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Regioni tra sfide e inopportunità inattese

The multistakeholder approach in fostering eco-innovation in less and more Italian developed regions under the lens of the Smart Specialization Strategy

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1. Introduction

Europe 2020 Strategy indicated the **narrow link between growth and sustainable investments** as key factor for implementing the **Smart Specialization Strategy (SSS)** (European Commission, 2017).

The new technological paradigm and **innovation-driven green strategies** also depend on the collaboration and the **relationships among actors and stakeholders** (Fabrizi, Guarini, & Meliciani, 2018).

Cooperation through the perspective of a **Quadruple Helix (QH)** (Carayannis & Campbell, 2009; Leydesdorff, 2012) may be a consistent long-term strategy for achieving sustainable growth.

From the Smart Specialization Strategy (SSS) point of view, the **QH may strongly contribute to the development of the less developed regions** (Kolehmainen et al. 2016).

2. Theoretical background (1)

Since 2012 **SSS** faces structural weaknesses and potentialities by considering three mutual priority areas: smart growth (based on knowledge and innovation); **sustainable growth (for a greener and competitive economy)**; and inclusive growth (European Commission, 2017).

The “**socio-ecological transition**” is one of the greatest challenge for current and future societies and economies, also recently emphasized with the **European Green Deal** (European Commission, 2019).

The **green transition** requires technological change that fosters productivity (Cassetta & Pini, 2017), disrupts conventional practices and **involve also institutional changes to better support eco-revolution** (Gouvea, Kassicieh, & Montoya, 2013).

SSS develops in the **post-linear era**, relying on a new way of knowledge and innovation production characterized by the **transition towards the QH model**. The QH Innovation System «could serve as the foundation for diverse smart specialization strategies» (Carayannis & Rakhmatullin, 2014, p. 218).



2. Theoretical background (2)

The “**green quadruple helix**” (Gouvea et al., 2013) indicates the involvement of industry, government, university and civil society along the overall green economy’s value chain (Gouvea et al., 2013; Nidumolu, Prahalad, & Rangaswami, 2009; Porter & Reinhardt, 2007).

Government: strengthening the cooperation propensity even further (e.g., Boardman, 2009), thus promoting knowledge exchange between different sectors and actors (e.g. Archer & Cameron, 2009); raising the awareness about the advantages of the green economy; **reduces the uncertainty** and **increases trust** (Molina-Morales, Martínez-Fernández, & Torlò, 2011; Lundvall, 1992).

Universities: foster firms to **access to basic and advanced information and knowledge**; carries out **research activities in a long term vision** (proprietary technology, collaborating research labs, etc.).

Civil society (Yang & Holgaard, 2012): **spreading community's awareness** about environmental problems (Betstill & Corell, 2001), favoring **the appropriation of technologies (including the green ones) into cultural settings** (Yang & Holgaard, 2012).



2. Theoretical background (3)

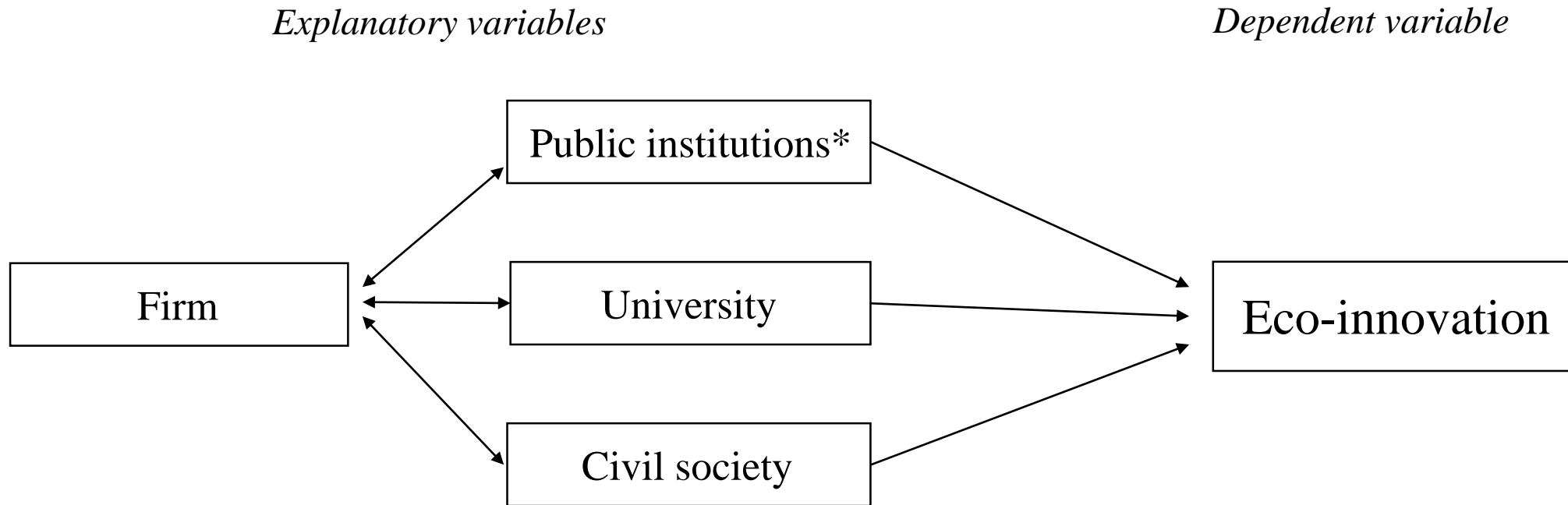
European innovation policy cannot be addressed without **considering the specific territorial resources, governance and institutional capacity of each region** (Rodrigues & Teles, 2017).

This means that **the geography** of the context plays a **key role** in organizing and consolidating the **QH dynamics for fostering the SSS** (Gertler, 2003).

The **needs of firms for the competitiveness** improvement **can differ according to the regions** where they operate, which in turn influences the efficient functioning of the QH (Nordberg, 2015; Höglund & Linton, 2018).



3. Research questions (1)



Disentangling by more (Center-North) and less (South) developed Italian regions



3. Research questions (2)

RQ1: *Is the collaboration with public institutions differently related with the probability of realizing eco-innovation practices for firms located in less developed regions compared to more developed regions?*

RQ2: *Is the collaboration with universities differently related with the probability of realizing eco-innovation practices for firms located in less developed regions compared to more developed regions?*

RQ2: *Is the collaboration with civil society differently related with the probability of realizing eco-innovation practices for firms located in less developed regions compared to more developed regions?*



4. Variables description

Variable	Definition
<i>Dependent variables</i>	
Eco-innovation	Dummy variable: 1 if a firm invested in green technologies involving sustainable products and/or processes (energy efficiency; emissions, raw materials and waste reduction; recycling)
<i>Independent variables</i>	
Public institutions	Dummy variable: 1 if the firm has strong relationships with public institutions (e.g., Chambers of Commerce, local public authorities, government agencies), e.g. for facilities, technological investments (including the green ones), information and support
University	Dummy variable: 1 if the firm has strong relationship with universities, e.g. for research projects, cooperation agreements and technological transfer
Civil society	Dummy variable: 1 if the firm has strong relationship with civil society such as social groups, NGOs, community-based organizations, voluntary organizations and cultural organizations
<i>Control variables</i>	
R&D	Dummy variable: 1 if the firm invested in R&D
Pavitt sector	Dummy variable that takes the value 1 if the firms reports its Pavitt sector: supplier dominated, scale intensive, specialized suppliers, science based
Age	Continuous variable: years since business establishment
Size	Continuous variable: number of employees

5. Data and Method (1)

DATA

The data source is a **survey** carried out by Unioncamere (Italian Union of Chambers of Commerce). We **merged two waves (2018 and 2019)**. Each survey is based on a representative sample of **3,000 Italian manufacturing firms** with at least five employees, corresponding to 2.4% of the whole Italian population in terms of firms and 3.6% in terms of employees. The survey was conducted by CATI (Computer-Assisted Telephone Interviewing) method by a professional contractor with the aim of gathering both qualitative and quantitative information on the firm.

We focused on SMEs as they represent the backbone of the global economy and are crucial to achieve many standard growth including technological progress (OECD, 2019).



5. Data and Method (2)

METHOD

Since each dependent variable takes values 1 and 0 **probit models** were used.

$$P(Eco-innovation_i = 1|QH_i, S_i) = P(\beta_0 + \beta_1 QH_i + \beta_2 S_i + \varepsilon_i > 0) = \Phi(\beta_0 + \beta_1 QH_i + \beta_2 S_i)$$

where:

Eco-innovation indicates if the firm invested in green technologies

QH if the firm has strong relationship with each actor of the Quadruple Helix (Public institution, University, Civil society)

S_i is a vector of all other explanatory variables regarding firm controls

Φ denotes the standard normal cumulative distribution function

ε_i is the normally distributed random error

To quantify the effects on the probability success $P(Y_i=1)$, we calculated the marginal effects: they indicate “the effect on conditional mean of Y of a change in one regressor, say, x_j ” (Cameron and Trivedi [95], p. 343).

We calculated **marginal effects at the means (MEMs)**.

Stata version 15 was used for all estimations.



6. Summary statistics

Variable	South		Center-North	
	Mean	Std. Dev.	Mean	Std. Dev.
<i>Dependent variables</i>				
Eco-innovation	0.353	0.478	0.380	0.485
<i>Independent variables</i>				
Public institutions	0.131	0.338	0.139	0.346
University	0.102	0.302	0.122	0.327
Civil society	0.072	0.259	0.079	0.270
<i>Control variables</i>				
R&D	0.326	0.469	0.371	0.483
Suppliers dominated	0.583	0.493	0.571	0.495
Scale intensive	0.273	0.446	0.208	0.406
Specialized suppliers	0.114	0.318	0.174	0.379
Science based	0.029	0.169	0.046	0.210
Age	32.919	11.221	36.377	12.465
Size	22.216	33.007	30.278	42.223



7. Results and discussion (1)

Preliminary analysis

Dependent variable: *Eco-innovation*

	South		Center-North	
	dy/dx	Std. Err.	dy/dx	Std. Err.
	(1)		(2)	
Public institutions	0.193***	(0.054)	0.009	(0.024)
University	0.002	(0.062)	0.055**	(0.023)
Civil society	0.033	(0.074)	0.128***	(0.030)
+ <i>Controls</i>				
Obs.	886		4,824	
Wald chi-square	95.85***		438.6***	
Pseudo R ²	0.088		0.076	

Note: (a) Dependent variable: eco-innovation = 1 if the firm invest invested in green technologies. (b) The table displays marginal effects at the means (MEMs). (c) Robust standard errors in parentheses. (d) Wald test for all the explanatory variables is reported. (e) Reference Pavitt category: Suppliers dominated.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.



7. Results and discussion (2)

PUBLIC INSTITUTIONS

- In **less developed regions** (South) firm's **relationship with Public institutions** may be more determinant as Public institutions devote consultancy and effective support in moving from the first step toward the competitiveness frontier. Public institutions represents the "efficacy" solution to structural burdens.

UNIVERSITY

- In **more developed regions** (Center-North) firm's **relationship with university** may be the "efficiency" solution for by passing the innovation frontiers and undertake new technological trajectories, involving firms that are less constrained by structural burdens.

CIVIL SOCIETY

- In **more developed regions** (Center-North) **civil society**, being more widespread, evolved and included over years in the decision-making mechanism may express its representativeness in a stronger network of relationships, linkages and knowledge atmosphere that may in turn increase the awareness of eco-innovation.



8. Policy implications

Innovation does not mean only new technologies but involves complexities requiring the **support of diverse stakeholders**.

The policy measures for reinforcing the relationships between actors should take into account **features** and the **level of effectiveness of the actors**.

This means that before encouraging the relationships, it is needful to understand the strength of that actor: **encouraging the firms' relationship with the most effective actor** and, at the same time, **improving the effectiveness of the other actors** before favoring their integration into the Quadruple Helix framework.



8. Limits and future research

Limits	Future research
Only manufacturing	Including services and agricultural sector
Cross-section analysis	Panel time series analysis
Firm's governance	Including family ownership and management
Quality of institutions	Measuring quality of Institutions at the regional level

Thank you for your attention