The role of Innovation and Internationalisation Public Policies on Industrial Performance

Abstract:
This study investigates the effectiveness of Italian policy for innovation and internationalisation by developing an empirical model that uses information, aggregated at the regional level, on the population of Italian firms that received such incentives from 2000 to 2007. The objective is to identify the effectiveness of such public measures by measuring their impact on regional levels of GDP. The analysis suggests that both innovation and internationalisation measures affect regional economic well-being, even if the first one seem to be more outstanding. Moreover we demonstrate that also innovation and internationalisation activities are a stimulus of regional welfare.

1. Introduction

The crisis that affects the world economy since 2008 enhances the need of governments interventions aimed at backing the national economy. In particular, the reduction of employment rate, GDP and productivity ask for the development of long-time growth strategy and for the design and implementation of policies that enable an effective industrial re-organization according to the evolution of the competitive context. However, on the same time, the crisis lowers the financial resources that governments can exploit to subsidy the Industry. Consequently, policy makers have to define priorities and allocate funds to most promising target areas. Past empirical studies prove, in fact, that industrial policies characterized by different objectives vary in the effectiveness in stimulating growth and competitiveness.

The promotion of firms' innovativeness and internationalization is an important goal of political economy. On one side, innovation policies are historically an effective tool to stimulate the economic growth. On the other side, in the last twenty years, public subsidies for firm's internationalization play an even more central and strategic role, especially in advanced economies (UNCTAD, 2001). The pursued goals and the expected benefits of an industrial policy are various. Obviously, innovation and internationalization policies are expected to positively affect the amount of research and development (R&D) expenditures and the establishment of foreign subsidiaries, respectively. Yet, these tools can also generate positive spillovers and reduce the unemployment rate, increase competitiveness and back the training of high qualified human capital and consequently enhance labor productivity.

Despite the increasing importance of such policy tools, we know surprisingly little about their effects and systematic and rigorous analyses are still lacking. This study aims at filling this gap. We analysed the effectiveness of innovation and internationalisation policies looking at the impact of their interaction on regional economic development and we demonstrate that, by planning concurrently innovation and internationalisation incentives, policy makers can enhance the effectiveness of industrial policies measures in stimulating positive spillovers.

2. Literature background

Industrial policy is framed by a complex set of measures played by governments in order to affect the allocation of resources that comes out from market relationships (Rodrik, 2004). Public subsidies aim at stimulating desirable firms' attitude and moulding industry structure. Some policies provide firms with incentives to undertake industrial investments that strengthen their productivity and other performance measures, others target new firm establishment, R&D activities and local economic development.

In particular public interventions can be categorized into vertical and horizontal policies (Ainginger, 2007). The first ones aim at developing specific industries whilst the others at correcting market failures. Yet, both drive the resources

allocation in order to enhance the social well-being, competitiveness and the economic growth. Since '80s, horizontal policies have been favored and the tools exploited by the industrial policies are manifold and combined according different aggregation schemas.
Literature highlights that the analysis of such industrial policies' effects is complex and provides contrasting results that depend on the proxies exploited to measure the performance. Whilst researches does not provide definitive evidence about the impact on productivity, the most of empirical studies agree that incentives positively affect the firm's growth measured in terms of employees or turnover (Bergstrom, 2000; Craig et al. 2008; Gabriele et al., 2007, Martini et al., 2006, Pellegrini & Centra, 2006; Skuras & Tzepelis, 2004). In particular, Hart et al. (2000) point out that firm's growth is proportional to the subsidy. Instead, the same studies highlight that policies are not able to affect the productivity (Pellegrini & Centra , 2006; Skuras & Tzelepis, 2004) or that have only a marginal impact (Gabriele et al., 2007). By studying the regional public subsidies, Bergstrom (2000) even shows that the productivity of subsidized firms increase in the short time but decrease in the long-term so much as their productivity is lower than that of no-subsidized firms.

2.1 Innovation policy measures

Science and technology (S&T) enhance the social well-being and provide solutions to economic, health and environment challenges. For these reasons in the last years, as stated also in Lisbon Strategy 2000, European governments strengthen their efforts in stimulating the improvement of S&T 's development process. In particular, governments aim at increasing the efficiency of public research, at motivating the private actors in R&D activities or at fostering closer interaction between universities, government labs, firms and civil society (OECD, 2004). Public financial support for encouraging firms' R&D activities are usually tax incentives and direct grants for R&D project. All these measures, deliberated at regional, national and European level, incentive R&D activities and technology transfer, hoping that they may encourage innovation, economic growth and performance (Howells, 2005). Governments believe that public R&D subsidies are needed to sufficiently incentive firms to undertake the "optimal" amount of innovative activity from society's point of view (Abramovsky et al. 2004). They target the resolution of the imperfections of financial markets for innovation, externalities and systemic failures (Martin & Scott, 2000). Financial markets are not enough to provide resources to highly innovative ideas and technologies, although venture capital mitigates the challenges related to high capital costs. Uncertainties characterizing R&D activities, the presence of information asymmetries, and moral hazard problems between lenders and borrowers generates high funds' rationing (Poti & Cerulli, 2009). This translates into the need for public interventions to enforce risky but socially valuable R&D investments. Moreover, the public good characteristics of R&D activity, that make not in all industries and not for all kinds of R&D activities the social return of R&D higher than the private return, leads to a

lower than desired private R&D expenditure (Arrow, 1962). The patent system provide a partial solution to the difficulty to fully appropriate the returns on the knowledge developed (Howells, 2005). Hence, there is the need to public policies that lowers the private costs of the R&D projects characterized by the non-rival nature of knowledge outputs, such as basic researches. A further rationale of innovation subsidies is related to the need to support a continuous interaction between different organizations and individuals involved in the innovation. In particular, a coordination of the participants of innovation system is desirable in order to avoid duplications in R&D efforts and other resource waste (O'Doherty & Arnold, 2001). Governments hope that by granting a subsidy, additional research projects will take place. Unfortunately, the main goal of public financial support is not always reached. Empirical studies on this topic provide conflicting answers about the nature of the relationship between public and private R&D spending (for a review see David et al., 2000). Sometimes public grants crowd out private investment whilst in other cases they prove to increase the private funding of R&D. In any case, by enabling the purchase of R&D infrastructure, equipment and other R&D facilities, public R&D funding lowers fixed costs and consequently, it lowers the private cost of an R&D project and makes an unprofitable project profitable (Lach, 2002).

2.2 Internationalisation policy measures

Whilst innovation policy are historical measures, the outward internationalisation of firms is becoming an increasingly important target of public intervention in most OECD countries only in recent years (UNCTAD, 2001). In the past, many governments viewed outward FDI as an undesirable transfer of capital and jobs to other countries but, from the 1990s, they started look at it as a way to build globally competitive firms, to accelerate the development of high value activities and productivity, to technological transformation and to better allocation of home resources (Dunning and Lundan, 2008; Te Velde, 2007; Westhead *et al.*, 2001). For these reasons, since the late 1990s governments have implemented home country measures (HCMs) to encourage outward internationalisation (UNCTAD, 2001; Lou et al., 2003). These measures include financial support, investment insurance, fiscal intervention, information provision and technical assistance (Sarmah, 2003). The rationale for HCMs is that FDI is good for home country development, so these measures are launched to mitigate market, information and coordination failures that deter investments and increase the costs of investments. In particular, the promotion of internationalisation seeks to reduce economic and political risks, to overcome uncertainties and to alleviate any shortfall in resources and capabilities in a company initiating the internationalisation process or seeking to invest in an environment that is distant in geographical, cultural and/or institutional terms (Sarmah 2003; Te Velde 2007).

3. Innovation and internationalisation circular relationship

Even if there are few investigations that study at the same time innovation and internationalization activities of the firm (Filipescu, 2009), scholars have found that exists a circular relationship between the two phenomena.

The technology that the firm posses helps to innovate in order to create proprietary competitive advantages and to compete and succeed in an international market. Once the firm has activities in the international markets, on one side it can capitalize the exclusive rents that derive therefore (Cooke & Morgan, 1998) and, on the other side, it gains knowledge about the environment and the competition. This knowledge will be very helpful in maintaining the competitive advantages and in creating others which in turn can generate more innovation. Moreover, as international markets are characterized by a greater competitive pressure than national markets, in order to survive, the innovation it seems to be unavoidable (Filipescu, 2009).

Once demonstrated that innovation can stimulate internationalisation, literature also find that innovation-performance relationship is moderated by a firm's degree of internationalization (i.e., the extent to which it operates beyond its national borders) (Kotabe et al. 2002; Kafouros et al. 2008). Internationally diversified firms can improve their innovative capacity by having greater opportunities to learn. They can utilize a wider range of resources available globally and utilize knowledge and ideas from several countries and from a broader group of scientists. Moreover, internationalization can reduce costs associated with innovation. As highly international firms can access many markets around the globe, they can buy materials and R&D inputs from the cheapest available sources. Internationalization also allows to better exploit and appropriate the returns from technological developments and to implement strategies to benefit economically through innovation. Highly international firms can offer products to a larger number of potential buyers, thereby spreading the costs. Finally internationalization might lower the risk of R&D by avoiding fluctuations and business cycles specific to a single market or region. Despite these positive effects, internationalization may negatively contribute to innovation by increasing the risk of knowledge leakage (the costs of outgoing spillovers may even outweigh the benefits from incoming spillovers) and by increasing the costs that the coordination and control of a global network requires.

Concluding, innovation virtuously impacts on the degree of international growth (Salomon and Shaver, 2005), which in turn positively influences innovation activities.

Thanks to innovation and internationalisation policy measures, governments aim at correcting for market and coordination failures, pushing country development in order to reduce regional disparities and at arranging local environments that favour the sharing and exchange of knowledge and the improvement of firm capabilities (Edquist, 2001; Te Velde, 2007). For these reasons we think that policy makers can enhance the effects of both industrial policies by planning linked measures (Figure 1).

Yet, public intervention can involve unwelcome consequences. Mostly, it can limit competition and give rise to market inefficiencies at the same time (Wollman, 2007). Secondly, public incentives could be exploited to substitute private funding instead of complements or stimulates it, making the effort of policy maker fruitless (Marglin, 1963). Nowadays the development of subsidiarity concept at different administrative level also makes the harmonization of public policies more challenging. Within this context, European Union legislation makes the evaluation of public intervention compulsory. So far there has been no systematic discussion or quantification of interaction of innovation and internationalization policy measures.

4. Empirical analysis

4.1 Italian context

In the last years European countries are characterized by the implementation of several public policies for the growth and competitiveness of national economy. These subsidies are designed and executed by different actors and managed according to a complementary and co-opetitive logic. At the European level, a large consistent set of instruments are exploited. These tools, characterized by different goals, are developed according to a subsidiary approach that underlines the relevant role of policies elaborated at national level.

Notwithstanding Italy is characterized by a large set of industrial policies and the public funding is very high, the country is characterized by a low amount of R&D expenditures insomuch as it is the economy with the lowest amount of R&D resources among the industrialized European countries. This is the consequence of the specialization in no- high tech industries and the narrow presence of large firms (EUROSTAT, 2009). Italian government tries to fill up this gap by assigning, on average, 20% of industrial policies resources to stimulate innovation. It funds different kinds of R&D expenses such as employees salary, consulting services, infrastructures and instrumentation, patent registration. Whilst the most traditional initiatives encourage the renewal of machinery and equipment incorporating innovation, since the 1990s there is an increasing emphasis on technology transfer and in promoting the development of local innovation systems. Moreover, in 1999 the Italian innovation policies were thoroughly revised and the plethora of laws rationalized in order to improve the effectiveness of these policies that, in the past, proved to be too fragmented.

In comparison to other European countries, in Italy the management of innovation policies is more peripheral that is to say that the most of innovation subsidies is managed at regional level. For instance, in 2004-2005, among the 124 different tools for the public support of innovation, 89 were regional and 28 were regionalized (Met, 2006). Yet, the amount of subsidies provided by regional innovation policies is low in comparison to national programmes (Evangelista, 2007). As a consequence, national policies still play the main role

in supporting industrial R&D activities. In particular, the Fund for the promotion of Research (FAR)[1] and the Fund for Technological Innovation (FIT) are the main policy measures. FAR is the public instrument to fund firms' research activities, both oriented and non-oriented, collaborative and non-collaborative, carried out by private firms or public-private consortia. The fund is managed by MIUR Ministry of University and Research, as established in the Legislative Decree no. 297 of 1999. FIT, managed by the Ministry of Economic Development, is aimed at strengthening the industrial research and the cooperation among private and public research. The fund is addressed to firms involved in the development of product and process innovation technologies.

As concerns policy for internationalisation, Italy has been traditionally active in promoting both outward and inward FDIs and started to invest earlier than other European Union countries (UNCTAD, 2001). Between 2000 and 2006, the Italian government spent more than 1,000 million euro to promote outward investment and export, with about three percent a year of public funds to be used for industrial policy. In particular, since the late 1990s, the major public instruments in support of outward internationalisation have been the acquisition of equity in direct investments abroad by Italian Firms (Law 100/90; Law Decree 143/98; Law 35/05; Law 19/91); venture capital funds; financial support to feasibility studies; training programmes and technical assistance for exports and direct investment abroad (Law Decree 143/98; Law 35/05; Ministerial Decree 136/00); the provision of financial resources for the creation of permanent marketing structures abroad (Law 394/81) and participation in international tenders (Law 304/90); the stabilisation of interest rates for export credits and for capital goods; interest rate support on bank financing of the Italian share of investments in foreign companies in which public agencies have a stake (Law Decree 143/98; Law 100/90).

The main Italian measures are described by Law 100/1990, which provide a particular form of financial HCM. The examined subsidies consist of venture capital funds and capital loans at interest rates below the market rate that are not paid back in case of failure of the foreign project (Law 394/1981). Public agencies can directly acquire up to 25% of the equity of a foreign venture, and benefiting firms agree to buy back the agency equity share within eight years. Although in principle, investment proposals presented by firms, partners of cooperative agreements, cooperatives, consortia and business associations are accepted, priority is given to initiatives by SMEs investing in Eastern Europe. Projects in the same sector as the parent company are encouraged, while the support programmes exclude FDIs in the European Union and FDIs that entail the divestment of R&D, sales or production activities in Italy (Law 80/2005).

Since the beginning of the law operation, the two agencies have approved over 1,000 investment projects outside the European Union and acquired shareholdings in Italian foreign affiliates with a total value of more than one billion Euros.

[1] FAR has replaced the special Fund for Applier Research established in 1968 and other measures for industrial research (Law no. 488 of 1992) as established in the industrial research funding reform (Law no. 297 of 1999).

The dataset used in the empirical analysis combines different sources of data: Reprint, a database that provides a census of outward and inward FDIs in Italy beginning in 1986; Overseas Trade Ministry annual reports and annual publications that collect information on Italian industrial policy, Istat census data that report structural characteristics of the Italian regions in 2001, and annual Istat publications that provide data on Italian export activities. The dataset obtained by merging the above sources includes information on 20 regions from 2000 to 2007.

4.2 The model and the variables

The empirical analysis is carried out, at the regional level, on Italian firms taking into account innovation and internationalisation subsidies granted from 2000-2007. The choice of a regional level approach is driven by the ascertainment of the heterogeneous performance of Italian region as well as by the willingness to understand how the role of public policies changes according to the innovative and internationalisation characteristics of the local industrial context. Assuming the regional development as a proxy of the policy effectiveness, the dependent variables have been identified in the GDP.
The fundamental need for all public policy evaluations is to observe the counterfactual conditions, in order to answer the causal question as to whether the observed outcomes are actually caused by the examined public policies (Marschak, 1953). The evaluation of public policy requires a model that links the target variables (i.e., GDP) to the policy tools and to the other non-policy determinants in a causal relationship (Duran & Ubeda, 2001). For these reasons, apart from amount of incentives for the internationalisation and innovation, the regression involves proxies of regional industrial structure, innovative capacity and internationalization degree. Hence, the estimated model is:

$$GDP_{r,t} = f\ (\text{Innovation public policy}_{r,t-2},\ \text{Internationalisation public policy}_{r,t-1},\ \text{Control var}_{r,t})$$

where the subscript r refers to the region and the subscript t to time. For a detailed description and definition of policy and control variables see Table 1. The estimates of the panel data are conducted using a random effects approach.

5. Empirical findings

This section presents the estimates of the proposed models for GDP of Italian regions (Table 2). Econometric estimations suggest that the provided measures generate intended effects, innovation and internationalisation incentives affect the regional economic well-being (i.e., both Innovation policy and Internationalisation policy are positive and significant respectively at $p<0.01$ and $p<0.05$). However innovation policies seem to be more outstanding than internationalization ones. This result could be explained not only by the fact

that innovation phenomenon have a greater impact on economic performance, but also by the likely inadequacy of internationalization grants. The comparatively few experience in developing internationalization grants and the lack of systematic and rigorous analyses about internationalization subsidies' effects make policy makers' duty more challenging. Instead, the well-established experience in innovation policies allows them to develop more effective measures.

Yet, as proved by the positive effect of Internationalisation variable (significant at $p<0.01$), the internationalisation phenomenon is a stimulus of regional welfare. Therefore, econometric outcomes suggest it is important to push internationalisation. Also innovation inputs positively contribute to regional development (i.e., Innovation is positive and significant at $p<0.05$).

Concluding, the preliminary findings highlight that both innovation and internationalization policy and phenomena provide competitive advantages to regional economic systems. As a consequence, public policies aimed at promoting the growth of internationalization and the effort in innovation practices are welcome.

6. Concluding remarks

Over the past 20 years, innovation and internationalization capabilities are gaining more and more importance as key factors for economic growth and industrial competitiveness (Parker, 2004; Dunning & Lundan, 2008). R&D investments and internationalization process individually prove to enhance firm productivity, enrich firm skills and competencies and give more opportunities to face knowledge-based global competition (Calvert et al., 1996; O'Mahony & Van Ark, 2003; Dunning & Lundan, 2008). Moreover, innovation and internationalization are inter-dependent stimulus of a virtuous cycle leading to profitability improvement (Simmie, 2003). Therefore, the low rate of international and R&D activities at country and regional level may explain the decline of the European Economic system. In particular, it is an acceptable explanation of Italian difficulties in facing the competition from emerging countries. The attitude towards innovative and internationalisation practices by Italian industry, that is somehow related to its specialisation in traditional manufacturing activities, lowers the Italian ranking in the competitiveness list. Within this context the role of government in driving the recovering of technological growth and economic performance is fundamental. These remarks and our findings suggest a re-think of industrial policy-making by emphasising both pro-innovation and pro-internationalization programmes (Goh, 2004;UNCTAD, 2001).

7. References

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Figure 1 *Circular relationship between innovation and internationalisation*

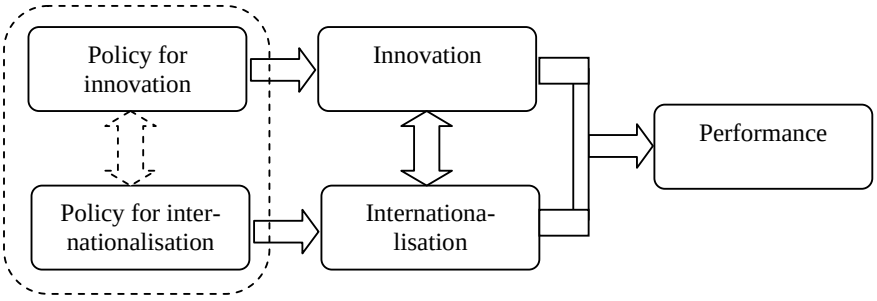

Table 1 *Description of the independent variables*

VARIABLES	DESCRIPTION
POLICY VARIABLES	
Innovation policy$_{r,t-2}$	Total amount of financial incentive (€) in region r and year t-2 (i.e. FIT FAR)
Internationalisation policy$_{r,t-1}$	Total amount (€) of financial incentives in region r and year t-1 (i.e., acquisition of equity interests in Italian firms' direct investment abroad and venture capital funds)
CONTROL VARIABLES	
Innovation$_{r,t-2}$	Ratio between number of R&D employee and total firms in region r and year t-2
Internationalisation $_{r,t}$	Number of MNEs in region r and year t
North $_{r}$	Dummy variable taking value 1 when the region r is located in Northern Italy
Export $_{r,t-1}$	Ratio of the amount of export (€) in region r in year t-1 and the total number of firms in region r in 2001
Leader $_{r}$	Incidence of firms with more than 250 employees on the total number of firms in the region r in 2001
Herfindal $_{r}$	The Herfindhal index is calculated utilizing the number of employees ($E_{r,i}$) belonging to Istat classes ($N_{r,i}$) for each region r in 2001 $\sum_{i=1}^{7} Nr,i\left(\frac{Er,i/Nr,i}{\sum_{i=1}^{7} Er,i}\right)^2$
Advanced$_{r}$	Percentage of firms belonging to technologically advanced sectors
Made in Italy$_{r}$	Percentage of firms belonging to sectors where Italian firms enjoy a traditional comparative advantage

Table 2 *Results of the random effects GLS regression*

VARIABLES	Coeff.		Std. Error
POLICY VARIABLES			
Innovation policy (t-2)	170.353	***	21.274
Internationalisation policy (t-1)	59.691	**	30.403
CONTROL VARIABLES			
Innovation (t-2)	192.093	**	80.088
Internationalisation (t-1)	1.232	***	0.388
Export (t-1)	3.030	***	0.780
Leader	138.966		97.282
Herfindal	29.154		32.551
North	0.055		0.047
Advanced	-8e-7		6e-7
Made in Italy	5e-7		5e-7
Constant	4.125	***	0.049

R-sq:		
within = 0.558		
between = 0.709	Observations = 140	Wald chi2 = 178.66
overall = 0.702	Number of regions = 20	Prob > chi2 = 0.0000

Asterisks denote the significance of the coefficients estimates:
*** p<0.01, ** p<0.05, * p<0.1