

Firms and Trade

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Trade and FDI

- **Trade and FDI among fastest growing economic activities globally early in decade, e.g., in 2003:**
 - (i) Merchandise exports, \$7.3 trillion; (ii) Service exports, \$1.8 trillion; (iii) FDI inflows, \$560 billion**
- **1990-2001, sales by foreign affiliates of multinational corporations (MNCs) expanded faster than exports of goods and services**
- **Systematic relationship appears to exist between characteristics of firms and their participation in both foreign trade and investment**

Trade and Firms

- **Relatively little attention given in traditional trade models to firms that actually drive trade flows**
- **Exporting actually quite a rare activity – in 2000, of 5.5 million firms operating in US, only 4% engaged in exporting (Bernard *et al.*, 2007)**
- **Even in industries more likely to be involved in exporting, manufacturing, mining and agriculture, only 15% of firms likely to be exporters**
- **More recent data from 2002 US Census of Manufactures confirms this (see table)**

Exporting By U.S. Manufacturing Firms, 2002

<i>NAICS industry</i>	<i>Percent of firms</i>	<i>Percent of firms that export</i>	<i>Mean exports as a percent of total shipments</i>
311 Food Manufacturing	6.8	12	15
312 Beverage and Tobacco Product	0.7	23	7
313 Textile Mills	1.0	25	13
314 Textile Product Mills	1.9	12	12
315 Apparel Manufacturing	3.2	8	14
316 Leather and Allied Product	0.4	24	13
321 Wood Product Manufacturing	5.5	8	19
322 Paper Manufacturing	1.4	24	9
323 Printing and Related Support	11.9	5	14
324 Petroleum and Coal Products	0.4	18	12
325 Chemical Manufacturing	3.1	36	14
326 Plastics and Rubber Products	4.4	28	10
327 Nonmetallic Mineral Product	4.0	9	12
331 Primary Metal Manufacturing	1.5	30	10
332 Fabricated Metal Product	19.9	14	12
333 Machinery Manufacturing	9.0	33	16
334 Computer and Electronic Product	4.5	38	21
335 Electrical Equipment, Appliance	1.7	38	13
336 Transportation Equipment	3.4	28	13
337 Furniture and Related Product	6.4	7	10
339 Miscellaneous Manufacturing	9.1	2	15
Aggregate manufacturing	100	18	14

Sources: Data are from the 2002 U.S. Census of Manufactures.

Trade and Firms

- Overall share of US manufacturing firms that export relatively small at 18%
- Share of firms exporting in each industry category varies widely, e.g., 38% in computers and electronic products, 23% in beverage and food products, to 8% in apparel manufacturing
- Exporters ship relatively small share of total shipments overseas, share across firms being 14%
- Again wide variation across industries, e.g., 21% in computers and electronic products, to 7% in beverage and tobacco products

Firms and Trade Theory

- **Observation that, exporting more likely by skill-intensive as opposed to labor-intensive US firms, fits traditional model of trade**
- **Traditional model cannot explain why some firms export and others produce only for domestic market, and firms symmetric in new trade models**
- **In US, exporting firms found to be larger, more skill and capital-intensive, and pay higher wages than non-exporters (Bernard *et al.*, 2007)**
- **US MNCs enjoy 15% productivity advantage over exporting firms, who in turn have 39% advantage over domestic-only suppliers (Helpman *et al.*, 2004)**

Firms and Trade Theory

- **Two key hypotheses proposed to explain higher productivity of exporters:**
 - **exporting requires extra resources in terms of transportation, distribution and marketing costs, workers with foreign managerial skills, and modification of products for export – impose a barrier only more productive firms can bear**
 - **firms can improve productivity by capturing knowledge and technical spillovers from participation in international markets, i.e., *learning by doing* effect**

Firms and Trade Theory

- Role of fixed entry costs also important in both export and FDI-decisions
- Allowing for heterogeneous firms brings two new insights into trade models:
 - differences in productivity *within* industries matter
 - resource allocation happens within industries after trade liberalization, i.e., number of firms and volume of exports can change – *extensive* and *intensive* margins
- How is this captured in a simple model? Focus on Helpman *et al.* (2004)

Theoretical Framework

- **N countries that use labor to produce goods in $H+1$ sectors; one sector produces homogeneous good with a unit of labor per unit of output; H sectors produce differentiated goods, $h=1\dots H$**
- **β_h of income spent on h , remaining fraction $1-\sum_h \beta_h$ spent on homogeneous good which is *numeraire***
- **Country i endowed with L^i units of labor, wage rate is w^i**
- **Consider a particular sector h , and drop h notation**

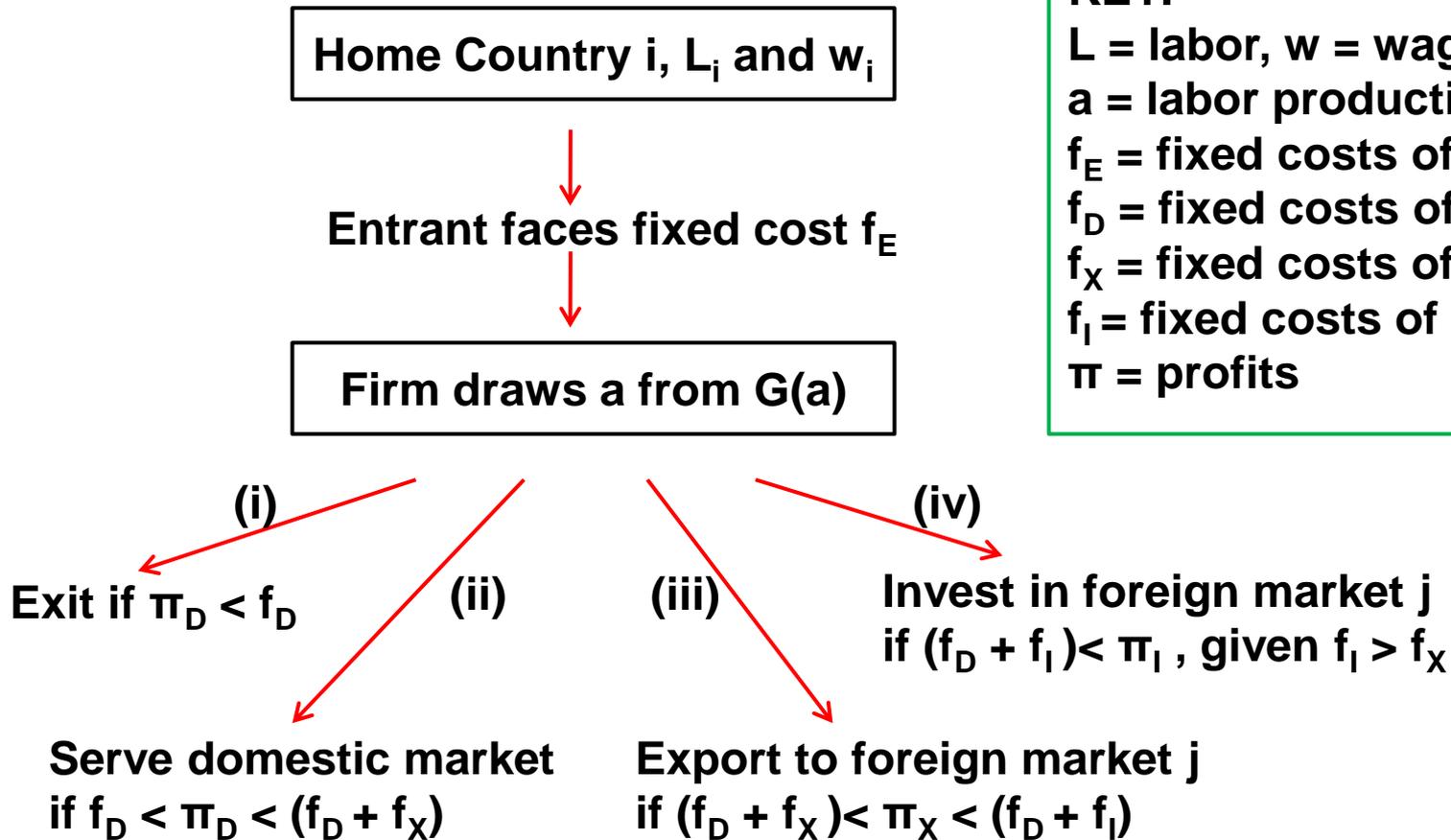
Theoretical Framework

- Only factor of production is labor L , and to enter an industry, firms incur a fixed cost, f_E
- Upon entry, firms draw labor productivity coefficient a (labor per unit output) from distribution $G(a)$
- With given a , firms in country i have four choices (see Figure 1):
 - (i) Exit domestic market
 - (ii) Serve domestic market only
 - (iii) Export
 - (iv) Set up foreign production (*horizontal FDI*)

Theoretical Framework

- If a firm chooses to produce for domestic market, bears fixed overhead labor costs f_D
- If firm chooses to export, it bears additional fixed costs f_X per foreign market, where f_X are costs of forming distribution and servicing network in foreign country
- If firm chooses FDI, it bears f_I in every foreign market, which include costs of forming subsidiary in each country, and duplicating f_D
- Goods transported from I to j subject to iceberg transport costs of $\tau^{ij} > 1$

Figure 1: Firm Choices



KEY:

L = labor, w = wage rate
 a = labor productivity
 f_E = fixed costs of entry
 f_D = fixed costs of home supply
 f_X = fixed costs of exporting
 f_I = fixed costs of FDI
 π = profits

Theoretical Framework

- Firms engage in *monopolistic competition*
- Preferences across varieties of h modeled as CES utility with elasticity of substitution $\varepsilon = 1 / (1 - \alpha) > 1$
- These preferences generate demand function in i for every brand, $A^i p^{-\varepsilon}$, where demand level A^i is treated as exogenous by individual firm
- Brand of monopolistic firm with labor coefficient a , offered at price $p = w^i a / \alpha$, where $1/\alpha$ is mark-up
- Effective domestic price is $w^i a / \alpha$, supplied by domestic firm or foreign affiliate, and if good is imported, effective price is $\tau^{ji} w^j a / \alpha$

Theoretical Framework

- Firm in country i that remains in industry always serves domestic market through domestic production, but it may also serve market j via exporting or FDI
- Choice driven by proximity-concentration trade-off: relative to exports, FDI saves transport costs, but duplicates production facilities, i.e., higher fixed costs
- In equilibrium no firm engages in both exports and FDI in a foreign market, assume:

$$\left(\frac{w^j}{w^i} \right)^{\varepsilon-1} f_i > (\tau^{ij})^{\varepsilon-1} f_x > f_D$$

Theoretical Framework

- Assume unit wages $w^i = 1$, operating profits for a firm serving domestic market are:

$$\pi_D^i = a^{1-\varepsilon} B^i - f_D$$

for a firm with productivity coefficient a , and B_i is a monotonic function of demand level A^i

- Additional profits from exporting to country j are:

$$\pi_X^{ij} = (\tau^{ij} a)^{1-\varepsilon} B^j - f_X$$

- Profits from FDI in j are:

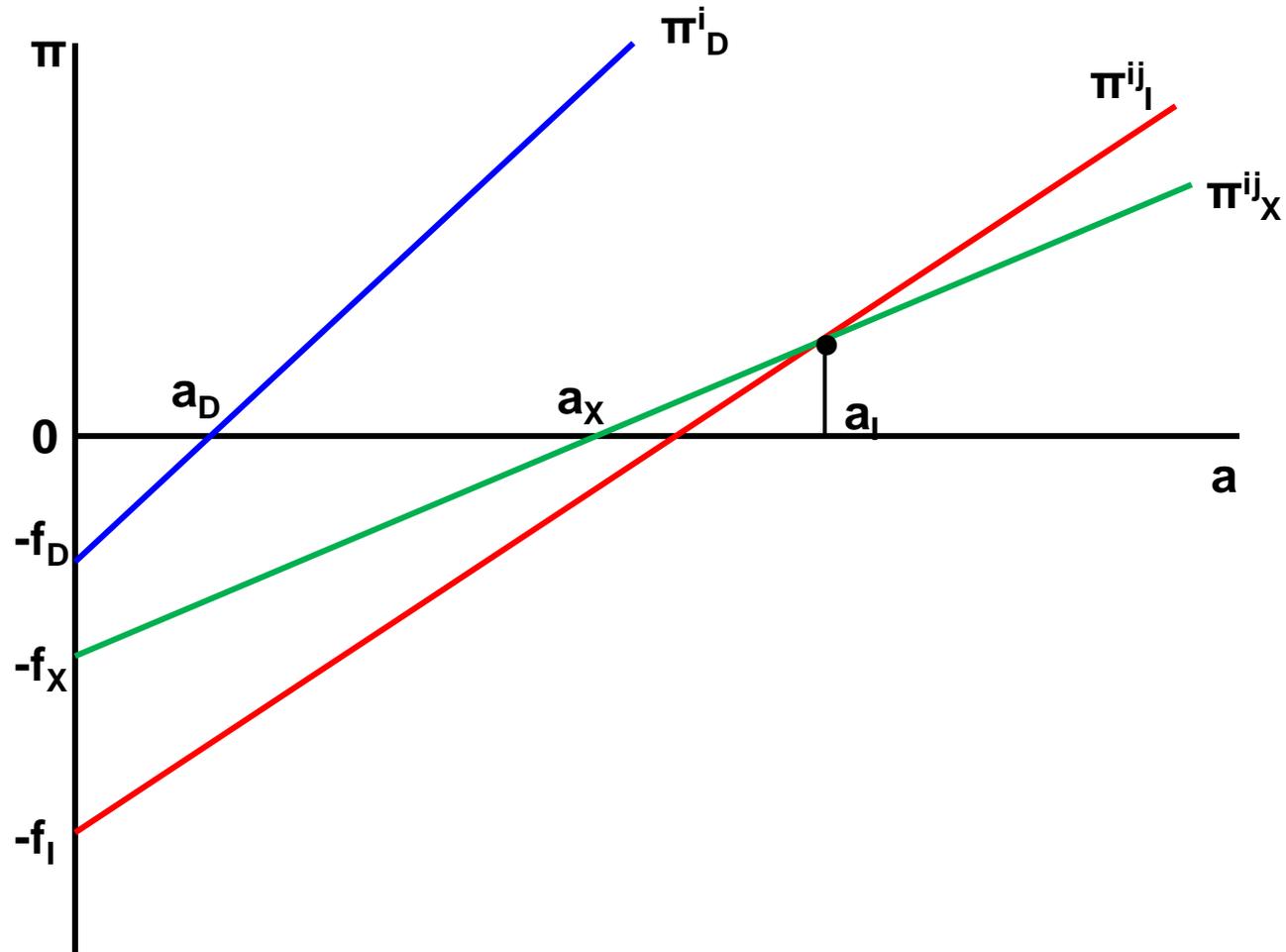
$$\pi_I^j = a^{1-\varepsilon} B^j - f_I$$

- Profit functions are increasing and linear: more productive firms are profitable in all three activities

Theoretical Framework

- In Figure 2, along horizontal axis, firm productivity (a) increases, while profits π are measured on vertical axis
- Domestic and FDI profit functions have same slope, as countries i and j are assumed to be the same in terms of demand, labor endowment and wages
- However, if there were tariffs on imports by i , slope of domestic profit function would be steeper
- Profits from exporting scaled by existence of trade costs t , so slope of export profit function is shallower
- Sorting pattern of firms is consistent with empirical evidence (Helpman *et al.*, 2004)

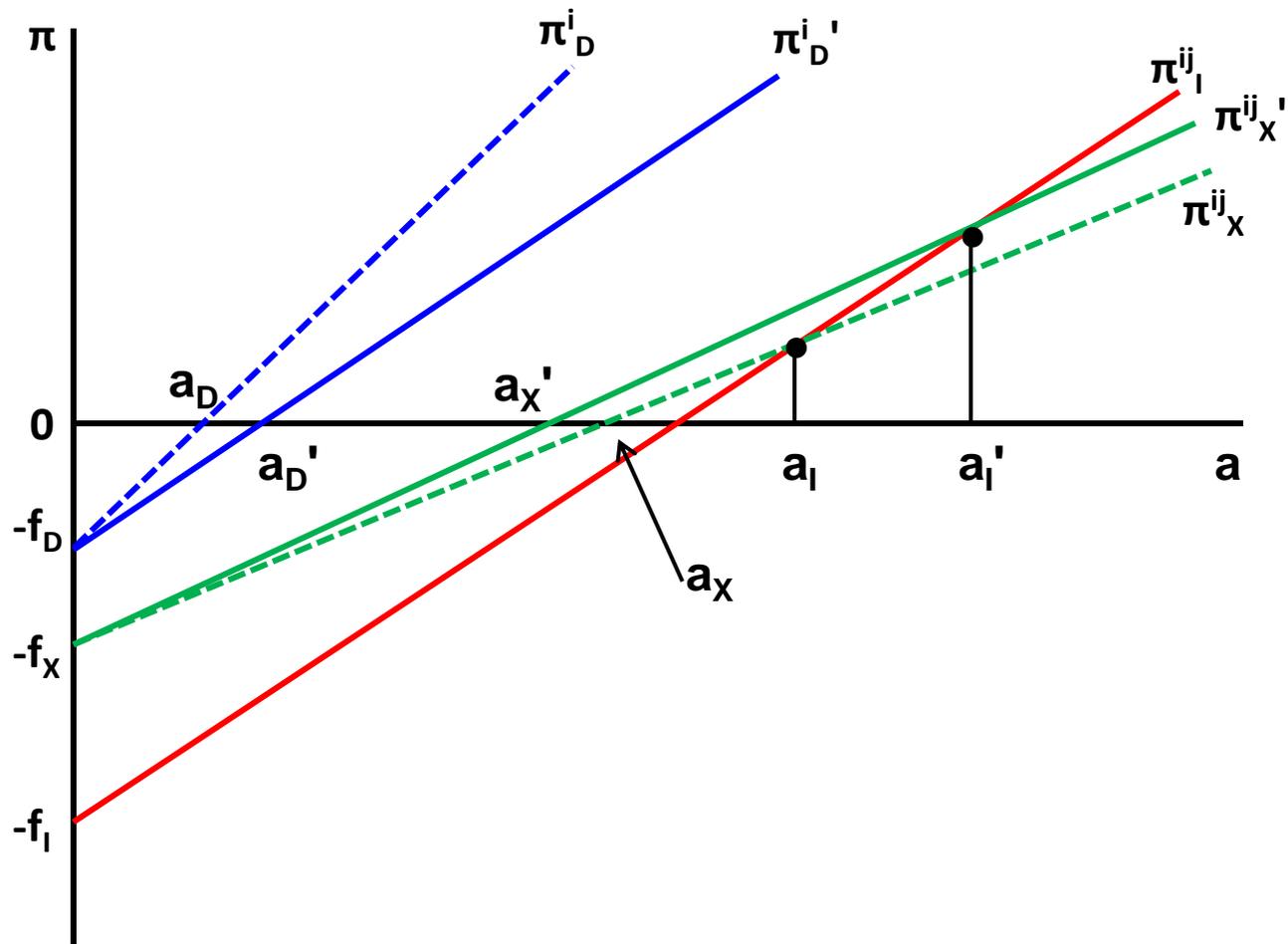
Figure 2: Profits from Domestic Sales, Exports and FDI



Firms and Trade Liberalization

- **Suppose productivity pattern same as in Figure 2**
- **If trade liberalization is treated as a reduction in t , raises (lowers) profits of existing exporters (non-exporters), and lowers (raises) their productivity cutoff (Figure 3)**
- **Firms previously only supplying domestic market may become exporters (extensive margin), and volume of exports also increases (intensive margin)**
- **Labor demand increases due to increase in both exports and number of firms exporting – wages bid up, reducing profits of non-exporting firms**

Figure 3: Trade Liberalization



Firms and Trade Liberalization

- **Induces low productivity firms to exit market, resulting in higher average industry productivity due to turnover of firms from domestic to export markets (Melitz, 2003; Bernard *et al.*, 2007)**
- **Even though there are within industry gains, the gains are greater in any industry that has stronger comparative advantage – i.e., greater export opportunities intensify impact on wages, driving out more low-productivity firms**
- **Differential productivity growth across industries magnifies factor-abundance-based gains from trade**

General Equilibrium Results

- **Larger countries attract disproportionately larger number of entrants and larger number of sellers – welfare per worker in larger country higher due to increased product variety**
- **Larger markets disproportionately served by domestically-owned firms – a “home-market” effect**
- **All countries share same cut-offs in each category, as long as countries do not differ too much in size, and wages are same everywhere**
- **Industry average productivity endogenously determined and affected by changes in trade costs – does not diminish role of R+D in raising productivity, i.e., R+D affects $G(a)$**

Applications to Food Processing

- **Food processing firms key constituent of manufacturing sector, and in some LDCs, account for major share of manufacturing, e.g., Chile, Colombia**
- **Food firms exhibit heterogeneity in terms of productivity, plant size, and capital and skill intensity (Bernard et al., 2007; Tybout, 2000; Echeverria, 2006)**
- **Few studies have explored impact on food industry export behavior – may be a data issue: less clarity on various stages involved in exporting or overseas production, hence harder to figure impact of productivity dispersion/sunk and trade costs**

Conclusions

- **Role of firms in traditional and new trade models limited – Ricardian/Heckscher-Ohlin models focus industries, while monopolistic competition model of Krugman assumes identical firms**
- **Empirical evidence indicates firms differ across and within industries of a country in multiple dimensions such as productivity**
- **Implies comparative advantage (disadvantage) does not mean all firms in an industry export (import)**
- **Additional gains from trade from increased within-industry productivity is critical**