

Competitiveness and innovation towards green growth in developing countries: a case study of Brazil

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Plat du jour

- Background introduction
- Literature survey
- Hypotheses and model development
- Data
- Results and discussion
- Conclusion



Background introduction

- ◉ Addressing climate change & historic challenges of development
 - > *“We are not in the face of new problems, but of old problems that have become more severe”* Raul Prebisch
- ◉ Green leapfrogging/Tunnelling through the EKC
 - > Avoid carbon lock-in
 - > Enhance well-being
 - > Promote environmental protection
- ◉ Can green innovation promote competitiveness?
- ◉ Can the tax system promote green innovation?

Why Brazil?

- ◉ Prominent role in the economy:
 - > In 2011, it became the sixth largest economy in the world
 - > In less than 10 years Brazil has doubled its share of the global GDP (from 1.5% in 2003 to 3.3% in 2011)
- ◉ Social improvements
- ◉ Green power: forests, water, biodiversity
 - > However, Brazil's growth has been occurring at the cost of ever increasing fossil fuel burning

Literature survey

- What is green innovation?
 - > implementation of a new or significantly improved product (good or service), or process, or a new organizational method in business practice, that is either motivated by environmental improvement aims (i.e. this is its intention) or, more broadly, whose use is (effectively) less environmentally harmful than available alternatives (regardless of intention)
- What is economic competitiveness?
 - > Intangible
 - > Labour productivity as proxy: pros and cons
- Limited literature in the case of developing countries
- Main findings:
 - > Green innovation is a part of firms' competitive strategies
 - > Evidence of positive, yet indirect influence of green innovations (environmental impact-reducing technologies) on competitiveness (in terms of reduced costs and/or improved quality, of value added and of operational performance)
 - > Evidence that the determinants of green innovation are similar to those of non-green innovation
 - > Evidence of demand-led competitive gains regardless of its environmental sustainability (Kaldor-Verdoorn Law)
 - > No literature on taxes & green innovation

Hypotheses

- Hypothesis 1: economic competitiveness is enhanced by innovation (green and non-green separately) and demand forces
 - > The level of labour productivity is positively associated with innovation (green and non-green separately) and demand components
 - > The rate of labour productivity is positively associated with innovation (green and non-green separately) and demand components.
- Hypothesis 2: tests the determinants of innovation (both green and non-green)
 - > Traditional determinants and taxes

Model development

- 1a: $LP_i = GI_i + NGI_i + FD_i + \varepsilon_i$
- 1b: $LPC_i = GI_i + NGI_i + FDC_i + \varepsilon_i$
- 2a: $GI_i = AV_i + OC_i + IE_i + ORD_i + TAX_i + \varepsilon_i$
- 2b: $NGI_i = AV_i + OC_i + IE_i + ORD_i + TAX_i + \varepsilon_i$
- Dummies:
 - > DP for pollution intensive sectors
 - > DR for leading product innovation strategy
- Generalized Least Squares analysis on a pooled cross-sectional database at industry level

Data

- ◉ Sources: National Innovation Survey & National Accounting System
- ◉ Data treatment:
 - > Correspondence
 - > Real values
 - > Compound rate of change
- ◉ 24 manufacturing sectors
- ◉ 2005-2008
- ◉ Multicollinearity & heteroskedasticity tests

Results

● Model 1a

$$\begin{aligned} > LP_{2008} = & GI_{2006-2008} + DPGI_{2006-2008} + NGI_{2006-2008} \\ & + DPNGI_{2006-2008} + EXP_{2005-2008} + DREXP_{2005-2008} + \\ & HH_{2005-2008} + DRHH_{2005-2008} + INV_{2005-2008} + \\ & DRINV_{2005-2008} + \varepsilon \end{aligned}$$

● Model 1b

$$\begin{aligned} > LPC_{2005-2008} = & GI_{2006-2008} + DPGI_{2006-2008} + \\ & NGI_{2006-2008} + DPNGI_{2006-2008} + EXP_{2005-2008} + \\ & DREXP_{2005-2008} + HH_{2005-2008} + DRHH_{2005-2008} + \\ & INV_{2005-2008} + DRINV_{2005-2008} + \varepsilon \end{aligned}$$

Results

Model	Model 1a	Model 1b		
Dependent variable	LP	LPC		
Independent variables	Coefficient	Coefficient	VIF	Tolerance
Constant	-34,808.03***	-0.0458008		
GI	357,723.2***	0.5563681***	3.66	0.2732
DPGI	-499,520.4**	-0.7000317**	10.54	0.0948
NGI	160,825.4***	-0.3073532*	2.72	0.3674
DPNGI	402,999.9**	0.3665873*	6.99	0.1430
EXP	35,835.9***	0.0031559	1.94	0.5150
DREXP	23,367.43***	-0.1078589*	3.00	0.3335
HH	-77,161.59***	0.3005199***	3.29	0.3044
DRHH	80,667.89***	-0.1323026	4.19	0.2386
INV	2,355.456***	0.0036962***	1.53	0.6527
DRINV	-1,865.774	0.0769221	3.40	0.2944
Log likelihood	-235.387	53.94483		
P > Chi squared	0.0000	0.0000		

Results

● Model 2a:

$$\begin{aligned} > GI_{2006-2008} = AV_{2008} + OC_{2008} + IE_{2008} + DPIE_{2008} + \\ & ORD_{2008} + DPORD_{2008} + II_{2005} + IPI_{2005} + ICMS_{2005} \\ & + \varepsilon \end{aligned}$$

● Model 2b:

$$\begin{aligned} > NGI_{2006-2008} = AV_{2008} + OC_{2008} + IE_{2008} + DPIE_{2008} \\ & + ORD_{2008} + DPORD_{2008} + II_{2005} + IPI_{2005} + \\ & ICMS_{2005} + \varepsilon \end{aligned}$$

Results

Model	Model 2a	Model 2b		
Dependent variable	GI	NGI		
Independent variables	Coefficient	Coefficient	VIF	Tolerance
Constant	-0.2397567***	-0.3551594**		
AV	0.0537841***	0.0482419***	3.24	0.3082
OC	-0.0454813***	-0.0172445**	3.39	0.2954
IE	0.2150534***	0.2809543 **	1.73	0.5789
DPIE	2.616154***	-0.5982864***	8.79	0.1137
ORD	0.0028307***	0.0013396	1.18	0.8496
DPORD	-0.0351601***	0.0044417	8.28	0.1208
II	-0.378663***	0.6955839***	2.82	0.3547
IPI	-0.1685946***	-0.058561*	8.59	0.1164
ICMS	0.1941354***	0.0480294	8.10	0.1235
Log likelihood	74.75358	63.29897		
P > Chi squared	0.0000	0.0000		

Conclusions

- Results corroborated the hypotheses
- Green innovation can be a driver of long term economic development
- Demand components also have an important role
- Impact of taxes on green innovation is complex, which may represent an opportunity for reform

Thank you!

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