

Exporting and the innovation life-cycle

evidence from Germany

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Innovation and trade has been heavily studied, but much remains not well understood:

- mechanisms for how firms conduct innovations
- differences in motivations/reasons for innovation between exporters, non-exporters

Questions (how and why):

- 1 do exporters innovate in different ways?
- 2 do successful exporters' innovation behaviour differ from less successful exporters' and non-exporters' behaviour?

Why should we care?

Innovation is a prime policy and academic concern, so need to understand drivers and composition of innovation:

- if pre and post-exporting innovation the same, and exporting causes more innovation, then boosting exporting ⇒ more innovation, which is good!
- but what if innovations for exporters are different?
 - do we want certain types of innovation more?

Important to understand innovation motivations and how innovation is conducted:

- How and why are important

Questions (how and why):

- 1 do exporters innovate in different ways? YES
 - exporters perform less “new” innovation
 - patents, licenses, designs, research and development, etc.
- 2 Does successful exporters’ innovation behaviour differ from less successful exporters’ and non-exporters’ behaviour? YES
 - firms in exporting periods less likely to innovate for experimentation, product design, research
 - more likely to spend on marketing their innovations/products

Ifo Institute (Munich) Business Innovation Panel:

- German annual survey data on innovation behaviour
- sample: German manufacturing firms, 1997-2011
 - 10-13 % sample, by employment
- many firms can be linked across several years
 - final sample: 1,337 firms and 11,048 observations
- basic firm information (employment, 2-digit NACE sector, revenue, export share, etc.)

- quantitative measures of innovation (expenditure shares)
 - innovation expenditure shares of process versus product innovation
 - expenditure shares for experimental development, patents, designs, etc.
- qualitative measures of innovation
 - whether innovations need R&D, patents, licenses, product design
 - use to construct measure of whether innovations conducted are “new”

Unstable exporters

Problem: how to get within-firm variation for stable periods of exporting?

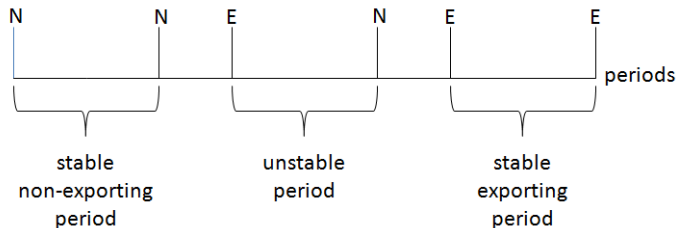
- not many firms transition to exporting cleanly
- many firms go back and forth in export status (unstable exporters)
- may be insufficient to simply use export status dummy

Solution: look at unstable exporters (firms that switch export status > 1 times)

- unstable exporters go through stable exporting and/or stable non-exporting periods
- if there are within-firm changes, should see differences in innovation behaviour as firms transition through periods

Unstable exporters example

A firm observed for 6 periods, where it goes through exporting years (E) and non-exporting years (N):



Specification

Within-firm specification (restrict sample to firms observed for 6 or more consecutive years):

$$INN_{ist} = \beta_0 + \beta_1 UNSTABLE_{ist} + \beta_2 STABLE_{ist} + \eta_t + \alpha_i + \epsilon_{ist}$$

- *INN* = innovation dependent variable
- *UNSTABLE* = firm is in an unstable period (fluctuate between export and non-export status)
- *STABLE* = firm is in a period where it is exporting for at least 3 consecutive years
- baseline firm status = a stable non-exporting period, where firms have not exported for at least 3 consecutive years
- all specifications are **within-firm** (firm fixed-effects)
- following results all conditional on obs. where firms report positive innovation expenditures

Main results

	(1)	(2)	(3)	(4)	(5)
Dep. Var.:	marketing preparation expenditure	research expenditure share	product design expenditure share	new product innovation	new process innovation
Type:	continuous	continuous	continuous	binary	binary
Range:	[0,100]	[0,100]	[0,100]	[0,1]	[0,1]
<i>UNSTABLE</i>	1.36* (.748)	-1.23 (1.01)	-2.26* (1.20)	-.0737*** (.0283)	-.0277 (.0350)
<i>STABLE</i>	1.44* (.751)	-1.97* (1.01)	-3.51*** (1.21)	-.169*** (.0288)	-.0465 (.0361)
p-value, $\beta_1 = \beta_2$.3281	.6035	.6583	.0858	.2330
Dep. Var. Mean	5.319	7.074	12.191	.2580	.3177
firm FE	yes	yes	yes	yes	yes
NACE-year FE	yes	yes	yes	yes	yes
obs.	3,511	3,511	3,511	4,191	3,667
adj. R^2	.3675	.6043	.3366	.3961	.3266

Innovation completion and export switching

To try to pin down whether innovation completion induces firms to begin exporting, use specification:

$$EXPORT_{ist} = \beta_0 + \beta_1 PROJECT_{ist} + \beta_2 INN_{ist} + \beta_3 PROJECT_{ist} * INN_{ist} + \gamma_{st} + \alpha_i + \epsilon_{ist}$$

where:

- *EXPORT* is dummy for export status
- *PROJECT* is dummy for completion of innovation project
- *INN* is innovation variables from before

	(1)	(2)	(3)	(4)	(5)	(6)
INN_{ist}	none	marketing preparation expenditure	research expenditure	product design expenditure	new product innovation	new process innovation
<i>PROJECT</i>	.139*** (.0103)	.00159 (.0118)	.0076 (.0115)	.0163 (.0122)	.0143 (.0173)	.0095 (.0130)
<i>INN</i>		-.00159 (.001)	-.00135* (.0007)	.00019 (.0006)	-.1193*** (.0317)	.0113 (.0196)
<i>INN * PROJECT</i>		.0022* (.0012)	.0005 (.0008)	-.0007 (.0006)	-.003 (.0339)	-.0093 (.0227)
firm FE	yes	yes	yes	yes	yes	yes
NACE-year FE	yes	yes	yes	yes	yes	yes
obs.	8,267	8,267	8,267	8,267	4,750	8,267
R^2	.1989	.5869	.5870	.5869	.5328	.5868

Summary of empirical results

- firms in exporting periods:
 - spend more on marketing
 - spend less on research
 - spend less on product design
 - do less product innovation
- project completion:
 - associated with export switching

Evidence is consistent with need to experiment at beginning of firm life

- firms spend prop. more on experimentation, design

Successful experimentation lowers costs/increases quality

- firms more likely to be able to export (Melitz cutoffs)
- firms re-orient innovation towards marketing, to protect/promote their top product

- Evidence that firms' innovation differs during exporting and non-exporting periods
 - ① pre-exporting, more experimenting, product design, new innovations
 - ② post-exporting, less experimenting, more marketing
- more work needs to be done:
 - ① fully specify Melitz model with experimentation, solve GE
 - ② qualitative measures of innovation (motivations, obstacles)