

THE ROLE OF EU-FUNDED RESEARCH NETWORKS IN PROMOTING KNOWLEDGE-INTENSIVE ENTREPRENEURSHIP

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ABSTRACT

Knowledge-intensive entrepreneurship (KIE) can be considered a key driving force for innovation-led and high-growth development paths by converting valuable knowledge into innovative new ventures. Therefore, it can enhance the Greek economy's innovation, knowledge content, and long-term developmental prospects. At the same time, the EU-funded Framework Programmes (FPs) and the research partnerships and networks developed through them are supposed to create and diffuse innovation across and within Member States. Considering the intense and steady participation of Greece in the FPs across time, this paper examines whether FP-based collaborative R&D networks can promote KIE by allowing young Greek firms a) to gain access to a considerable amount of resources and b) to develop relationships with actors exhibiting a high degree of diversity. Furthermore, it explores firm-specific factors determining their participation in EU-funded research projects.

KEYWORDS: Knowledge-Intensive Entrepreneurship, Framework Programmes, Social Network Analysis, Desk Research, Young Firms

INTRODUCTION

Several studies have examined the structural features of collaborative research networks funded by the European Commission's Framework Programmes (FPs)^[1-4]

The most important findings of these studies can be summarised as follows:

- Research activity funded by the EU is characterized by a significant increase over time, both in terms of participating bodies and the number of participations of these bodies, thus leading to the creation of large networks.
- The connectivity of networks depends, to a large extent, on a core of important actors/organizations consisting mainly of universities, research centers, and large enterprises, which have strengthened their positions and strategic roles over time.
- New entrants (such as small businesses) gain access to FPs, often through participation in projects coordinated by larger and more renowned organizations. Therefore, it can be assumed that, although the core networks remain stable, they can also attract new partners.
- Network connectivity depends, to a large extent, on a core of important actors/organizations, mainly universities, research centers, and large enterprises, which have strengthened their positions and strategic roles over time.
- Finally, these networks exhibit "small world properties," i.e., they can be considered effective mechanisms for creating and diffusing knowledge.

Empirical evidence shows a general downward trend in industrial participation in FPs over time^[4] due to contractual terms for intellectual property rights, administrative complexity, and red tape. The presence of dynamic SMEs is generally limited, and only a small number of them acquire as important network positions as their larger, established counterparts^[4]. Barriers to participation^[5]

may be related to a) the cognitive distance between EU research projects and SME practices, which determines the extent to which an SME can use the additional resources accessed and/or whether it has produced new knowledge as a result of working with partner organizations on a project; (b) the social distance between SMEs and potentially attractive partners because the extent to which SMEs can find suitable partner organizations mainly depends on their relational and structural integration into existing cooperation networks; (c) the cost of participation, and finally (d) the complexity and length of EU proposal procedures.

Moreover, the available empirical evidence on the impact of FPs on businesses shows that their main contribution lies in improving their scientific and technological capacities and not directly in their economic performance. In this context, there is a need for a better understanding of whether EU-funded research projects create an appropriate networking environment to enhance companies' intangible assets (e.g., technological capabilities, specialized knowledge), which in turn influence their economic and innovation performance, with a focus on small, new knowledge-intensive enterprises.

The purpose of this paper is to investigate whether collaborative research networks formed within the framework of European research programmes can enhance knowledge-intensive entrepreneurship^[6-7] by providing new Greek enterprises participating in them, access to multiple resources, such as financial resources, knowledge, technological expertise and linkages with highly diverse institutions, with whom cooperation can yield multiple benefits. At the same time, the paper aims to unveil which characteristics of these new Greek enterprises influence their participation in FPs, focusing mainly on factors that reflect their knowledge intensity and the roles they undertake in research projects.

RESULTS AND DISCUSSION

Our research methodology included three main stages. In the first stage, young Greek companies (established from 2010 onwards) with at least one participation in the Horizon 2020 (2014-2020) or the 7th Framework Programme (FP) (2007-2013) were identified using the STEP-to-RJVs database. This database, created and constantly updated by the LIEE/NTUA, draws data from CORDIS, the official Community Research & Development Dissemination Service of the European Commission. In total, 167 enterprises with these characteristics were detected. Then, through the STEP-to-RJVs database, the projects in which these companies participated and their partners were identified to build the overall network of projects in which the young companies participated. Essentially, the overall network was constructed by composing all the individual networks around each business, i.e., their "ego-networks."^[8] In the second stage, we used social network analysis^[9] to investigate the structural features of the overall network formed in the previous stage. We also explored the position and patterns of participation and cooperation of the young Greek enterprises in this network.

In the third stage, extensive desk research was carried out using multiple secondary sources in order to develop a database with detailed information on the general characteristics of these companies (e.g., size, sector, age, member of a business group), quality of their human capital (founding team and employees), the research projects they have participated in (including the Horizon Europe programme) and their key roles in these projects. We found complete data for 121 of the 167 companies identified in the first stage.

Table 1 indicates that both networks (FP7 and H2020) are strongly interconnected. The giant (largest) components covered a very extensive area of the relevant graphs. For example, in the largest network (H2020), the size of the giant component amounts to 4333 organizations, representing 99.88% of the participating organizations. The characteristic path length and network diameter indicate that the average shortest path between any two nodes is just 2.71 steps, while the average longest path is 5 steps. These findings highlight that most organizations involved in these EU-funded research projects are directly or indirectly interconnected. The distance between any two nodes is relatively small, indicating the capacity to reach easily other network partners and favoring the knowledge flow and diffusion of information between nodes. Moreover, the network size is relatively large, considering the large number of participating nodes and connections developed between them (4338 different organizations and 91941 connections interconnecting them in H2020) and the relatively small number of corresponding research partnerships (around 430).

Network structural features can be used to measure the amount of resources an actor can access through direct and indirect ties. The implication for the firms we are examining is that they are embedded in a network where they can have access to a large amount of resources (technological knowledge and information) held by other actors, and, therefore, this may influence their entrepreneurial outcomes^[10]. Due to their liabilities of smallness and newness, young firms have limited resources (e.g., financial, human, and technological) and, consequently, limited possibilities for in-house development of knowledge and technology^[11]. Therefore, by participating in highly interconnected EU-funded research networks, young firms may acquire resources essential for innovation and, at the same time, share risks with others, implementing value-creating strategies that may strengthen their competitive advantage.

Table 1. Networks' Structural Characteristics

	FP7	H2020
Nodes	456	4338
Edges	5467	91941
No. of components	4	3
Size of Giant Component	425	4333
Edges of Giant Component	5342	91937
% of Giant Component	93.2%	99.88%
Density (x100)	5.27	0.977
Global efficiency	0.342	0.387
Clustering coefficient	0.939	0.866
Characteristic path length	2.91	2.71
Diameter	6	5

Figure 4 provides an indication of the diversity of resources a firm can access. Greek young firms participating in EU-funded networks have the potential to develop relationships and exchange

technological knowledge with a variety of organizations, including firms (46.5% of their total ties account for linkages with other firms), universities (21.5%), and research institutes (19.8%). This finding suggests that FPs encourage the collaboration of young Greek firms with diverse public and private entities, i.e., organizations with different experiences, cultures, organizational forms, and technological endowments, promoting in this way the constructive exchange of capabilities, novel knowledge, and technology, increased productivity and entry into new product markets^[11].

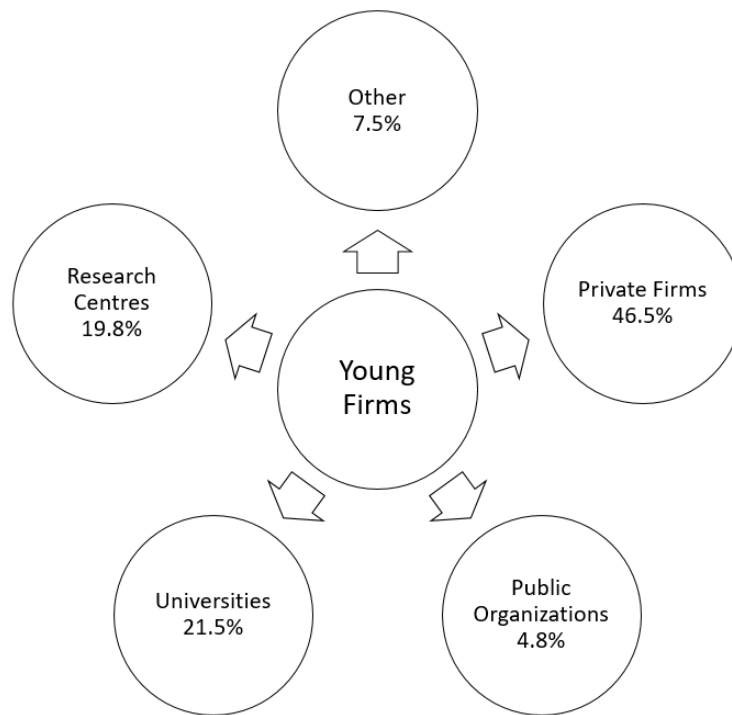


Figure 1. Diversity of young Greek firms' partners (FP7 and H2020)

Table 2 presents two linear regression models examining the determinants of young firms' participation in EU-funded research programmes. In both models the dependent variable was measured as a continuous variable reflecting each firm's participation in FP7, Horizon 2020, and Horizon Europe. The results show that the participation intensity of young Greek firms is significantly correlated with the quality of their human capital. Specifically, well-educated employees holding a doctoral degree embody considerable scientific knowledge and research skills and, thus, are an integral part of the research capability of these enterprises, enhancing their ability to participate in such projects systematically. Furthermore, enterprises with founding teams exhibiting complementary expertise, i.e., combining technological and management/financial knowledge, tend to participate more in European research projects. By combining technical know-how with managerial acumen, such teams can navigate the complexities of securing funding, managing resources effectively, and translating research outcomes into tangible innovations or products. In addition, the ability of firms to assume multiple roles in projects reflects their high knowledge base and demonstrates their ability to leverage their resources and capabilities optimally, thereby enhancing the overall efficiency and effectiveness of collaborative endeavors. Consequently, firms possessing this capability are sought after as partners by prominent research actors and other businesses seeking to leverage their expertise and enhance the success of collaborative projects. All in all, the number of participations is expected to increase with a firm's research capacity^[12], and,

therefore, enterprises with a higher quality of human capital and the ability to undertake multiple research roles in projects engage in more collaborations.

Table 2. Determinants of firms' participation in FPs (Linear regression models)

Independent Variables	No of European Projects	
	Model 1	Model 2
Control Variables		
Firm's Age	0.110	0.112
No of Employees (ln)	0.692*	0.573
Human Resources		
No of Employees with PhD	0.383***	0.421***
Founding Team		
No of Founders	-0.282	-0.288
Combination_Tech & Economy_Scientific Background	1.774**	1.626**
Firm's Role in European Projects		
No of different Roles	1.660***	
Role_Basic Research		0.606
Role_Applied Research		1.142
Role_Technology Development		1.308
Role_Technological Services Provider		2.105**
Role_Trial Use of Research Results		2.107**
	N	110
	F (Prob > F)	18.38***
	Adjusted R2	0.489

***: $p < 0.01$ **: $p < 0.05$ *: $p < 0.10$

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