

The role of founders' human capital and external knowledge sources in the innovative performance of knowledge-intensive entrepreneurial firms

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Conference of Goethe-Institut Athen, LIEE/NTUA and GFOSS – Open Technologies Alliance, 26-27 November 2018, Athens

“Research, Innovation and Entrepreneurship: A new agenda for the enhancement of structural competitiveness”

Knowledge-intensive entrepreneurship

Knowledge-intensive entrepreneurship (KIE) puts a lot of emphasis on:

- a) **Knowledge** – that relates to science, technology and design and creative activities, education and advanced skills
- b) **Innovation systems** – that surround, support and interact with the entrepreneur

KIE refers to **new learning organisations that generate new knowledge or use, transform or recombine existing knowledge and are problem solvers through innovation systems and knowledge networks** (Malerba and Mckelvey 2018)

KIE ventures differ from **new firms in high-technology sectors, new technology-based firms** and **fast-growing innovative firms**

What do we empirically know about KIE

- **Books:** Malerba (2011), McKelvey and Lassen (2013), **Malerba, Caloghirou, McKelvey & Radošević (2016)**, Hirsch-Kreinsen and Schwinge (2015)
- **Journal publications:** Malerba and McKelvey (2018); Protoğerou, Caloghirou and Vonortas (2017); Protoğerou, Kontolaimou and Caloghirou (2017); Gifford (2017)
- **Surveys:**
 - **AEGIS FP7 EU Project (4004 firms, 10 European countries) (2009-2012)**
 - **Cre8tv.eu FP7 Project (1050 firms in creative industries, 5 EU countries) (2013-2016)**

Both surveys were coordinated by LIEE/NTUA

- **Case studies:** 86 case studies of KIE ventures (Malerba, Caloghirou, McKelvey & Radošević, 2016)

Key aspects of knowledge-intensive entrepreneurship

- **Knowledge** gained by **the founders and teams** (such as education, experience etc.) within and across industries, as well as in scientific and research organisations, and in upstream and downstream activities, are fundamental/vital for entrepreneurship survival and performance (Klepper, 2015; Adams et al., 2016)
- **Knowledge creation** is an **individual** as well as a **collective** effort in both its various dimensions and dynamics
- **Innovation systems** provide the **learning context** in terms of knowledge sources, capabilities that are shared, brought together or integrated, and channels through which knowledge flows from one agent to another. Linkages and networks of actors are of utmost importance in the innovation process and also for the creation and formation of entrepreneurship (Malerba and Mckelvey, 2018).

Founders' knowledge and access to external knowledge sources as determinants of young firms' innovative performance

- This presentation will focus on the impact of **founders' human capital and external knowledge sources on the innovative performance of young firms.**
 - Founders' generic human capital
 - Founders' specific human capital
 - Founders' heterogeneity in terms of functional and occupational expertise
 - Networking with universities and targeted collaborative agreements
- Part of a paper focusing on the impact of diverse firm resources and capabilities (internal and external) on the innovation performance of young firms. Recently published in Research Policy (Protogerou, Caloghirou and Vonortas, 2017).
- **Quantitative analysis** based upon the database of the large-scale EU research project, **AEGIS (Advancing knowledge-intensive entrepreneurship and innovation for growth and social well-being in Europe)**, funded by FP7, 2009-2012.

The data

- The quantitative analysis data originate from the AEGIS project survey carried out during Fall 2010 and Spring 2011
- The sample firms were 3-10 years old (i.e. young independent firms which had surpassed the 3-year survival threshold) spanning a wide range of sectors and originating from 10 European countries
- Detailed survey questionnaire which purported to identify the motives characteristics and patterns in the creation and growth of knowledge-intensive young firms in high-tech and low-tech manufacturing and knowledge intensive business services
- Data were collected through telephone interviews with one of the firm's founder

Country & Sectoral group firm distribution

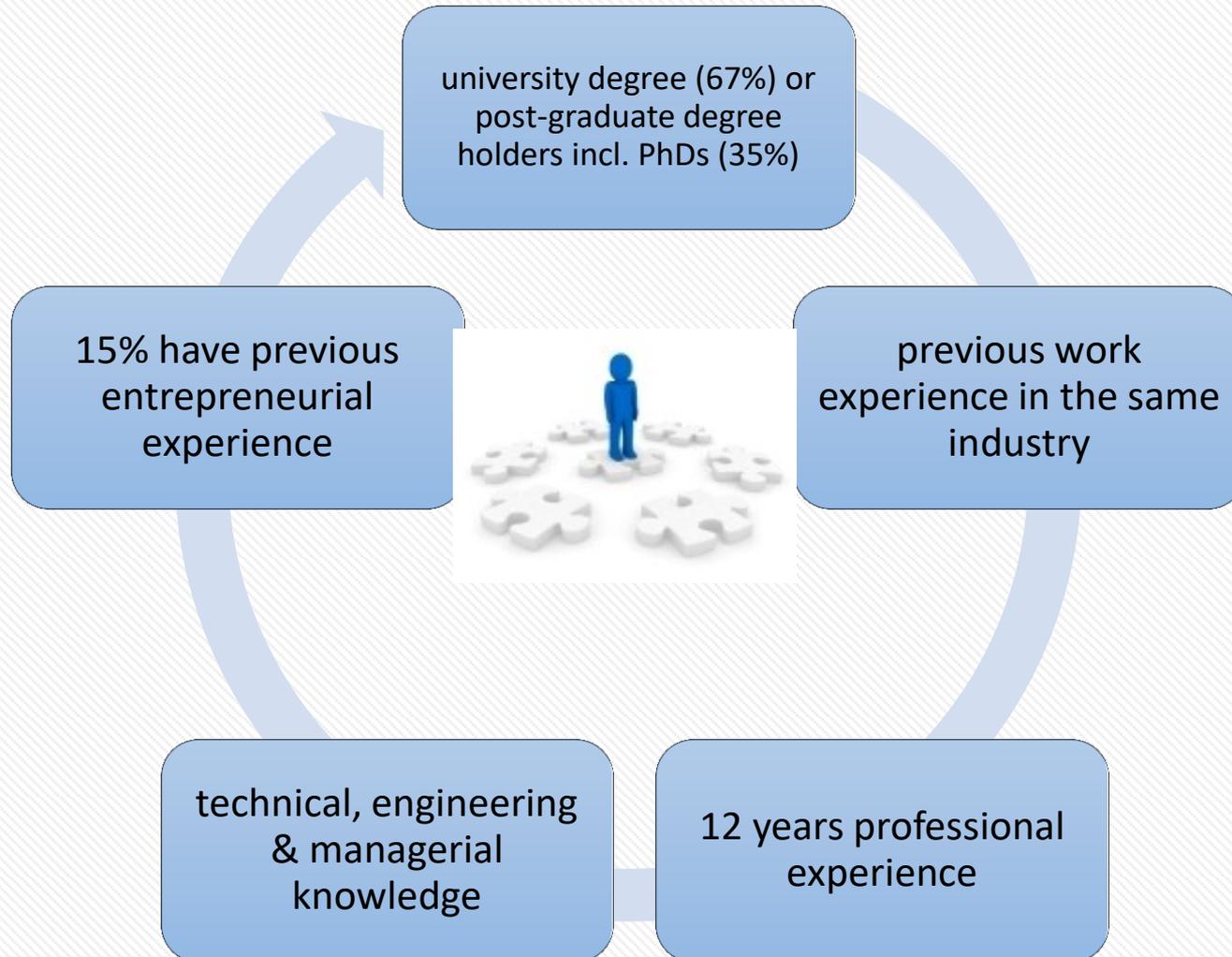
Country	No of firms
Czech Republic	199
Croatia	196
Denmark	329
France	568
Germany	548
Greece	326
Italy	573
Portugal	327
Sweden	326
UK	570
Total	3962

Sectoral group	No of Firms
High-tech manufacturing	87
Medium high-tech manufacturing	328
Medium low-tech manufacturing	280
Low-tech Manufacturing	891
KIBS	2377
Total	3962

Age and size class distribution

Age class	No of firms	%	Size class	No of firms	%
3-5 years	1421	36	Micro	2865	72
6-8 years	1475	37	Small	986	25
9-10 years	1066	27	Medium-sized	111	3
Total	6962	100	Total	3962	100

What is the Founders background?



Determinants of innovation in young firms

<i>Founders' characteristics</i>	Radicalness of innovation	R&D Intensity
Educational attainment	***	***
Professional experience	ns	***
Prior industry experience	ns	**
Prior experience in R&D	***	***
Team diversity in functional expertise	***	**
Team diversity in occupational background	ns	ns
<i>Firm-specific characteristics</i>		
International sales	***	***
Size	***	ns
Employees with university degree	***	ns
Employees' training	**	ns
Venture capital funding	ns	***
Technology collaborations	***	***
Networking activities with universities	**	***
<i>Industry-specific variables</i>		
Price competition	***	***
Market dynamism	***	***
Medium-to-low tech manufacturing	ns	ns
Medium-to-high tech manufacturing	***	***
KIBS	ns	**

General human Capital: **higher educational attainment matter, general working experience does not**

- Findings suggest that entrepreneurs with higher formal education will tend to invest more in R&D and at the same time are more likely to introduce a radical product innovation.
- Findings do not support the hypothesis that working experience in general has a positive impact on a young firm's innovative performance.
 - Founders' educational level might be more important to innovation compared to their general professional experience since higher education attainment can be a source of substantial value especially in contexts where the continuous absorption of complex specialized knowledge is required as a basis of competitive advantage and innovative activity.

Specific human Capital: **prior R&D experience and prior industry experience matter**

- Previous R&D experience important both to radical innovation and R&D intensity implying that this type of knowledge is required to manage effectively available research resources, to devise R&D strategies and to organize and coordinate relative projects.
- Prior industry experience appears to impact positively R&D intensity suggesting that founders with such experience have accumulated valuable market and technology knowledge that may facilitate opportunity recognition and thus strengthen their decision to invest in specific research directions in their new venture.

Team heterogeneity and the ability to interact and access external knowledge matter

- Increased diversity in terms of functional expertise, and especially the coexistence of specific types of functional expertise i.e. technological and marketing skills, enhances the ability of firms to pursue radical innovation and at the same time boosts R&D intensity.
 - This is an important finding considering that technical skills are often prioritized at the expense of complementary managerial skills required to bring products to the market.
- Formal technology collaborations have a stronger effect on innovation than networking with universities and research institutes suggesting that collaborations with commercial/market related partners may be more important than those with academic partners.

Founders' human capital and external knowledge linkages have a **positive parallel role** on innovative activity

Necessity for the development of internal firm capabilities and human capital in conjunction with networking capabilities and the use of external knowledge sources to create value-added innovative activities. Efforts for establishing interaction mechanisms and openness to knowledge sharing should complement internal efforts for a balance and more efficient approach to innovation and entrepreneurship.

Policy Implications (I)

- Encourage single technical entrepreneurs or technically oriented founding teams to **embrace business and management training** or **create mechanisms through which adequate support could be offered to such firms**.
- **Policy makers responsible for allocating financial aid to firms** which undertake projects of high innovative potential **should not only look for technical efficiency in a team** but they should also ensure the existence of adequate managerial and business skills that will enhance firm performance.

Policy Implications (II)

- **Create a larger pool of high-potential would-be entrepreneurs** among, for example, university graduates and people working in R&D labs in universities and research centers. This can be achieved by providing such populations with the necessary entrepreneurial skills and by cultivating, in general, a mindset for innovation and entrepreneurship.
- **Middle aged, highly educated people that used to work for large or smaller enterprises but are currently unemployed** due to the crisis, downsizing, closure or delocalization of their companies should be encouraged through specific start-up programmes to complement their accumulated technical and market skills and knowledge with those skills necessary to undertake entrepreneurial action.

Policy implications (III)

- Innovation-supporting policy efforts should facilitate young ventures **build collaborative interfirm relationships by providing information linkages** about the key variables impacting young ventures **or contacts to facilitate finding new collaboration partners** (e.g. by supporting intermediary actors).
- **Programmes facilitating networking with universities** may help young firms to complement and expand their limited technological resources and knowledge bases. However, there is a **need for more targeted knowledge policy instruments according to the young firms' specific needs**. For example, for small ventures in science based industries, university networking may be critical for strengthening credibility and reputation, while interfirm collaborations are essential in for product development and commercialisation.

Thank you for your attention!

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