Universität Zürich[UZH]

Topic 8 – Heterogeneous Firms

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Introduction

- So far, we have made little effort to provide a realistic description of the role played by firms in international trade

- In the Ricardian and Heckscher-Ohlin model, we assumed firms to be atomistically small. In the Krugman model, we assumed firms to be all the same

- In this lecture, we will discuss a body of research which focuses on the role played by firms in international trade

- The main theme will be that firms are heterogeneous and that this heterogeneity matters for understanding international trade

Overview of the lecture

- Present some facts about firm heterogeneity and international trade

- Sketch the Melitz (2003) model which captures these facts

- Discuss what firm heterogeneity implies for the gains from trade

Facts

1) Few firms export

2) Exporting firms are different

3) Trade liberalization raises industry productivity

Facts – Few firms export

- Only 4 percent of US firms were exporters in 2000. Among these 4 percent, the top 10 percent accounted for 96 percent of total US exports

- Only 18 percent of US manufacturing firms were exporters in 2002. Remember that manufacturing goods account for the bulk of US exports

- The percentage of firms that export is higher in more skilled-labor intensive sectors, giving rise to a pattern of inter-industry trade consistent with the Heckscher-Ohlin model

- The percentage of firms that export is positive in all sectors, giving rise to a pattern of intra-industry trade consistent with the Krugman model

Facts – Few firms export (contd.)

Exporting By U.S. Manufacturing Firms, 2002

NAICS industry	*Percent of firms*	*Percent of firms that export*	*Mean exports as a percent of total shipments*
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**

Source: Bernard et al (2007)

Facts – Exporting firms are different

Exporter Premia in U.S. Manufacturing, 2002

	Exporter premia		
	(1)	*(2)*	*(3)*
Log employment	1.19	0.97	
Log shipments	1.48	1.08	0.08
Log value-added per worker	0.26	0.11	0.10
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 fixed effects	Industry fixed effects, log employment

Sources: Data are for 2002 and are from the U.S. Census of Manufactures.
Notes: All results are from bivariate ordinary least squares regressions of the firm characteristic in the first column on a dummy variable indicating firm's export status. Regressions in column 2 include industry fixed effects. Regressions in column 3 include industry fixed effects and log firm employment as controls. Total factor productivity (TFP) is computed as in Caves, Christensen, and Diewert (1982). "Capital per worker" refers to capital stock per worker. "Skill per worker" is nonproduction workers per total employment. All results are significant at the 1 percent level.

Source: Bernard et al (2007)

- Exporting firms outperform non-exporting firms along a number of dimensions
- In particular, they
  - are larger
  - are more productive
  - pay higher wages
  - are more capital intensive
  - are more skill intensive

Facts – Exporting firms are different (contd.)

- Are exporting firms more productive than non-exporting firms because exporting is a challenging activity only high-productivity firms can master?

- Or is it instead because exporting makes firms more productive through some sort of learning-by-exporting?

- The consensus view in the empirical literature is that the causality mainly runs from productivity to exporting and not the other way round

- One fact is that high productivity tends to precede exporting in the time series which is suggestive of selection into exporting

Facts – Exporting firms are different (contd.)

- The finding that exporters are more skilled-labor intensive implies that Stolper-Samuleson effects may be at work within industries

- In particular, the relative demand for skills is then likely to rise following trade liberalization thus pushing up the skill premium and inequality

- This is another example of how Stolper-Samuelson like effects may be partially responsible for the recent increase in inequality even though the textbook Stolper-Samuelson effect is not

<u>Clicker question:</u>

What was the other example of how Stolper-Samuelson like effects may be partially responsible for the recent increase in inequality?

Facts – Trade liberalization increases industry productivity

- Low-productivity firms tend to contract or even exit following trade liberalization while high-productivity firms tend to expand

- The reason is that trade liberalization subjects import-competing firms to more import competition while giving export-oriented firms more export opportunities

- One implication of this is that trade liberalization increases industry productivity by reallocating resources from less to more productive firms

Facts – Trade liberalization increases industry productivity (contd.)

– Pavcnik (2002), for example, considers Chile's trade liberalization of the late 1970s and early 1980s. She finds that Chile's manufacturing productivity increased by 19 percent due to this trade liberalization

– Two-thirds of these 19 percent were due to a reallocation of resources from low-productivity to high productivity firms. The remaining one-third was due to firm-level productivity increases

- Similar findings emerge from a large number of studies of trade liberalization reforms in other developing countries, such as Turkey (1984), Cote d'Ivoire (1985), Mexico (1984-1990), and India (1991)

- Moreover, Trefler (2004) finds that the Canada-US Free Trade Agreement (1989) increased labor productivity in Canada's manufacturing sector by about 6 percent overall

Melitz model

- Melitz (2003) has extended the Krugman model to account for these facts. While the details of the Melitz model are complicated, its basic story is easy to understand

- The Melitz model differs from the Krugman model in two key respects. First, firms are assumed to be heterogeneous in terms of productivity. Second, firms are assumed to face fixed costs of exporting

- Such fixed costs of exporting are meant to capture that firms must learn about foreign markets, adapt their products to meet foreign regulations, set up new distribution channels, and so on

Melitz model (contd.)

- Because of these fixed costs of exporting, only the most productive firms find it profitable to export. This explains facts 1) and 2)

- Since only the most productive firms export, only the most productive firms expand following trade liberalization thereby bidding up factor prices and forcing the less productive firms to contract. This then explains fact 3)

- Just like the Krugman model, the Melitz model can again be combined with our earlier models of comparative advantage

- If you think of world trade through the lens of a Ricardo-Heckscher-Ohlin-Krugman-Melitz model, you think the way most trade economists now do

Gains from trade

- The original interpretation of the Melitz model was that the domestic productivity gains resulting from resource reallocations constitute a new source of gains from trade

- Indeed, the conventional wisdom was that the “new” import variety and domestic productivity gains predicted by “new” trade models simply magnify the “traditional” comparative advantage gains

- This conventional wisdom was questioned in an influential paper by Arkolakis et al (2012) which we already came across in Topic 3

- Their main point is that the same gains from trade formula applies in a whole range of so-called gravity models, i.e. models delivering a gravity equation of the sort discussed in Topic 1

Gains from trade (contd.)

– Specifically, they show that the gains from trade formula we derived in the Armington model also applies in mainstream versions of the Ricardian model, the Krugman model, and the Melitz model

$$G = \lambda^{-\frac{1}{\varepsilon}}$$

– λ denotes the **own trade share**, that is the share of domestic goods in total expenditure. ε denotes the **trade elasticity**, that is the partial elasticity of trade flows with respect to trade costs

– In the Armington model and the Krugman model, the trade elasticity is given by $\sigma - 1$ so that the formula is exactly the same as in Topic 3

– In mainstream versions of the Ricardian model and the Melitz model, it is instead given by a parameter θ which captures the dispersion of productivities across industries or firms

Gains from trade (contd.)

- This result means that if we calibrate these models to the same trade elasticity and own trade share (which seems sensible), they all predict the same gains from trade

- This suggests that the **extensive margin adjustments** (i.e. adjustments at the entry and exit margin) featuring so prominently in the Melitz model do not affect the gains from trade

- Intuitively, this is because domestic variety losses exactly offset the import variety gains and import productivity losses exactly offset the domestic productivity gains

- Trade liberalization allows additional foreign firms to enter into exporting (import variety gains) which are less productive than incumbent foreign exporters (import productivity loss). It also forces some domestic firms to shut down (domestic variety losses) which are less productive than surviving domestic firms (domestic productivity gain)

Gains from trade (contd.)

- The Arkolakis et al (2012) equivalence result is a theoretical result which is based on common but strong modeling assumptions

- Hsieh at al (2017) relax some of these assumptions and study the extensive margin effects of the Canada-US Free Trade Agreement (CUSFTA) empirically

- They find that Canada lost more from the exit of Canadian firms than it gained from the entry of new US exporters thus actually experiencing negative “new” gains from trade

- However, they also find that Canada still gained from CUSFTA overall since the tariff cuts reduced import prices substantially

Conclusions

- Few firms export, exporting firms are more productive, and trade liberalization increases industry productivity
- These facts can be explained by the Melitz model which adds firm heterogeneity and fixed exporting costs to the Krugman model
- While it is tempting to think that the Krugman and Melitz model capture “new” import variety and domestic productivity gains, lowering import prices is still the main benefit of liberalizing trade

References

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