales (π_D), export sales (π_X), and foreign affiliate sales (π_I) as a function of an index of firm productivity ($\varphi^{\sigma-1}$)
- The key feature is that π_I is increasing in productivity faster than π_X so that the most productive firms sort into horizontal FDI
- The intuition is simply that more productive firms have larger sales and therefore benefit more from adopting a low marginal costs-high fixed cost technology

Source: Antras and Yeaple (2014)

Horizontal FDI – Heterogeneous firms (contd.)



- This basic sorting is consistent with the evidence
- This graph, for example, shows the productivity distributions of plants in Spain
- The Spanish data is special because it distinguishes between parent and affiliate plants operating in Spain

Source: Antras and Yeaple (2014)



Horizontal FDI – Heterogeneous firms (contd.)

- In this extended model, the basic proximity-concentration tradeoff still applies with the natural modification that high f_X now also increase the propensity of horizontal FDI
- However, the effect is smoother now than in the Krugman-style model in which either all firms export or engage in horizontal FDI
- A novel prediction of the Helpman et al (2004) model is that an increase in the variance of sales across firms should be associated with an increased propensity for FDI
- Helpman et al (2004) find evidence for this prediction in the data in addition to also confirming the Brainard (1997) results



Vertical FDI - Overview

- The central idea of the literature on vertical FDI is that firms might be able to reduce their production costs by locating different parts of the production process in different countries
- While trade and horizontal FDI are substitutes (firms either export or engage in horizontal FDI), trade and vertical FDI are complements (firms ship intermediate inputs if they engage in vertical FDI)
- Fact 1, that net FDI flows from developed to developing countries, and Fact 5, that R&D expenditures are concentrated in the parent firm, suggest a need to address international specialization
- In the following, we will discuss the main models capturing this hypothesis as well as the associated empirical evidence



Vertical FDI – Homogenous firms

- The classic model of vertical FDI is due to Helpman (1984) and builds on a special case of Helpman and Krugman's (1985) synthesis of the Heckscher-Ohlin and Krugman models discussed in Topic 7
- In particular, there is a capital-abundant and a labor-abundant country and a capital-intensive and a labor-intensive industry
- The capital-intensive industry features product differentiation and IRS with homogeneous firms while the labor-intensive industry is standard Heckscher-Ohlin
- Trade in both industries is assumed to be costless in order to eliminate any incentives for engaging in horizontal FDI



Vertical FDI – Homogenous firms (contd.)

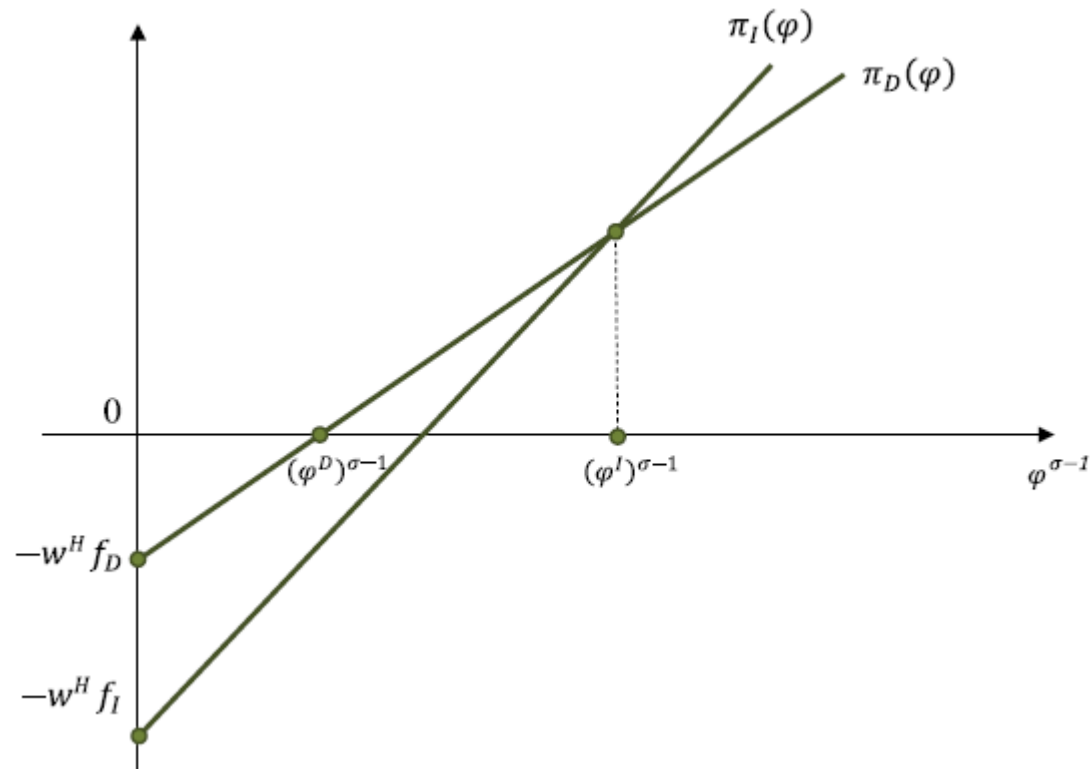
- The key departure from Helpman and Krugman (1985) is that production in the differentiated goods industry requires headquarter services and manufacturing
- Both are produced with an IRS technology but headquarter services are more capital intensive than manufacturing
- Headquarter services are meant to capture typical activities performed by headquarters of multinationals such as R&D, financing, marketing, and so on
- Helpman (1984) shows that headquarter services are located in the capital abundant country and manufacturing are located in the labor abundant country if the countries' endowment differences are sufficiently large



Vertical FDI – Heterogeneous firms

- It is straightforward to introduce heterogeneous firms along the same lines as in the horizontal FDI model we just saw
- In particular, suppose that headquarter services are always provided in Home and firms have a choice to manufacture their products in high-cost Home or low-cost Foreign
- Manufacturing in Home implies lower fixed costs (no need for an extra plant) but higher marginal costs (Home is the high-cost location) and thus makes sense for low productivity firms
- Conversely, manufacturing in Foreign implies higher fixed costs (need for an extra plant) but lower marginal costs (Foreign is the low-cost location) and thus makes sense for high productivity firms

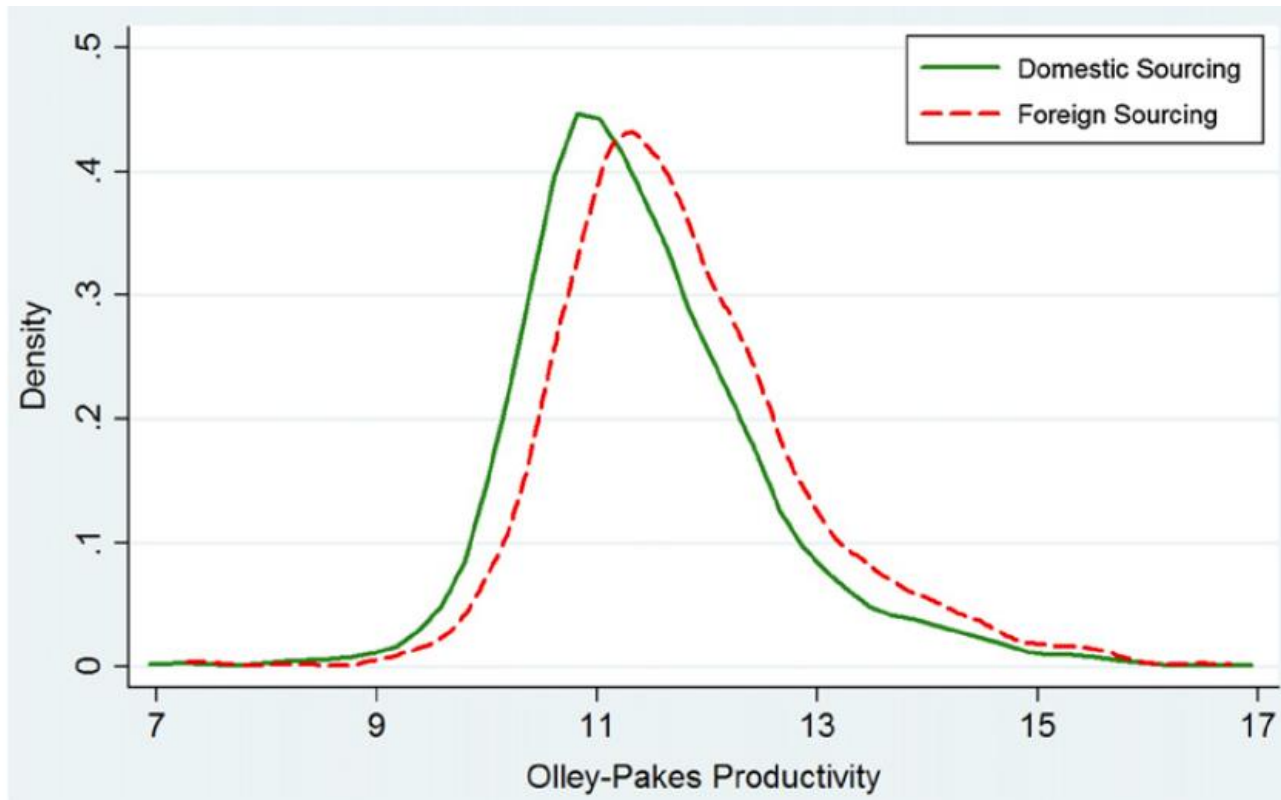
Vertical FDI – Heterogeneous firms (contd.)



Source: Antras and Yeaple (2014)

- This graph shows the profits from domestic sourcing (π_D) and foreign sourcing (π_I) as a function of an index of firm productivity ($\varphi^{\sigma-1}$)
- The key feature is that π_I is increasing in productivity faster than π_D so that the most productive firms sort into vertical FDI
- The intuition is again that more productive firms have larger sales and therefore benefit more from adopting a low marginal costs-high fixed cost technology

Vertical FDI – Heterogeneous firms (contd.)



- This basic sorting is again consistent with the evidence
- This graph, for example, shows the productivity distributions of plants in Spain

Source: Antras and Yeaple (2014)



Vertical FDI – Evidence

- While it is easy to come up with examples of firms engaged in vertical FDI, the aggregate importance of vertical FDI appears to be limited:
 - 1) According to Fact 1, most FDI flows not to developing countries but to other developed countries
 - 2) According to Fact 5, a relatively small fraction of affiliate output is exported back to the host country
 - 3) Ramondo et al (2012) document that most foreign affiliates sell all of their output in the host country
- Notice that this does not imply that foreign sourcing is unimportant just that most such transactions occur at arm's length



Internalization - Overview

- In our models of horizontal and vertical FDI, we have simply assumed that multinational production takes place within the boundaries of multinational firms
- In practice, firms of course also have the possibility to conduct arm's length transactions through licensing or subcontracting
- We will now consider the literature on firms' internalization decisions in order to complete our understanding of multinational firms
- The **internalization decision** is the decision to keep production in-house or to license or subcontract it to another firm



Internalization – Overview (contd.)

- The unifying theme of the literature on multinational firm boundaries is the departure from the assumption of complete contracting
- After all, firm boundaries are irrelevant in a world in which complete contracts specify all possible contingencies, as pointed out by Coase (1937)
- Different contributions emphasize different types of contractual frictions which can be grouped into the **transaction-costs approach** and the **property-rights approach**
- In the following, we will provide a brief introduction to these two approaches and discuss the related evidence



Internalization – Transaction-costs approach

- The transaction-cost theory argues that firms internalize any transactions for which the costs of transacting across firm boundaries exceed the costs of transacting within firm boundaries
- The concept of **transaction costs** is somewhat vague but is often associated with inefficiencies that arise when transactions are not covered by complete contracts
- Two examples which have received particular attention in the literature on multinational firm boundaries are rent dissipation and hold up inefficiencies
- In particular, rent dissipation inefficiencies have been emphasized in the context of horizontal FDI while hold up inefficiencies have been emphasized in the context of vertical FDI



Internalization – Transaction-costs approach (contd.)

- To understand the role played by rent dissipation inefficiencies, suppose that domestic firms can serve the foreign market through horizontal FDI or licensing
- Suppose further that licensing is more efficient with complete contracts because foreign firms have lower marginal costs due to their superior knowledge of the foreign market
- Add now that domestic firms are not able to appropriate all the rents under licensing perhaps because the foreign licensee can copy parts of its proprietary technology
- Horizontal FDI is then chosen despite its inefficiency unless the foreign marginal cost advantage is too large or the rent dissipation under licensing is too small



Internalization – Transaction-costs approach (contd.)

- To understand the role played by hold-up inefficiencies, suppose that the intermediate input is **relationship-specific** in the sense that it is worth more within than outside the buyer-seller relationship
- The seller could then hold up the buyer and vice versa after they have made their relationship-specific investments leading to inefficient investments in the first place
- If these inefficiencies are large enough across firm boundaries and small enough within firm boundaries, it might make sense for the buyer and seller to integrate
- The hold-up problem is only one of many inefficiencies which can arise with relationship-specificity which makes sense since markets only work well with competition



Internalization – Property-rights approach

- The central idea of the property-rights approach is that internalization matters because ownership is a source of power when contracts are incomplete
- The argument is that the owner of an asset naturally holds residual rights of control when the parties encounter unforeseen contingencies
- This then leads to a theory of the boundaries of the firm in which the costs and benefits of integration are endogenous
- In particular, integration encourages the integrating party but discourages the integrated party to contribute to the relationship so that integration only makes sense if the integrating party's contribution is sufficiently important



Internalization – Property-rights approach (contd.)

- These insights can be applied to a model of vertical FDI featuring headquarter services and manufacturing
- In particular, vertical FDI becomes more attractive the more important are non-contractible headquarter investments
- Similarly, arms-length sourcing becomes more attractive the more important are non-contractible manufacturing investments
- Tradeoffs of this type have been explored in detail in pioneering work by Antras (2003) and Antras and Helpman (2004)

Internalization – Evidence

Dep. Var.: $\frac{\text{Intrafirm Imports}}{\text{Total Imports}}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (R&D/Sales + 0.001)	0.33** [0.05]	0.32** [0.05]	0.25** [0.06]	0.09** [0.02]	0.08** [0.02]	0.09** [0.02]	0.07** [0.02]	0.06* [0.03]
Log (Skilled/Unskilled)	0.10 [0.07]	0.16* [0.07]	0.14 [0.11]	0.07* [0.029]	0.07* [0.029]	0.01 [0.02]	0.03 [0.03]	0.03 [0.03]
Log (Capital/Labor)	0.28** [0.05]							
Log (Buildings/L)		-0.23** [0.10]	-0.11 [0.09]	-0.14** [0.03]	-0.14** [0.03]	-0.08* [0.03]	-0.10** [0.04]	-0.05 [0.04]
Log (Equipment/L)		0.46** [0.09]						
Log (Autos/L)			-0.24** [0.06]	-0.08** [0.02]	-0.07** [0.02]	-0.05** [0.01]	-0.07** [0.02]	-0.07** [0.02]
Log (Computer/L)			0.12 [0.10]	0.05 [0.03]	0.03 [0.03]	0.06* [0.03]	0.05 [0.03]	0.02 [0.04]
Log (Other Eq./L)			0.39** [0.09]	0.14** [0.03]	0.17** [0.03]	0.13** [0.03]	0.17** [0.04]	0.13** [0.04]
Seller Contractibility					-0.05* [0.02]	0.05** [0.03]	0.05** [0.03]	0.05 [0.03]
Buyer Contractibility						-0.11** [0.02]	-0.09** [0.03]	-0.12** [0.03]
Buyer Productivity Dispersion								0.03 [0.03]
Freight Costs								-0.05** [0.01]
Tariffs								-0.02** [0.000]
Headquarter controls	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer
Restricted Sample	No	No	No	No	No	No	Yes	Yes
Observations	2,888	2,888	2,888	214,694	214,694	227,829	85,691	55,161
R-Squared	0.28	0.30	0.35	0.18	0.18	0.18	0.16	0.20

Standard errors clustered at the industry level are in brackets.

*Significant at 5%

**At 1%

Columns 1–3 include year fixed effects. Columns 4–8 include country-year fixed effects.

Source: Antras and Yeaple (2014)

- The share of intrafirm imports in total imports is commonly used as a proxy for the relative importance of vertical FDI
- The R&D or capital intensity of an industry is commonly used as a proxy for the headquarter intensity
- There appears to be a robust positive relationship between the importance of non-contractible investments by headquarters and the prevalence of intra-firm imports



Conclusions

- In this lecture, we took a closer look at multinational firms and their foreign direct investment (FDI)
- Rather than focusing on one particular model, we provided an overview of the literature in this area following the excellent survey of Antras and Yeaple (2014)
- Our main questions were: Why do some firms operate in more than one country while others do not? What determines in which countries production facilities are located? Why do firms own foreign facilities rather than simply contract with local producers or distributors?
- A curious feature is that all models we saw feature immobile capital so that they are strictly speaking models of multinational production and not FDI



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