



# **Ninth ARTNeT Capacity Building Workshop for Trade Research "Trade Flows and Trade Policy Analysis"**

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# Firms in international trade

## Stylized facts about firms in international trade

- Firms are heterogeneous
- The extensive and intensive margin of trade at the firm level
- Only few firms export
- Exporting is concentrated
- Exporters are different
- Most productive firms self-select into exporting
- Trade liberalization raises industry productivity
- Evidence on importing firms
- Overview of major trade theories
- Melitz (2003) in a nutshell

## Firms are heterogeneous

- Across all the US plants in 1992 ([Bernard et al., 2003](#)) :
  1. A plant one standard deviation above the mean size is 167% bigger than the average
  2. A plant one standard deviation above the mean plant productivity level is 75% more productive

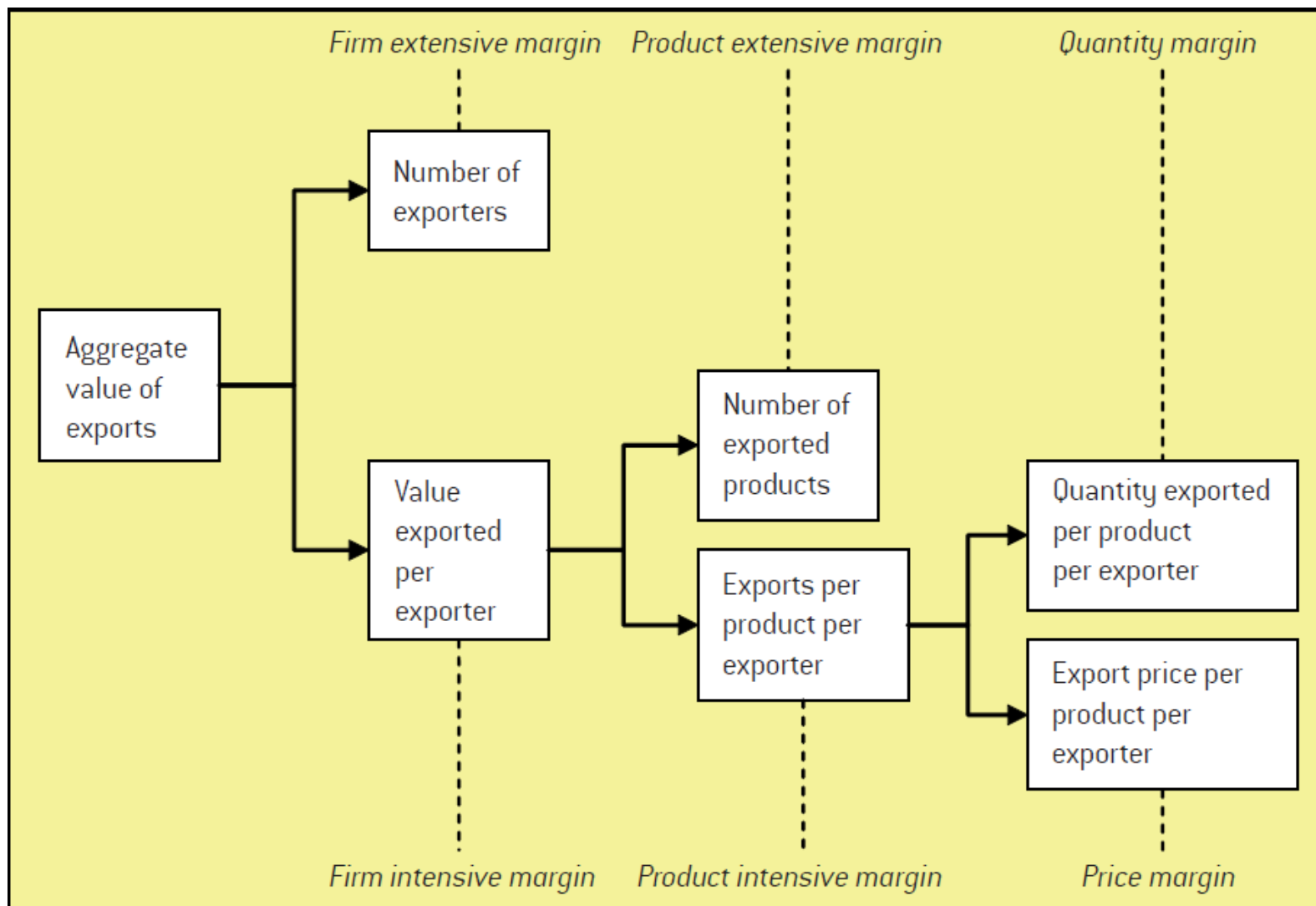
## Firms are heterogeneous (ct'd)

- The distribution of firms size is dispersed, even within sectors (evidence of heterogeneity across firms)

Table 1: Heterogeneity of firms (standard deviation of log sales)

Country	Producers	Overall	Within sector
France	76,456	1.82	1.7
Italy	39,704	1.33	1.29
Spain	31,446	1.26	1.18
US (plants)	224,009	1.67	-

## The extensive and intensive margin of trade at the firm level



Source: Mayer and Ottaviano (2007)

## Only few firms export

Table 2: Share of exporters in total number of manufacturing firms

	Year	Share of exporters in total number of manufacturing firms
United States	2002	18.0
Norway	2003	39.2
France	1986	17.4
Japan	2000	20.0
Chile	1999	20.9
Colombia	1990	18.2
Indonesia	1991-2000	19.0

Sources: [WTO \(2008, Table 5\)](#); [Amiti and Cameron \(2012\)](#) for Indonesia

## Only few firms export (ct'd): Heterogeneity across sectors

Table 3: Heterogeneity of US firms ([Bernard et al. 2007](#))

Sector	Per cent of firms	Per cent of Firms that export	Mean Exports as a per cent of total shipments
Food manufacturing	6.8	12	15
Beverage and tobacco products	0.7	23	7
Textile mills	1	25	13
Textile product mills	1.9	12	12
Apparel manufacturing	3.2	8	14
Leather and allied product	0.4	24	13
Wood product manufacturing	5.5	8	19
Paper manufacturing	1.4	24	9
Printing and related support	11.9	5	14
Petroleum and coal products	0.4	18	12
Chemical manufacturing	3.1	36	14
Plastics and rubber products	4.4	28	10
Nonmetallic mineral products	4	9	12
Primary metal manufacturing	1.5	30	10
Fabricated metal product	19.9	14	12
Machinery manufacturing	9	33	16
Computer and electronic product	4.5	38	21
Electrical equipment	1.7	38	13
Transportation equipment	3.4	28	13
Furniture and related product	6.4	7	10
Miscellaneous manufacturing	9.1	2	15
<b>Aggregate Manufacturing</b>	<b>100</b>	<b>18</b>	<b>14</b>



## Only few firms export (ct'd)

- Exporting firms ship a small share of their total shipments abroad
  - In the US, the average is 14% (see Table 3)
  - The shares range from 21% in computer sector to 7% in beverages
- In the EU, the *intensive margin* (share of export value over total turnover) is as follows:

Table 4. Intensive margin of exports in the EU

	Austria	France	Germany	Hungary	Italy	Spain	UK
Intensive margin	40.4	28.5	30.0	44.8	34.6	25.9	29.1

Source: [Second EFIGE Report \(2011\)](#)

Note: Samples of firms (large firms over-represented)

## Exporting is concentrated

- “Superstar exporters”: aggregate exports are driven by a small number of top exporters

Table 5. Per cent of exports accounted for by largest exporters

	Year	Top 1%	Top 5%	Top 10%
United States	2002	80.9	93	96.3
Belgium	2003	48	73	84
France	2003	44	73	84
Germany	2003	59	81	90
Hungary	2003	77	91	96
Italy	2003	32	59	72
Norway	2003	53	81	91
UK	2003	42	69	80
Chile	1999	49.1	82.2	96.4

Source: [WTO \(2008, Table 6\)](#)

## Exporting is concentrated

- Larger firms are more likely to export
- The share of exporters increases with firm size: in EU countries, the difference in the *extensive margin* (percentage of firms that export a fraction of their sales) between the group of firms with 10-19 employees and the group of firms with at least 250 employees is above 25%

Table 6. Extensive margin of exports, by country and firms size

Firm size	UT	FRA	GER	HUN	ITA	SPA	UK
10-19	69.8	44.7	45.7	58.9	65.4	51.2	54.9
20-49	63.8	59.1	65.4	64.7	73.3	63.5	62.8
50-249	88.6	75.4	78.2	79.3	86.6	76.2	76.8
> 249	90.8	87.6	84.0	97.4	92.6	88.0	80.7
<b>Total</b>	<b>72.6</b>	<b>57.9</b>	<b>63.4</b>	<b>67.3</b>	<b>72.2</b>	<b>61.1</b>	<b>64.0</b>

## Exporting is concentrated

- Among exporters, larger firms export a higher share of their turnover
- The higher the size class the higher the intensive margin (although differences across size classes are less pronounced than for the extensive margin)

Table 7. Intensive margin of exports, by country and firms size

Firm size	AUT	FRA	GER	HUN	ITA	SPA	UK
10-19	26.2	23.0	25.9	30.2	30.4	21.4	26.2
20-49	33.3	27.0	28.1	43.6	34.2	24.5	27.8
50-249	55.9	33.0	33.9	53.2	42.2	33.3	33.2
> 249	64.7	41.2	37.8	66.6	52.6	40.6	34.2
<b>Total</b>	<b>40.4</b>	<b>28.5</b>	<b>30.0</b>	<b>44.8</b>	<b>34.6</b>	<b>25.9</b>	<b>29.1</b>

Source: [Second EFIGE Report \(2011\)](#)

## Exporters are different

- Firms that export look very different from non-exporters. US Exporters:
  - are larger by 97% for log employment and 108% for shipments
  - are more productive by 11% for log value added and 3% for log TFP
  - pay higher log wages by 6%
  - own more physical and human capital

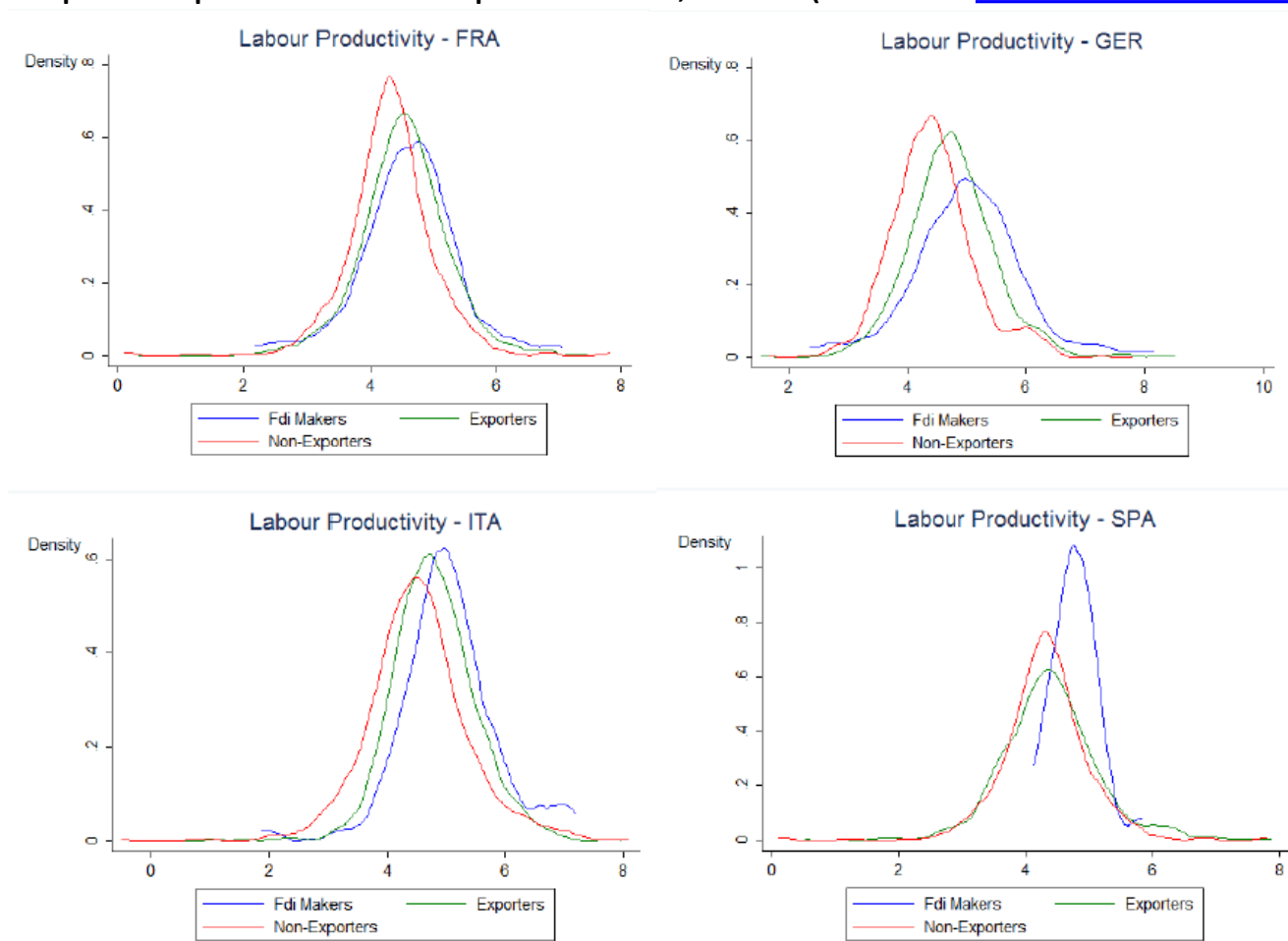
Table 8. Exporter premia in US manufacturing (source: [Bernard et al. 2007](#))

	(1)	(2)	(3)
Log employment	1.19	0.97	
Log shipment	1.48	1.08	0.08
Log VA per worker	0.26	0.11	0.1
Log TFP	0.02	0.03	0.05
Log wage	0.17	0.06	0.06
Log capital per worker	0.32	0.12	0.04
Log skill per worker	0.19	0.11	0.19
Additional covariates	None	Industry f.e.	Industry f.e. and log employment

## Exporters are different (ct'd)

- Among EU countries, exporters have higher labour productivity than non-exporting firms

Table 9. Exporter premia in European firms, 2008 (Source: [Second EFIGE Report, 2011](#))



## Exporters are different (ct'd)

- Larger firms export to a higher number of destination markets

Table 10. Average number of export destinations by country and size class

Size Class	AUT	FRA	GER	HUN	ITA	SPA	UK
10-19	5	7	7	3	8	5	9
20-49	8	9	12	4	10	8	12
50-249	18	14	18	6	17	12	18
> 249	32	24	28	14	29	23	27
<b>Total</b>	<b>12</b>	<b>11</b>	<b>14</b>	<b>5</b>	<b>11</b>	<b>8</b>	<b>13</b>

Source: [Second FIGE Report \(2011\)](#)

## Most productive firms self-select into exporting

- The finding that exporters are systematically more productive than non-exporters raises the question of whether exporting causes productivity growth through some form of “learning by exporting”
- A lot of studies across industries and countries confirm that high productivity precedes entry into export markets. This indicates the presence of sunk costs
- Moreover some other studies find little or no evidence of improved productivity as a result of beginning to export ([Bernard and Jensen 1999](#); [Clerides et al. 1998](#))
- However, there is abundant evidence of the fact that firms entering export market grow faster in terms of employment and output than non-exporters



## Trade liberalization raises industry productivity

- Given that exporters are more productive than non-exporters and that exporters grow faster than non-exporters, trade liberalization has an important role in enhancing aggregate productivity through reallocation across firms
  - Aggregate productivity growth is driven by the contraction and exit of low-productive firms and by the expansion and entry into export markets of high-productivity firms
  - This reallocation of resources from low to high productive plants raises average productivity level
- [Pavcnik \(2002\)](#) finds that two-third of the 19% increase in aggregate productivity following Chile's trade liberalization of the late 1970's and early 1980's was due to the relatively greater survival and growth of high-productivity plants
- This evidence has been shown for both developing and developed countries

## Trade liberalization raises industry productivity (ct'd)

- The increase in average productivity after trade liberalization is also due to the within-plant productivity gains from the reallocation of resources across activities within plants ([Pavcnik 2002](#))
- [Trefler \(2004\)](#) finds that Canada-US Free Trade Agreement raised labour productivity of Canadian firms by 7.4% or by an annual compound growth rate of 0.93%
- [Bernard et al. \(2006\)](#) find that a one standard deviation reduction in industry-level trade costs (i.e. trade liberalization) raises plant-level productivity growth by 2.3%

## Evidence on importing firms: [Bernard et al. \(2011\)](#)

- Around 41 per cent of US exporters also import while 79 per cent of importers also export
- Importers are bigger, more productive, pay higher wages and are more skill- and capital-intensive than non-importers
- Firms which both import and export exhibit the largest performance differences compared to domestic firms
- Recent evidence suggests that reductions in tariffs on imported intermediate inputs may be a prominent source of productivity gains
  - [Amiti and Konings \(2007\)](#)

## Overview of major trade theories

- Traditional and “new” trade models assume “representative” firms
- Incorporating firm heterogeneity (in terms of productivity) in trade models allows to explain empirical observations and brings new insights regarding the gains from trade and trade policy

Table 11. Trade theories and gains from Trade, trade patterns and distribution (WTO, 2008)

	Traditional trade theory Ricardo, Heckscher-Ohlin	“New” trade theory Krugman(1980)	Heterogeneous firms models Melitz (2003)
Gains from trade (causes)			
Specialization	Yes	No	No
Economies of scale	No	Yes	Yes
Pro-competitive	No	Yes	No
Variety	No	Yes	No <sup>1</sup>
Aggregate productivity (through selection/ reallocation)	No	No <sup>2</sup>	Yes
Trade patterns			
Inter-industry	Yes	No	No
Intra-industry	No	Yes	Yes
Exporters and non-exporters within industries	No	No	Yes
Distribution			
Trade liberalization affects relative factor rewards	Yes	No	No

## Melitz (2003) in a nutshell

- Key assumptions:
  - Heterogeneity with respect to firm's marginal costs (productivity)
  - Fixed entry costs for each market (to be added to the fixed cost for developing a new variety)
- The Melitz model is a dynamic model with heterogeneous firms where opening to trade leads to:
  - No change in firm productivity
  - A change in aggregate industry productivity and welfare gain due to a reallocation of resources within an industry from low to high productivity firms
  - Low productivity firms exit as increased labour demand bids up real wages (and due to increased competition by foreign exporters, [Melitz and Ottaviano, 2008](#))
  - High productivity firms enter the export market and increase their market share

## Conclusions and implications

- Strong differences among firms (heterogeneity) in terms of size, productivity, etc. Their different performances suggest:
- Inappropriateness of traditional trade models which consider the “representative” firm
- In new-new trade models such as [Melitz \(2003\)](#) firm level heterogeneity leads to self-selection of firms into export markets and welfare gains arise from the re-allocation of resources from less to more productive firms
- Trade policies such as tariffs, subsidies, etc. have more than simple traditional *Term of Trade effect*. They potentially affect:
  - The probability to survive for a firm competing in the domestic market
  - The probability of entry the foreign market
  - The average industry productivity level