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Innovation and Business Performance in Rural and Peripheral Areas of Greece

by
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Abstract

The present work explores the extent and patterns of innovation in two mountainous areas of Greece and its effect on business performance. Innovative activity is categorized in fives classes of product and market innovation. Both areas are characterized by extreme rurality and peripherality but the one is more accessible by the market of two urban agglomerations while the other one is very remote. Empirical evidence is drawn from a survey of 100 enterprises in the manufacturing and service sectors. Product and market innovation is facilitated by the operation of various types of business networks and influenced by a range of entrepreneurial and enterprise specific characteristics. In turn, innovative activity has an impact on conventional measures of business performance. Policy implications for a territorially specific business innovation support strategy are drawn.

1. Introduction

According to Goodall (1987: 350), peripherality is "the condition experienced by individuals, firms and regions at the edge of a communication system, where they are away from the core or controlling center of the economy". Being peripheral means

usually for enterprises that they lack the convenience of having physical communication, highly skilled staff (Romijn & Albaladejo, 2001), customers and suppliers, factors that tend to locate within the core. Peripheral firms have to pay the extra cost to manufacture or to service, as their scale of production and their access to professional labour and advice is limited (due to their limited local markets). Moreover, their larger suppliers and customers are distant (Anderson, 2000: 94); (Fynes & Ennis, 1997:4,5). However, a number of studies show (Keeble et al, 1992:21; Keeble & Tyler, 1995: 989-900; Townroe, 1991:8, Bye & Font, 1990:14) that this isolation can become the competitive advantage of peripheral regions, as their firms tend to be more innovative and better performing than their urban counterparts. Their natural beauty and good quality of life usually attract firms with no economic constraints concerning their location. This study explores the innovative activity and performance of firms in two Greek mountainous areas and namely Kalavryta and Evrytania. The second part reviews recent literature on innovation and business performance, as also their territorial aspects. The third part presents the results of a survey of 100 businesses in the manufacturing and services sector. Innovative activity is categorized according to North & Smallbone (2000a) to five types: the introduction of a new good, the introduction of a new process, the opening of a new market, the identification of a new source of raw materials and the creation of a new type of industrial organization.

2. Theoretical Underpinnings

2.1 Definitions

Innovation is an elusive concept and it is therefore difficult to define. First of all, it is important to distinguish between "innovation" and "invention", which are very often confused. An invention is defined as '*an idea, a sketch or model for a new improved device, product, process or system*', whereas innovation is achieved '*…only with the first commercial transaction involving the new product, process, system or device…*'. (Freeman, 1982: 7). The main definition of innovation mentioned by many authors (e.g. Freeman, 1971; Porter, 1990; Pavitt et al, 1987; Thwaites & Wynarczyk, 1996; North & Smallbone, 2000a: 147-148; Neely & Hii, 1998:8) is the one proposed by OECD (1981: 15-16) where innovation *"consists of all those scientific, technical, commercial and financial steps necessary for the successful development and marketing*

of new or improved manufactured products, the commercial use of new or improved processes or equipment or an introduction of a new approach to a social service. R &D is only one of these steps". According to Wiig & Isaksen (1998) it is a complex, interactive and collective process, in which new products and processes are created and diffused through co-operation of different actors. It involves fundamental or radical changes that are the result of the implementation of a new idea or invention through the creation of a new product or process. These changes are technical advances and aim to create or maintain a competitive advantage (Freeman, 1971; Porter, 1990; Pavitt et al, 1987; Thwaites & Wynarczyk, 1996 *in North & Smallbone, 2000a: 147-148*; Freeman, 1986; Fischer, 1999:13). Innovation may also concern new developments within a sector or economy (called "radical innovation") or new changes to an individual firm, but which other firms have already adopted ("adaptive or diffusion innovation") (North & Smallbone, 2000b: 91; Neely & Hii, 1998:9) or finally modification of existing products and services ("incremental innovation") (Ratti, 1991:85); (Mole &Worrall, 2001: 354).

Authors distinguish different types of innovation. Schumpeter (1934) was the first to distinguish five types, which are the "development of new products", "modification of existing ones", "market innovation", "sourcing and organizational innovation" and finally "process innovation". According to Neely and Hii (1999), Neely & Hii (1998:8-9), Goudis & Skuras (2001:11), innovation can be classified to three categories (product, process and organizational innovation), which are not necessarily mutually exclusive, but in contrast, the one may lead to the other.

- *Product innovation*: A newly marketed product, equipment or service with its main characteristics changed or an existing or new product whose technical characteristics have been enhanced or upgraded.

- *Process innovation:* Gopalakrishnan and Damanpour (1997) refer to the taking up of new or significantly better production methods. Process innovation for SMEs in local areas, seems to require mostly internal knowledge, accumulated by the firm, but with some technological proximity to suppliers and customers (Capello, 1999).

- *Organizational innovation:* Of equal importance to the creation of new products and processes is the introduction of new approaches to managing or organizing the firm (Littunen, 2000). Organizational innovation creates new knowledge and information.

North and Smallbone (2000a) take a more practical view of what constitutes innovation, which is also closer to Schumpeter's original ideas and distinguish five types: the introduction of a new good, the introduction of a new process, the opening of a new market, the identification of a new source of raw materials and the creation of a new type of industrial organization.

Finally, according to Neely and Hii (1999:8-9); Goudis & Skuras (2001), the ability to innovate is influenced by four major 'sources': *culture*, according to which each company develops a strategy for innovation, *resources* like assets and skills, *competences*, such as integrating market opportunities with technological abilities, creative problem solving skills, sharing tacit knowledge and experimentation and *networking*, which acts as a vehicle for importing external knowledge. Finally, authors also report the barriers to innovation (Neely and Hii, 1998:5); (OECD, 1992: 38) and distinguish them to "internal" and "external". Among the internal that are included is conservatism, lack of vision and motivation, hierarchical communication structures, rigid organizational arrangements and procedures etc. External barriers constitute lack of infrastructure, lack of appropriate legislation, not suitable educational and training systems and a general neglect from the part of society. Camagni & Capello (1999: 196-197) describe four groups of barriers. Those are "economic" and concern financial matters of the firm, "information" and the lack of it concerning technology or markets, "organizational" and the related structures that help develop innovation and "co-operation" barriers inhibiting the collaboration with suppliers, other firms or institutions.

2.2 How is innovation created?

The process of innovation creation is not only technological, but also social, as it involves co-operation among people, firms and institutions and it needs mutual understanding and trust (Wiig & Isaksen, 1998:2). The creation of innovation can be explained by the complex relationship of three elements: the spatial one, which is the "functional space" of a firm, the different types of innovation and the so-called "innovative milieu". It is within this "functional space" and with the help of the "innovative milieu" that the different types of innovation are developed. According to Ratti (1991: 72) three functional spaces are of strategic importance for a firm:

The "production space": It is determined by the way that the firm buys outside and how the production is delocalised outside.

The "market space": This is determined by the relationship of the firm with the market (from a spatial perspective of view).

The "supporting space»: It consists of relationships outside the market, which are organization of the production factors, relationship with partners, customers and marketing agents and relationship with territorial environment institutions.

Enterprise innovation is also created and supported by the so-called "innovative milieux", which act as innovation incubators. The definition most broadly used for "innovative milieu" (Neely and Hii, 1998:17); (Mole &Worrall, 2001: 354) is the one of Camagni (1991:3, 1995: 318) who describes it as *" the set or the complex network of mainly informal social relationships on a limited geographical area, often determining a specific external 'image' and a specific internal 'representation' and sense of belonging, which enhance the local innovative capability through synergetic and collective learning processes"*. Maillat & Lecoq (1992:2) describe innovative milieu as *"a new development model in which the innovation process has a territorial base, which is a function of the milieu's characteristics"*.

According to Perrin (1991:35); (Bramanti & Senn, 1991: 94);(Wiig & Isaksen, 1998:1) the elements of an innovative network or milieu are individuals and institutions (actors) participating in an innovation process and the formal and informal relations that they develop for this purpose. The informal relations are mainly between customers and suppliers, public and private actors and transfer of tacit knowledge through mobility and inter-firm imitation. The formal relations are usually trans- territorial and concern vocational training, technological development or infrastructure (Camagni & Capello, 1999: 205). The milieu cannot be precised geographically as it takes the shape of networks of firms and the relations among them, local associations, policy makers and research institutions. According to Maillat & Lecoq (1992:16) integral characteristics of the milieu are technology use, know-how, corporate behaviour, types of organization and market understanding.

The role of the innovative milieu is of major importance for the firm as this one generates the innovative behaviour by providing a background, which promotes the learning process and the exchange of tacit knowledge and consequently enhances creativity and innovativeness. Moreover, through its synergies it helps reducing uncertainty with better forecasting of market trends, analyzing and interpreting

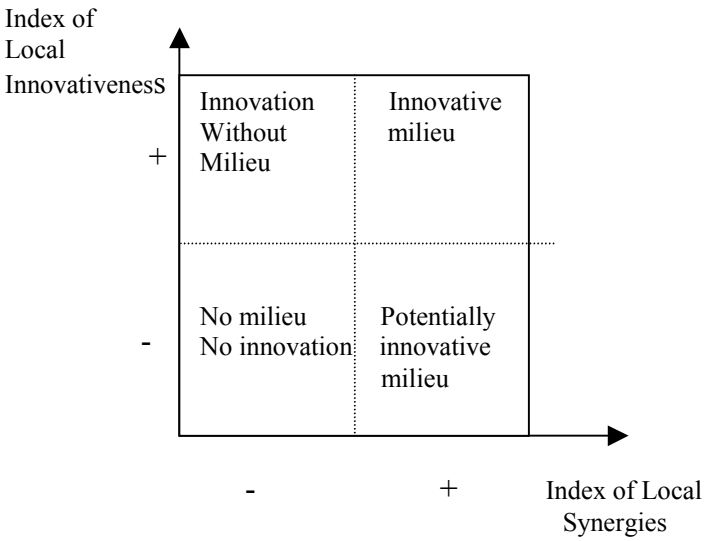
technological information, monitoring strategies of other firms and generally assessing incoming information (Camagni & Capello, 1999: 205). The innovation capacity of an area is directly linked to the characteristics of its milieu, like the intensity of local informal networks and relationships to produce a dynamic process of collective learning and their capacity to develop or improve specific skills, solidarity and partnerships between firms and local actors (Maillat & Lecoq, 1992:16).

Maillat & Lecoq (1992:16-17) present three forms of innovative milieu:

- Technological district or endogenous inn. milieu which is based on SME networks with long historical and cultural relations (e.g. Third Italy, Baden- Wuerttemberg).
- Exogenous inn. milieu (e.g. Sophia Antipolis or Cambridge), which is formed by the delocalisation of certain segments of the production process of large firms.
- Techno-metropolitan inn. milieu formed in the periphery of metropolitan centers (e.g. Randstadt, Greater London etc) taking mainly advantage of their incubator capacity.

Camagni (1995) describes four region types according to their extent of presenting the characteristics of an innovative milieu. In the first one there is no innovation and no milieu. The second region type has no milieu, but there is innovation. In the third one there is some kind of milieu through synergies and some innovation, but to a limited extent. Finally, the fourth type has the so-defined innovative milieu. The following figure shows the four region types (adapted from Shefer & Frenkel (1998:188)).

Figure 1: Four region types related to milieu



If we would like to link the types of innovation (radical, adaptive and incremental) to the type of milieu and the type of functional space, where they can be developed, we get the following results (Ratti, 1991: 85): Radical innovation is usually adopted by large firms, not really linked to each other, so in their case there is an absence of an innovative milieu, which is spatially identifiable. Radical innovation usually takes place in the framework of the functional "production space". Adaptive innovation, on the other hand, takes place inside the "market space". Here a spatially identifiable innovative milieu exists and it is diversified (activities are concentrated and form metropolitan areas or cities). Finally, there is a spatially identifiable milieu, which is integrated and specialized, developed in the supporting space and in this milieu incremental innovations are developed.

2.3How can innovation be measured?

Innovation measurement is a very important task and mainly for two reasons: firstly because it constitutes a feedback for the current innovativeness of a firm and secondly because it reveals any gaps in its performance and gives an impulse for a process of continuous improvement (Neely and Hii, 1998:40). Coombs et al (1996), cited in Komninos (2000:333) distinguish three general categories of methods to measure innovation. Those are:

- *"subject- based"*. This method examines the characteristics of the innovator and one of the main indicators measured is R&D expenditure (this method was used for CIS). It has received criticism as R&D expenditure and patents cannot perfectly explain the innovation process (Coombs et al,1996:404).
- *"object- based"*. Indicators measured here are announcements of new products or services, patents or sales of new products in technical journals, in big innovation databases and generally in technical literature. The "object- based" method does also have weaknesses, like the fact that it is not easy to select the appropriate journals on which the indicators will be based and the fact that some companies will try to exaggerate about their achievements to enhance their public relations (Coombs et al, 1996:404).
- *"based on process indicators"*. Those methods measure links, flows and the interaction of actors that contribute in the innovation process. The advantage of these methods is their possibility to show the interactions during the innovation process.

In the early 90's institutions like the OECD and the European Commission realized the importance of measuring innovation and took initiatives to define a series of indicators. Those initiatives include the OECD "Oslo Manual" (1992 and 1997 publication) and the Eurostat Community Innovation Survey (conducted in 92-93 and in 97-98) (Smith, 2000:3). The following table presents a list of indicators measured, which is a combination of indicators used by the European Innovation Scoreboard 2002 (Technical Paper 4:2) and CBI/DTI (1993: 27-28).

Table 1: Indicators of innovation

Dimension	**Metrics**
Human resources for innovation	-New S&E graduates (‰ of 20-29 years age class) -Population with tertiary education (% of 25-64 years age classes) -Participation in life-long learning (% of 25-64 years olds) -Employment in medium-high and high-tech manufacturing (% of total workforce) -Employment in high-tech services (% of total workforce) -% of projects delayed, cancelled because of lack of human resources -% of personnel in product development who have worked for more than 1/ 2 functions -% of projects cancelled/ delayed due to lack of funding
Leadership	-no/% of members from product development/ technical function -% of employees aware of company innovation policies and values -no of pages in annual report devoted to innovation/ technology
The creation of new knowledge & technology acquisition	-Public R&D expenditures (GERD - BERD) (% GDP) -Business expenditure on R&D (BERD) (% GDP) -EPO high-tech patent applications (per million population) -USPTO high-tech patent applications per million population -no of licenses in/out over last 3 years -% R&D projects leading to a successful new or enhanced products/ processes/ licenses
The transmission and application of knowledge	-SMEs innovating in-house (% of manufacturing SMEs) -Manufacturing SMEs involved in innovation co-operation -Innovation expenditures (% of all turnover in manufacturing)
Innovation finance, outputs and markets	-High-tech venture capital investment (‰ of GDP) -New capital raised on stock markets (% of GDP) -'New to market' products (% of sales by manufacturing firms) -Home internet access ((% of all households) -ICT expenditures (% of GDP) -Percent of manufacturing value-added from high technology
Product Innovation	-No of new product ideas -%sales/profits from products 3(5) years old -market share -product planning horizon
Product Development	-time to market -product performance -design performance
Process Innovation	-process parameters, cost, quality, WIP levels, lead time etc -installation lead times -no of new processes -continuous improvement -progress to lean production WIP, lead times, quality

… table 1 continued

System & Tools	-% of designers/ engineers with access to CAD screens -% of products of CAD database -% of products produced on processes with SPC -% of designers trained in design for manufacture -% of development projects using BS5750 certified processes

In order to measure innovation, North & Smallbone (2000a: 147-148) and North & Smallbone (2000b: 92-93) identify and measure several dimensions, which are a) product and service innovation, b) market development, c) marketing methods, d) process technology and innovation and e) the use of computers/ IT in administration. More specifically, the variables examined are: a) an innovative product created or a new product being developed, b) a newly created non-local domestic market or a new export market, c) three or more new marketing methods introduced and the use of internet for marketing reasons, d) use of computer technology for core manufacturing or service activity or for the introduction of process innovation and e) using IT for innovative administration. Finally, Coombs et al (1996) use an "object-based" method to measure innovation through the announcements in a series of technical, trade, engineering and commercial journals. The information they collect and the indicators developed concern product and firm identity, type of innovation, national origin of innovation, industrial sector of innovation and firm size.

2.4 Relation of Innovation & Business Performance

When referring to business performance, Murphy et al (1996:15-16) propose eight dimensions to be measured: efficiency, growth, profit, size, liquidity, success/failure, market share and leverage. In the following table, we can see the different measures for each dimension. Many authors suggest that there is a strong link between innovation and business performance. Geroski (1994: 130) cited in Neely & Hii (1998:30) refers to two views concerning the type of this link. The first supports that innovation enhances a firm's competitiveness, but this lasts as long as the firm can defend itself against its competitors. According to the second, the impact of innovation is fundamental and makes a firm more capable (through enhancing its flexibility and adaptability) than non-innovative ones to resist market pressure. However, Neely & Hii (1998:30) emphasize that innovation is not the only prerequisite for business performance, but one of a wide range of factors. Thwaites & Wynarczyk (1996) study

the economic performance of innovative SMEs in the UK (South East Region and elsewhere) through the following variables, examined at the time of firm foundation, the time of innovation and four years later: turnover, exports, operating profits, retained profits and total assets. The findings (that cover the period 1975-83) show that the innovative firm that survives closure is fast growing as it has usually increased the number of its employees, and has a growth in assets, return on assets, retained profits and exports. The survey conducted by North & Smallbone (2000a: 153-155) shows that "most innovative rural firms are the best performing ones". The highly innovative achieved an increase in sales turnover that touches 80%, while the percentage for "fairly innovative" and "non- innovative" is 20% and 29% respectively. Overall the "highly innovative" achieved 77% median turnover growth (in real terms) and the percentage for the other types is 35% and 9%.

Finally, highly innovative firms managed also to achieve job creation and their employment increased 50% (for the other two types of firms was 27% and 22%). For the highly innovative firms belonging to the manufacturing sector this job creation means a median increase of eight jobs, while for the ones belonging to the services sector it means two jobs. Another empirical survey carried out in UK companies showed that "80% of the companies with at least one innovation in the last three years improved their business performance in terms of profits, market share and new markets penetration" (Neely & Hii, 1998:31). Mole & Worrall (2001: 360) conducted two surveys in West Midlands region in 1995 and 1996 and conclude that innovators are more competitive than non- innovators. 40% of the firms that developed product innovation had a sales increase of more than 10%, while the same percentage achieving similar increase for non-innovators was 23%. Finally, Heunks (1998: 266) concludes, through a study of 200 firms in six countries, that small innovative firms increase their performance mainly in terms of productivity and growth, while profits tend to be low. This could be either due to the price of innovative investments or low profits could be a reason to innovate (and consequently precede innovation).

Table 2: Measures of Business Performance

DIMENSION	MEASURE	
Efficiency	Return on investment	Average return on assets
	Return on equity	Net sales to total capital
	Return on assets	Return on average equity
	Return on net worth	Internal rate of return
	Gross revenues on employee	Relative product costs
Growth	Change in sales	Job generation
	Change in employees	Company births
	Market share growth	Change in present value
	Change in net income margin	Number of acquisitions
	Change in CEO/owner compensation	Change in pretax profit
	Change in labour expense to revenue	Loan growth
Profit	Return on sales	Stock price appreciation
	Net profit margin	Price to earnings
	Gross profit margin	Respondent assessment
	Net profit level	Earnings per share
	Net profit from operations	Average return on sales
	Pretax profit	Average net profit margin
	Clients estimate of incremental profits	Market to book
Size liquidity	Sales level	Number of employees
	Cash flow level	Case flow to sales
	Ability to fund growth	Inventory turnover
	Current ratio	Accounts receivable turnover
	Quick ratio	Case flow to total debt
	Total asset turnover	Working capital to sales
	Cash flow to investment	
SCS/Fail	Discontinued business	Operating under court order
	Researcher subjective assessment	No new telephone number
	Return on net worth	Salary of owner
	Respondent subjective assessment	Change in gross earnings
Market share	Respondent assessment	PIMS value
	Firm product sales to industry product sales	
Leverage	Debt to equity	Long-term debt to equity
	Times interest earned	Stockholders capital to total capital
Other	Change in employee turnover	Relative quality
	Dependence on corporate sponsor	

Adapted from Murphy et al (1996:17)

2.5 Innovation and Territorial Aspects

According to Keeble et al (1988) cited in Burca (1997:24) innovation is developed firstly in the core and later it may spread in the periphery. This happens due to the possibility of the firms located in the core to have direct access to information networks and highly skilled staff. Moreover, the success of their innovations is more

possible in core areas, where the people are more open to new ideas and keener to buy new products. Empirical studies show that peripheral zones are characterized by low innovation potential (concerning mainly product and to a lesser extent process innovation) and technological dynamism (Burca, 1997:26). In an attempt to examine how regional policy can affect firms' innovation potential in lagging regions, Frenkel (2000) conducts a survey in 211 industrial firms in metropolitan, intermediate and peripheral regions in northern Israel. Results concerning the peripheral regions show that those mainly attract innovative firms of the traditional industry, while innovative high-tech firms are located in metropolitan and intermediate regions. A basic reason for that is the fact that the periphery doesn't seem to provide a supportive innovative milieu, as it lacks highly skilled labor. Lack of skilled labour is one of the findings of the survey carried out by Keeble & Tyler (1995:990) and constitutes a problem for both accessible and remote rural firms, which tend to recruit such staff non- locally. Anderson (2000: 94-95) conducts a literature review about entrepreneurship in peripheral regions of Europe. According to Whitley (1990) and Perry (1982,1987) there is an overproportional share of labour- intensive SME's in regions away from the core and those face many problems to overcome distance (Keeble, 1990:38,40). Smallbone et al (1993) report that markets served by rural SME's are usually distant and non-local. Mason (1991) tries to explain the high rates of new manufacturing firms in the Highlands and Islands of Scotland and comments that those are related to tourism, are usually craft based and not oriented to growth. He also notes that there is a "lack of new firms in finance, property and professional services sectors…explaining that the core regions have the highest concentration of managerial and skilled staff".

Wiig & Isaksen (1998) conduct a survey in Finnmark, an ultra-peripheral area of Norway and they conclude that rural areas have a very low share of firms with innovation costs in comparison with city- centers and surroundings. However, there is a high level of innovative firms in smaller towns. The survey reveals that among the biggest obstacles for innovative firms is lack of qualified personnel with the appropriate know-how and lack of risk/investment capital, especially for small firms with less than 10 employees. Most important factors for the firms' ability to innovate are proximity to markets, presence of suppliers and regional infrastructure, while horizontal networks, cooperation with regional institutions and technological help through public programs seem to be less important.

However, this isolation of the periphery can become its comparative advantage. Keeble et al (1992:21) conduct a survey in rural and urban firms. The results show that 33% of the remote rural firms (tourism excluded) attributed rising income, while the proportion in accessible remote firms was 21% and in urban only 16%. Moreover, 18% of the remote rural firms were highly oriented towards personal consumers, while the percentage in urban firms was only 4%. Keeble & Tyler (1995: 989-990) conduct a survey in 1000 firms in England located in remote, accessible rural, as also in urban areas. The results present that accessible rural firms are more innovative, dynamic and develop more in- house technological expertise than their urban or remote rural counterparts. The same authors and Townroe (1991:8) report that natural beauty and high quality of life of the remote rural regions is a key factor in the formation of new small firms. According to Bye & Font (1990:14) "rural space becomes the main source for the provision of services and production factors that are relatively less commodified (air, water, tourism, leisure activities, healthy goods and 'other' secondary products)". Firms that do not have any economic constraints concerning their location prefer it and the high quality of life attracts considerably managers and staff (Keeble & Tyler, 1995).

North & Smallbone, (2000a: 149-153) conduct a survey in remote and accessible rural areas studying firms' innovation for the period 1991-96. Among their conclusions are that accessible rural areas show a higher degree of product and process innovation. The main reason for that is not so much the location itself, but the fact that a bigger proportion of their SME's (than in remote areas) belong to more innovative sectors. Moreover, innovative firms tend more to develop new markets than non-innovative ones. However, concerning new marketing methods accessible rural areas are twice as much possible than the remote ones to use Internet for marketing reasons, something that clearly shows the limited learning environment of remote regions. Finally, remote rural areas tend to have process innovation in a lesser extent and this is most probably the result of the lower cost of labour, which encourages them to use more labour- intensive production methods than modernizing their production process equipment. An overall result is that remote rural manufacturing firms are slightly more innovative than the more accessible ones, while the opposite is the case for service firms.

Finally, there is also a possibility that the innovativeness of firms is not affected by their location. According to Roper (2001:224) and his survey in Ireland, it seems that

the location of firms does not have any impact on their possibility to innovate and terms like innovative milieu or advantages coming from agglomeration are not empirically proved.

3. Case Studies and Data

3.1 Case Study Areas

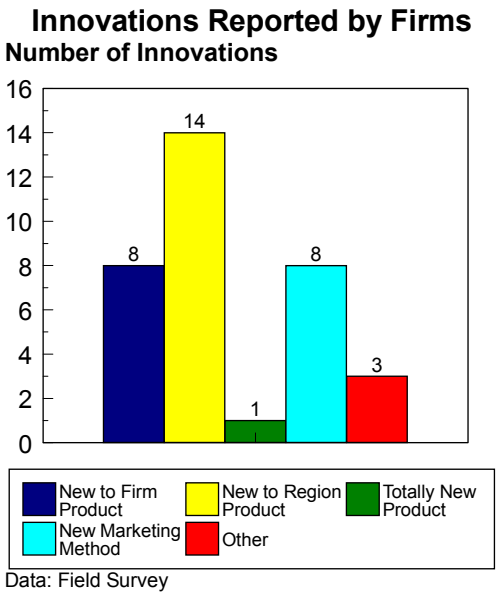
The area of Kalavryta is a mountainous region in the prefecture of Achaia, just one and a half hours driving from Athens. Kalavryta is assumed to be a peripheral area, but situated relatively closer to major markets than other disadvantaged areas of the country. The economic activity in this study area is based on the operation of a ski resort that is the second largest of the country and religious and cultural tourism. Alongside tourism, certain food processing businesses produce local quality food, with feta cheese being the most famous product of the region. On the other hand, the prefecture of Evrytania, the second study area of the project is located in Central Greece about 4 hours driving from Athens and Thessaloniki. Evrytania is by far less accessible than Kalavryta and day trips to the area from major urban centers are not possible. The economic activity in Evrytania is more diversified than the one in Kalavryta and, despite the existence of a ski resort, tourism is mostly scattered over a large number of villages (more than 80) and a large number of activities and is not dominated by skiing as is the case in Kalavryta. Thus, the economic base of the area is more diversified and the development of tourism is softer. In Evrytania, manufacturing industry is mostly concentrated on food processing activities and more specifically meat processing, while remoteness has developed a sustainable trade sector (wholesale and retail) and many support services.

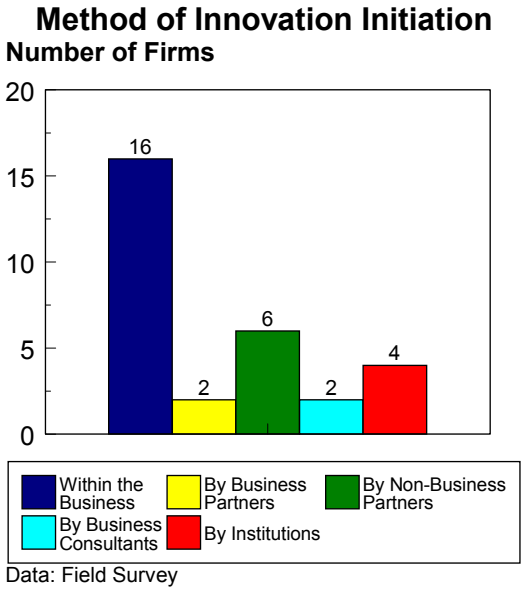
In both areas there is a degree of economic growth, which, if measured in terms of per capita income is higher in Evrytania, despite remoteness. Other indicators of economic development are also showing that Evrytania achieves a more sustainable growth due to the diversification of economic activities and the participation of a large part of the population in the development process while in Kalavryta, growth is concentrated in the town of the area and around the ski resort and benefits a limited number of the population.

3.2 Data

It was decided (due to cost limitations) to sample 50 businesses in each of the two case study areas. A two-stage, (quota, then representative stratified) sampling procedure has been devised. The total of 50 businesses is first divided into two sub-samples (25 each), to be drawn from the manufacturing and service sectors (as defined by the NACE Divisions). Each sub-sample, was proportionately stratified as regards the distribution of micro, small, medium and large firms in the two case study area and yielded a sample representative to the population of businesses. An exhaustive list of enterprises in the two case study areas was drawn up and, due to the fairly limited number of businesses in the manufacturing sector, all businesses in manufacturing were included in the sample. After conducting a pilot survey, certain minor adjustments were made to the questionnaire, and personal interviews conducted by trained personnel started in the second half of April 2002 and ended in mid August of the same year. The survey yielded 100 fully completed and usable questionnaires. The sampled enterprises are active in food processing operations (meat processing, olive oil refineries, cheese making, etc.), other manufacturing activities, wholesale and retail, transportation, rural tourism activities, mostly room-letting, combined or not with restaurants and/or other services, such as financial services or tourism and property agents. The questionnaire recorded in detail each firm's innovative activities and attempted to capture several dimensions of business performance. More specifically we tried to capture a firm's innovative activity following the classification provided by North and Smallbone (2000a) who distinguish five types of innovation: the introduction of a new good, the introduction of a new process, the opening of a new market, the identification of a new source of raw materials and the creation of a new type of industrial organization. Figure 1 shows that 30 firms claimed that they introduced 34 innovations in the very recent years. From the same figure it is also evident that firms claim innovations to be initiated from within the business or in cooperation with non-business partners (family, friends, etc.) while the role of business partners and business consultants in instigating innovations is restricted.

Figure 2. Innovative Activity of Sampled Businesses





4. Results

4. 1. Factors Influencing the Introduction of Innovations

In this work we assume that a firm's probability to have introduced an innovation in the recent years is:

$$\Pr ob(INNOV = 1) = \int_{-\infty}^{\beta' \mathbf{x}} \phi(t)dt = \Phi(\beta' \mathbf{x}) \quad (1)$$

the well known probit specification, where $\phi(.)$ is the standard normal density, $\Phi(.)$ is the standard normal distribution, $\mathbf{x}$ is a vector of covariates assumed to influence the introduction of innovations and β a vector of unknown parameters to be estimated. The marginal effects of the covariates on the probability that an innovation has been introduced by the firm are:

$$\frac{\partial E[y|x]}{\partial x} = \phi(\beta' x)\beta \quad (2)$$

The marginal effects show how much the probability to report innovative activity, expressed in percentages, will change if the independent (explanatory) variable changes by a marginal amount from its sample mean. The marginal effects for dummy independent variables are estimated as a difference between the variable's two values, i.e. 0 and 1 (Greene, 1997). A goodness of fit measure based on the likelihood ratio test statistic, usually reported as McFadden's ρ^2 measure (Maddala, 1983), is:

$$\rho^2 = 1 - \frac{\log L_{\Omega}}{\log L\omega} \tag{3}$$

where L_{Ω} is the maximum of the likelihood function when maximised with respect to all parameters and L_{ω} is the maximum when the likelihood function is maximised with respect to the constant term only, i.e. setting all the βs equal to zero. Table 4 shows the estimated coefficients for the probit model and the estimated marginal effects of equation (2). The definition and descriptive statistics of the variables used in the estimation of the probit model are shown in table 3.

Table 3. Definitions and descriptive statistics of dependent and independent variables.

Variable Name	Definition	Mean (S.D)
Dependent Variables		
INNOV	Dummy variable, 0= Firm has not reported the introduction of an innovation in recent years (less than 5), 1=Firm reported the introduction of at least one innovation in recent years	0.30 (0.46)
PEREMP	Dummy variable, 0= Firm reports negative or no change in employment, 1=Firm reports positive change	0.29 (0.45)
PERPM	Dummy variable, 0= Firm reports negative or no change in profit margins, 1=Firm reports positive change	0.52 (0.50)
PERTS	Dummy variable, 0= Firm reports negative or no change in total sales, 1=Firm reports positive change	0.53 (0.50)

…table 3 continued on next page

… table 3 continued

PERINV	Dummy variable, 0= Firm reports negative or no change in investments, 1=Firm reports positive change	0.36 (0.48)
Independent Variables		
LABSIZE	The firm's size in Annual Full-Time Equivalents (AFEs)	2.55 (3.27)
FIRMAGE	Firm's age in years	12.13 (11.52)
REGION	Dummy variable, 1= Firm is located in Kalavryta (less remote), 0=Firm is located in Evrytania (remote)	0.50 (0.50)
LOCAL	Dummy variable, 1=Entrepreneur Born and Raised in the area, 0=Otherwise	0.68 (0.47)
PSR	Percentage of production sold to local businesses and customers	74.39 (67.97)
AGE	The owner's age in years	39.61 (10.72)
NETSALES	Dummy variable, 1= Firm does not have access to vertical networks for output, i.e, it accesses horizontal networks or exercises spot trade for output, 0=Firm accesses vertical networks for output,	0.59 (0.49)

Before finalizing the variables included in table 4, a wide range of variables that could affect innovative activity has been entered but did not improve the model's explanatory power. More specifically, a wide range of variables measuring business networking were tested as omitted variables and the tests failed to indicate inclusion in the model. Other firm specific and entrepreneur specific variables were also examined for omission. Finally, dummy variables capturing the sector of economic activity were not included in the model due to high multi-collinearity with the firm size and age variables. An inspection of the fitted coefficients in table 1 reveals that the size of the business measured in employment positively affects the probability of innovations while the firm's age affects the same probability negatively. The negative coefficient for the regional dummy reveals that the probability that an innovation is claimed by a firm is

lower if the firm is located in Evrytania than if the firm is located in Kalavryta. Finally, if the entrepreneur has been born and raised in the area the probability that his/her firm claims the introduction of an innovation, is lower as opposed to an entrepreneur that he/she is not from the area and may be considered as an 'outsider'. The estimated marginal effects reveal the same picture. The probability that a firm claims innovations increases by 7.3% for each additional labour unit more than the sample mean with all other variables held constant at their sample means. The probability that a firm claims an innovation decreases by 1.6% for each year of additional age from the sample mean with all other variables held constant at sample means. The probability that a firm reports an innovation is higher for a firm located in the area of Kalavryta by 36.5% to a firm located in Evrytania with all other characteristics held constant at sample means. Finally, the probability that an innovation is reported by a firm whose owner is from the area (born and raised in the area) is 25.5% less than that of a corresponding firm whose entrepreneur is from outside the area.

Table 4: Coefficient estimates of probit model for the introduction of innovations.

Independent Variables	Coefficient Estimates		Marginal Effects	
	Coefficient	t-value	Coefficient	t-value
Constant	0.442	1.335		
LABSIZE	0.231**	3.091	0.073**	2.979
FIRMAGE	-0.050**	-2.528	-0.016**	-2.621
REGION	-1.200**	-3.706	-0.365**	-3.994
LOCAL	-0.759**	-2.307	-0.255**	-2.222
ρ	0.303			
Log-L_{Ω}	-42.547			
Log-L_{ω}	-61.086			
% of correct predictions	82.0%			

Note: Two asterisks indicate significance at the 5%.

The effects of firm size and age are best portrayed in figures 2 and 3. The estimated probabilities for each one of the two areas were carried out using the formula in equation (1) and holding firm age and firm size at their sample means in figures 2 and

3 correspondingly. It is evident that both size and age matter. Innovation starts exhibiting any positive probabilities once the size becomes larger than 15 employees and after 20 employees increases with an extremely high rate for entrepreneurs born and raised in Kalavryta (pink line in figure 2). As concerns the effects of age it is evident from figure 3 that newborn firms exhibit high probabilities to innovate, which decrease rapidly and become zero well before the age reaches 10 years.

Figure 2. Effects of Size on Predicted Probabilities of Innovation

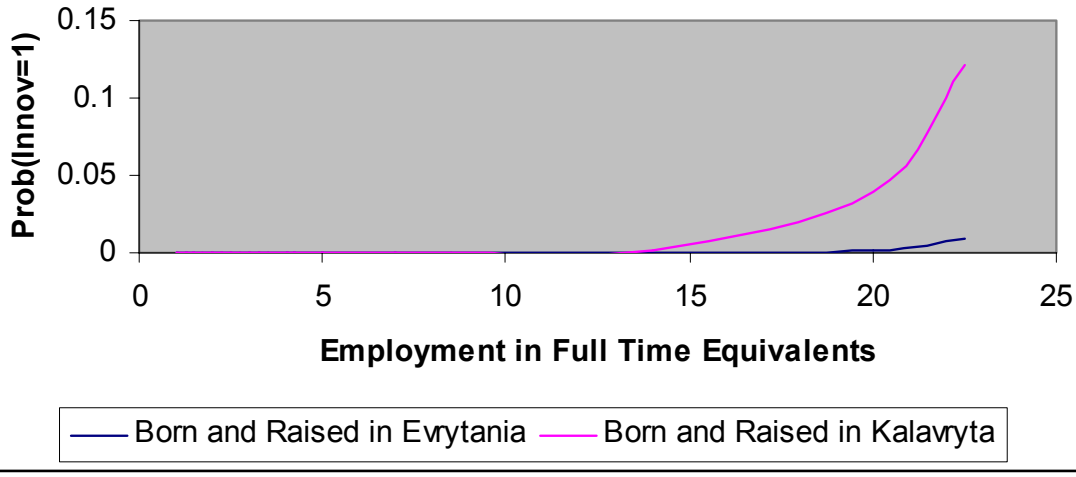
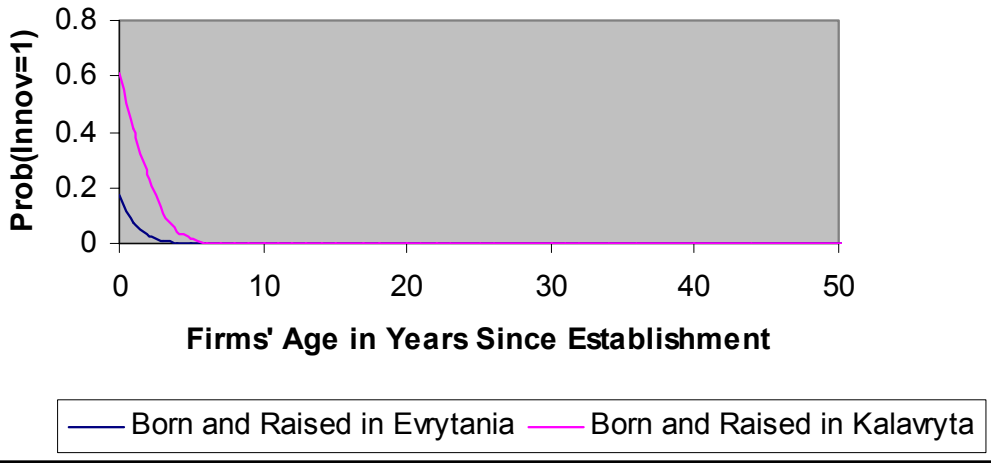


Figure 3. Effects of Firms' Age on Predicted Probabilities of Innovation



4.2 Innovation and Firm Performance

The second aim of this paper is to examine the effects of having introduced an innovation to various dimensions of firm performance. The definition of successful business performance is a controversial issue in business economics, largely due to the multidimensional meanings and goals that have been assigned to entrepreneurship. Research on performance measurement generates from organization theory and strategic management. Murphy's et al. (1996) work has provided the most complete account of the changing meaning and measurement of performance in entrepreneurship research up to the mid 90's. Financial performance is at the core of the organizational effectiveness domain (Chakravarthy, 1986) while operational performance measures concepts such as product quality and market share and defines a broader conceptualization of organizational performance by focusing on factors that ultimately lead to financial performance (Hofer, 1987; Kaplan, 1983).

Measuring performance in SMEs in lagging and peripheral regions presents some very acute difficulties in practical terms. Basic performance may be measured by physical quantities (employment, quantities of inputs or outputs, etc.) or by basic financial measures of performance (e.g. Returns on Assets), profitability (e.g. profit margins, etc.), growth (of sales, assets, etc.) or of leverage (liquidity measures etc.). Data may be derived either from published data that are drawn from a firm's book values or directly from questionnaires conducted with businesses. Both sources involve serious concerns about data validity, referring either to the firm's disclosure policy or to intentionally misleading answers in questionnaires. Another problem related to data derived from book values is that only data related to the firms' financial performance may be derived while all other dimensions of performance such as strategic and/or organizational may not be approximated. Especially when SMEs are considered, financial performance data are not easily derived from book values because most firms are not legally obliged to publish book value data or make them available to interested parties. It is not thus surprising why in most studies examining dimensions of performance of SMEs in rural and peripheral areas data are derived from questionnaires. In our work, and in order to avoid recording actual data we recorded whether a series of performance indicators including employment, profit margins, total sales and investments have increased in the recent years or not. Thus, performance indicators have been recorded as binary variables indicating positive change and/or no change

(none of the firms reported negative change in this sample). The performance in terms of employment and taking into account innovation may be modeled as:

$$\Pr ob(PEREMP = 1) = \int_{-\infty}^{\gamma' z} \phi(t)dt = \Phi(\gamma \mathbf{z}) \quad (4)$$

which is a probit formulation as in equation (1) but the binary variable indicating innovation is included in the z vector of explanatory variables. However, taking into account equation (1), then equations (1) and (3) should be simultaneously estimated as a bivarate probit model. The estimated coefficients of the bivariate probit model and the marginal effects are shown in table 5. The definition and descriptive statistics of the variables in the bivariate probit model are shown in table 3.

Table 5. Coefficient estimates of the bivariate probit model.

Independent Variables	Coefficient Estimates and Marginal Effects		
	Coefficient	t-value	t-value
Performance Equation			
Constant	-2.862**	-3.209	
INNOV	1.085**	1.978	0.187
AGE	0.025*	1.773	0.002
PSR	0.013*	1.773	0.001
NETSALES	-0.528	-1.340	-0.059
LABSIZE	0.129	1.323	0.012
Innovation Equation			
Constant	0.406	0.977	
LABSIZE	0.226	1.431	0.013
FIRMAGE	-0.040**	-2.310	-0.002
REGION	-1.304**	-4.233	-0.076
LOCAL	-0.729**	-2.187	-0.050
RHO	-0.712*	-1.725	
Log-Likelihood	-93.473		

Note: Two and one asterisks indicate significance at the 5% and 10% correspondingly.

From the results shown in table 5 it is evident that the existence of an innovation positively affects the probability that performance in terms of employment has increased. The same positive effect is also produced by the entrepreneur's age and the extent of sales to local businesses and customers. What is also interesting, although not statistically significant, is the negative sign of the variable indicating that the firm accesses a network for output linking the specific business to businesses that are located outside the area. Inspecting the marginal effects we see that if a firm claims the introduction of an innovation, the probability that the same firm reports increased employment increases by 18.7%. The same results were derived if the performance indicator is replaced by increased profit margins (PERPM), total sales (PERTS) and investments (PERINV). The introduction of an innovation increases the probability that performance measured by these dimensions, is positive. Detailed results are not reported here due to space limitations but are available by the authors upon request.

5. Conclusions

This paper aims to contribute to the effect of innovation on business performance in the spatial context of peripheral areas. We recorded in detail each firm's innovative activity and attempted to capture several dimensions of business performance.

After using a probit and bivariate probit model our conclusions are that:

- a wide range of variables measuring business networking were tested as omitted variables and tests failed to indicate inclusion in the model
- the business size affects positively the probability of innovation, while the opposite is the case for business age
- the entrepreneur who has been born and raised in the area is less probable to introduce innovation than the entrepreneur who is not from the area.
- The location of the firm affects its innovation with firms located in Kalavryta (less peripheral and more accessible than Evrytania) being more innovative than firms located in Evrytania.

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