Innovation-exports behavior in developing countries: How this causal relationship change in acquisition of knowledge or R&D?

Fernando Greve

April 10, 2017

Abstract

Using micro-level data from a developing country (Chile), I study an econometric causality test (Granger) to study the relationship between the innovation effort and the exports propensity, considering how this causal relationship change under technological adoption or R&D expenditures. The results show a difference in the causal direction between innovation and exports according to the type of innovation engaged, where the acquisition of knowledge shows a mutual reinforcing (reciprocal causality); rather that R&D expenditure, where causality is found from exports towards innovation (Learning-by-Exporting) and not in the opposite direction. Both the former idea and result are important given that the main source of technological progress in developing countries is related to technological adoption from developed countries, rather that in-house R&D.

Keywords: Exports, Innovation, Learning-by-Exporting, Self-Selection, Mutual Reinforcement, Granger Causality Test, Developing Countries

1 Introduction

The available of new firm-level detailed data has promoted a great amount of research which study innovation, exports and firm performance. The main findings are consistent with the idea of positive relationship between: exports, productivity and innovation [Bernard and Jensen (1999); Crepon et al. (1998) and López-Rodríguez and García-Rodríguez (2005)]. In relation to innovation activities, while some firms engaged in R&D projects and new technology creation (mainly firms from developed countries), most of them simply imitate or adapt existing production techniques to local conditions [Evenson and Westphal (1995) ; (UNCTAD, 1999)]. In developing countries, the former idea is important because the main source of technological progress is related to technological adoption from developed countries, rather that in-house R&D [(Hoekman, Maskus, & Saggi, 2004); (UNCTAD, 2004)]. Furthermore, study innovation doing the distinction between technological adoption and R&D is important, especially for developing countries. This paper aims to provide evidence, for developing countries, of the causal relationship between the innovation effort and the export propensity, considering how this causal relationship change under technological adoption or R&D expenditures. Which is a contribution regarding previous papers in two main aspects. First, there

are few studies that take into account the firm-level export-innovation relationship in developing countries, and those few research that do it, take into account only R&D expenditure as innovation and they do not consider acquisition of knowledge [(Benavente, Ortega-Bravo, & Gonzlez, 2013); (lvarez, Garca, & Garca, 2008); (eker, 2012); (lvarez & Robertson, 2004) and (Almeida & Fernandes, 2007)]. In that sense, my paper study an interesting aspects for the mainly low-tech firms from developing countries. Firms in developing countries innovate, but not in a sophisticated-disruptive way like developed ones. They do not have large R&D departments and laboratories; rather, they adapt external knowledge and technology, in the form of patents, license, and new machinery for innovation. They performs little improvements to their products in order to achieve new market requirements and expand, the change the shape of products and not their technical specifications. Furthermore, firms innovations are mainly related to other expenses, like acquisition of knowledge, rather than R&D.

Secondly, there is not literature that study innovation-export causal relationship considering both R&D and acquisition of knowledge separately. For one side, there is a considerable amount of literaturemainly in developed countriesthat study the effects of innovation on firms exporting behavior (Barrios, Grg, and Strobl 2003; Cho and Pucik 2005; Daz-Daz, Aguiar, and Sa-Prez 2008; Kylheiko et al. 2011; Vila and Kuster 2007; Basile 2001; Cassiman and Golovko 2010 and Wakelin 1998). In the other side, some literature has examined the reverse relationshipnamely, the effect of exports on firms technological resources and innovation (Golovko and Valentini 2011; Hitt, Hoskisson, and Kim 1997). Internationalized firms are able to maintain their international competitiveness by acquiring more experience and technological knowledge in foreign markets (Zahra, Ireland, and Hitt 2000). These papers examine only a single causal direction of innovation-export relationship (Cho and Pucik 2005; Damijan, Kostevc, and Polanec 2010; Kylheiko et al. 2011), and have not consider the double relationship (Kumar and Saqib 1996; Salomon and Shaver 2005; Zahra, Ireland, and Hitt 2000). With only a few notable exceptions (Filatotchev and Piesse 2009; Golovko and Valentini 2011; Monreal-Prez, Aragn-Snchez, and Snchez-Marn 2012), which jointly examine innovations and exports without define the causality relation previously. Golovko and Valentinis (2011, p. 375) study highlights a dynamic virtuous circle with regard to innovation and exports, arguing that they are complementary activities that reinforce each other, and whose individual marginal contribution to [small and medium-sized enterprises] sales growth is higher if the other activity is also in place. Their study complements that of Fila- totchev and Piesse (2009) by examining the joint effect of innovation and exports over small and medium-sized enterprises growth. Filipescu (2015) study the double causal effect between a firms export and innovation activities, which has been overlooked insofar as they have typically been related to one another unidirectionally (Pla-Barber and Alegre 2007; Vila and Kuster 2007). None of these study the relationship between the innovation effort and the exports propensity, considering how this causal relationship change under technological adoption or R&D expenditures.

Table 1: Summary Stats Mean, by type (logarithmics values)

	all-sample	no-expend	expend	tech	know	train
Sales	14.7	14.4	15.5	15.0	15.9	16.1
Export	13.8	13.5	14.6	15.1	14.5	14.3
Innov.Exp	10.3	.	10.3	10.2	10.4	10.3
Labor	3.8	3.6	4.6	4.2	4.7	4.9
Observations	2317	1738	579	282	42	255

Source: Authors elaboration.

Table 2: Summary Stats Mean, by type (logarithmic values)

	all-sample	no-expend	expend	tech	know	train
Labor Productivity	10.9	10.8	11.0	10.8	11.2	11.2
Export.worker	9.0	9.0	9.1	9.9	8.2	8.6
Innov.Exp.Worker	5.7	.	5.7	6.0	5.7	5.4
Observations	2317	1738	579	282	42	255

Source: Authors elaboration.

Table 3: Summary Stats Mean, by type (percent values)

	all-sample	no-expend	expend	tech	know	train
Export.Intensity	5.4	5.0	6.4	7.3	5.5	5.5
Innov.Intensity	4.9	0.0	19.7	28.1	2.2	13.4
Observations	2317	1738	579	282	42	255

Source: Authors elaboration.

Table 4: F-statistics, Granger Causality Test: Export Intensity

	general	tech	know	train
model				
$Innov.Effort_t$	-	-	-	-
$Innov.Effort_{t-1}$	+	-	+	+
FE Other Expend.	No	Yes	Yes	Yes
FE Sector	Yes	Yes	Yes	Yes
FE Geog	Yes	Yes	Yes	Yes
F-stat.	0.00	0.04	0.61	0.89
Prob > F	1.00	0.96	0.54	0.41
Obs.	2,317	2,317	2,317	2,317
Obs.Uncensured	364	364	364	364
Obs.Censured	1,953	1,953	1,953	1,953
Estimation	tobit	tobit	tobit	tobit

Source: Author's elaboration based on information from the EIT and Enia.
Control Var: Labor, Foreign Property.

Table 5: F-statistics, Granger Causality Test: Innovation Effort

	general	tech	know	train
model				
$Export.Intensity_t$	+	+	-	+
$Export.Intensity_{t-1}$	-	-	+	-
FE Other Expend.	No	Yes	Yes	Yes
FE Sector	Yes	Yes	Yes	Yes
FE Geog	Yes	Yes	Yes	Yes
F-estat.	1.25	2.09	0.10	0.89
Prob > F	0.29	0.12	0.91	0.41
Obs.	2,317	2,317	2,317	2,317
Obs.Uncensured	579	482	92	255
Obs.Censured	1,738	1,835	2,225	2,062
Estimation	tobit	tobit	tobit	tobit

Source: Author's elaboration based on information from the EIT and Enia.
Control Var: Labor, Foreign Property.

References

Andrew B. Bernard and J. Jensen. Exceptional exporter performance: cause, effect, or both? *Journal of International Economics*, 47(1):1–25, 1999. ISSN 0022-1996. doi: http://dx.doi.org/10.1016/S0022-1996(98)00027-0. URL http://www.sciencedirect.com/science/article/pii/S0022199698000270.

B. Crepon, E Duguet, and J. Mairesse. Research, Innovation and Productivity: An Econometric Analysis at the Firm Level. *Economics of Innovation and New Technology*, 7(2), 1998.

R. E. Evenson and L. E. Westphal. Technological change and technology strategy. In Blackwell Publishers, editor, *Handbook of Development Economics*. H. Chenery, and T. Srinivasan, 1995.

José López-Rodríguez and Rafael M. García-Rodríguez. Technology and export behaviour: A resource-based view approach . *International Business Review*, 14(5):539 – 557, 2005. ISSN 0969-5931. doi: http://dx.doi.org/10.1016/j.ibusrev.2005.07.002. URL http://www.sciencedirect.com/science/article/pii/S0969593105000739.