

# The Formation and Operation of the Multinational Enterprise

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Lecture 2: Firm heterogeneity and the  
organization of production.

# Outline of lecture 2

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1. Firm heterogeneity in models of horizontal FDI
2. Defining vertical FDI, outsourcing and offshoring
3. Vertical FDI and wage gradients
4. Leave over to Marc

# The theory of the MNE and firm heterogeneity

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- “Traditional” approaches assume representative firms
  - Can be grouped in types of firms with identical technology.
- Sometimes not rich enough to use as basis for empirical analysis at firm level.
  - Firms exhibit strong variation in size and productivity within industries.
- Recent models incorporate firm heterogeneity along the lines of Melitz (2003, *Econometrica*).
- Helpman, Melitz and Yeaple paper shows that firms sort into different firm types:
  - national firms selling only for the local market
  - national exporting firms
  - multinational firms.

# Model of HFDI with heterogenous firms

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## Assumptions:

- There are two countries: 1 and 2
- Let  $c_1=c_2=1$
- There is free entry and exit of firms producing different varieties of a good.
- Demand of a variety is given by  $A_i p^{-\sigma}$ ,  $i=1,2$ ,  $\sigma>1$
- To enter a firm needs to pay a fixed cost,  $F_E$ . The firm then draws a unit input coefficient,  $a$ , from a distribution  $G(a)$ . If  $a$  is high the firm may exit.
- The following additional fixed costs apply:
  - $F_D$  simply to produce (H+F before).
  - $F_X$  to export (distribution network)
  - $F_I$  to invest abroad (distribution network + plant-level fixed costs)

## HFDI with heterogenous firms (cont.)

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- Consumer price for domestic sales:  $p = a/\alpha$ ,  $\alpha = (\sigma - 1)/\sigma$
- Consumer price for exports:  $p = \tau a/\alpha$ ,  $\tau \geq 1$

**Operating profits on domestic sales:**

$$\pi_D = a^{1-\sigma} B_1 - F_D$$

**Operating profits on exports:**

$$\pi_X = (\tau a)^{1-\sigma} B_2 - F_X$$

$$B_i = \frac{(1-\alpha)A_i}{\alpha^{1-\sigma}}$$

**Operating profits on affiliate sales:**

$$\pi_I = a^{1-\sigma} B_2 - F_I$$

Determine equilibrium cut-off points w r t productivity levels for different supply strategies.

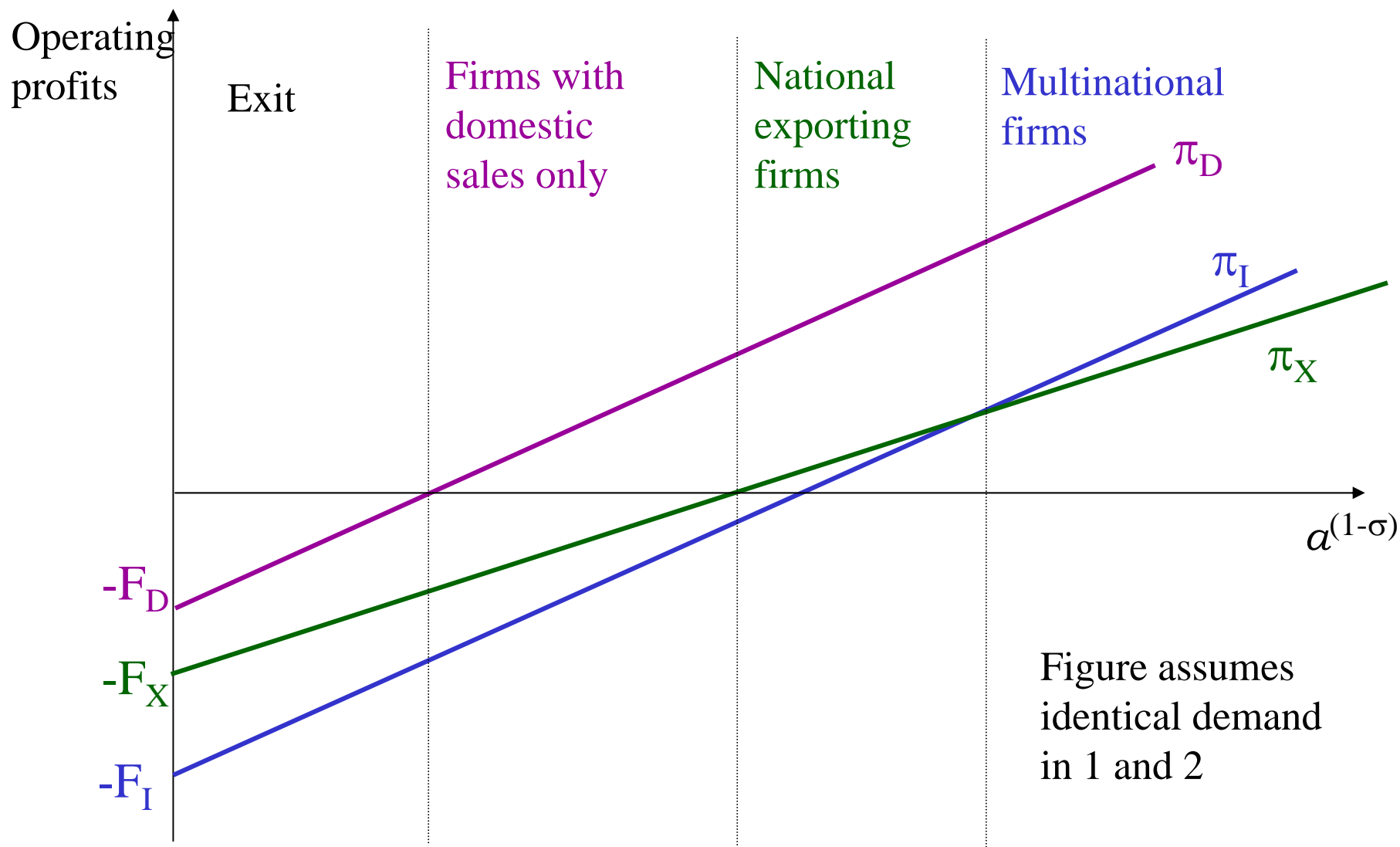
## HFDI with heterogenous firms (cont.)

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- Additional equilibrium condition: expected profits of entering equal to fixed entry cost in equilibrium:

$$\int_0^{a_D} (a^{1-\sigma} B_1 - F_D) dG(a) + \int_{a_I}^{a_X} ((\tau a)^{1-\sigma} B_2 - F_X) dG(a) \\ + \int_0^{a_I} (a^{1-\sigma} B_2 - F_I) dG(a) = F_E$$

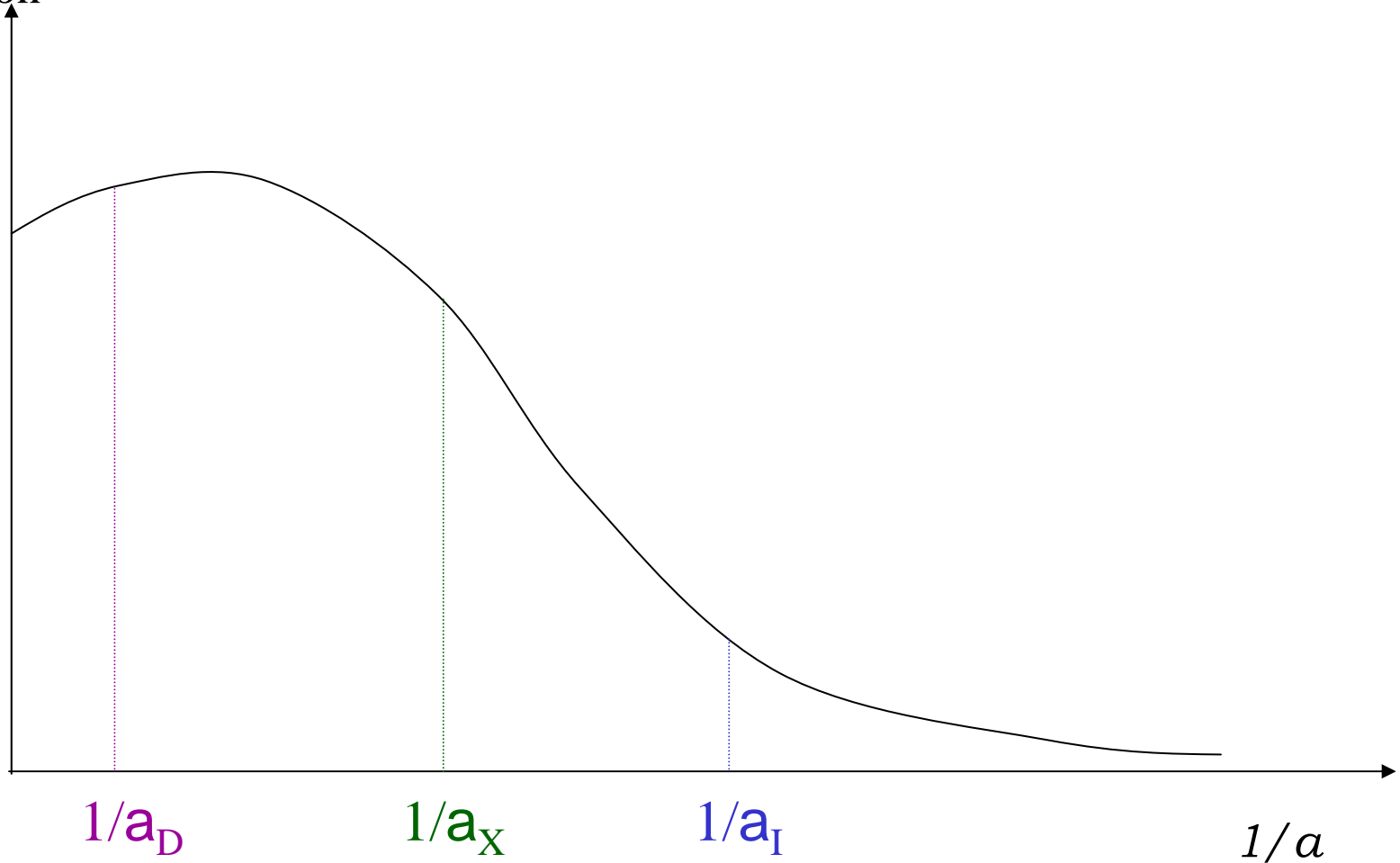
# HFDI with heterogenous firms (cont.)



# HFDI with heterogenous firms (cont.)

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Probability  
distribution



## HFDI with heterogenous firms (cont.)

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- Predictions generated consistent with observed differences between firms:
  - Exporting firms more productive than non-exporting firms (previously shown)
  - MNEs more productive than non-MNEs (find 15 percent productivity advantage of MNEs)
- Additional prediction tested in the paper:
  - Industries with a higher degree of dispersion in productivity should have lower relative export sales.
  - Find support for the hypothesis using US data.

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

*Notes:* *T*-statistics are in parentheses (calculated on the basis of White standard errors). Coefficients for capital intensity controls and industry effects are suppressed.

Source: Helpman, Meliz and Yeaple (2004)

# VFDI, offshoring and outsourcing

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- Suppose a firm has the blueprint of a product which is produced in two stages:
  - Component production, C
  - Assembly, A
- Possible outcomes
  - The firm carries out C and A at home
    - national vertically integrated firm
  - The firm carries out C (A) at home and A (C) abroad
    - **VFDI (offshoring of A (C))**
  - The firm carries out C (A) at home and licenses a domestic firm to carry out A (C)
    - national firm with domestic **outsourcing**
  - The firm carries out C (A) at home and licenses foreign firm to carry out A (C)
    - national firm with foreign **outsourcing (offshoring of A (C))**
- Suppose A is labor intensive and wages at home relatively high

# Fragmentation of production (cont.)

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Trade costs for  
final goods

Components at home, assembly at home and abroad (HFDI and trade in components)

All production at home, no exports

Components at home, assembly abroad (VFDI and trade in both comp. & final output)

All production at home, exports

Trade costs for components

# Fragmentation of production and the wage gradient

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- Suppose there are two countries, N and S, but product only demanded in N
- Condition for firm to be indifferent between offshoring of A and domestic production:

$$[c(w_N)\tau^c + a(w_S)]\tau^a = [c(w_N) + a(w_N)]$$

$c(w_i)$  = cost of producing one unit of components

$a(w_j)$  = factor input cost of assembling one unit of final output

- For given trade costs and wage rate in N, this expression defines the maximum wage level in S consistent with firms wanting to invest.

## Fragmentation of production and the wage gradient (cont.)

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- The higher the level of trade costs, the lower this maximum level of the wage rate.
- Conclusion: remoteness affect equilibrium wage levels.