

# The global production landscape reshaped – The role of Greece

*Greece excels in innovative research programs. The DiaNEOsis study “Research and Innovation in 2021 Greece” shows that for the past 36 years, the country ranks among the top ten in EU research programs participation. The Greek production model, on the other hand, lacks innovations and technological progress. Greek researchers may produce a plethora of high-level scientific publications, but they rarely lead to new product patents. Although there is a small core of dynamic, extroverted and innovative companies, most Greek companies procure and use technology as a “ready-made commodity” the study notes. How is that possible? The DiaNEOsis study tries to shed light into the Greek paradox and highlight the immense opportunities the Fourth Industrial Revolution (Industry 4.0) could offer to the Greek entrepreneurship*

by Yannis Caloghirou\*

**I**ndustry 4.0 (4IR) is a paradigm shift in industrial production towards the “factory of the future” driven by a cluster of enabling (Internet of Things, Cloud, Robotics, Additive Manufacturing) and General-Purpose Technologies (Big Data and Artificial Intelligence) that demonstrate remarkably high degrees of pervasiveness, dynamism, and complementarity.

4IR is characterized by the dominance of Cyber Physical Systems. In this context, design, procurement, manufacturing, maintenance, distribution, and customer service are linked through the Internet (cloud). Thus, rigid Value Chains are converted to exceptionally flexible Value Networks.

Due to the nature of 4IR, it primarily affects the manufacturing industries. It represents a crucial dimension of the new production model of Greece and

a critical factor of driving the digitalization venture in the Greek Recovery and Resilient Strategy. Furthermore, the creation of industry 4.0 startups can facilitate the adoption of these technologies by the Greek production system.

### “Stuck in the middle” – Empowered by 4IR

One of the critical defects of the Greek production and entrepreneurial system is “the stuck in the middle” or “stuck in-between” trap in the international division of labor. In this respect, Greek firms face a dual competitive pressure both from the low cost and the quality-based producers. The adoption of 4IR technologies in the Greek economy opens new possibilities for Greek SMEs (i.e., through 3D printing) enabling them to cope with the Global Competition based on economies of scale and

lower labor cost. In addition, in an era of uncertainty and significant volatility, 4IR Technologies can allow the transformation of Value Chains and production processes associated with the Greek Businesses to a more flexible and resilient mode.

Global Value Chains will undergo a drastic transformation in the decade ahead. Based on UNCTAD’s World Investment Report 2020, the global trade and investment landscape will be reshaped by the restructuring of global chains, build-up of new regional chains, and distributed manufacturing. In this regard, Greek firms should reposition their participation in shorter, less complicated, more flexible, and resilient Global Value Chains and they would not rely exclusively on efficiency (in terms of cost). In this regard they will participate in building up or building back European

Value Chains. Furthermore, they need to strengthen domestic value chains in certain sectoral production ecosystems e.g., food, energy, environment, creative industries.

Greek firms should participate in building up or building back European Value Chains. For example, Greece has a strong research community in biomedical sciences both domestically and in the Greek diaspora. A coordinated long-term programme involving top researchers from Greece and abroad and scientists and engineers employed in the Greek pharma industry could support the production of medical instruments, devices and equipment and contribute to the development of new drugs.

I would also mention the value chain linking agriculture, the food industry and tourism as a channel to promote Greek food products and Greek cuisine to the millions of visitors travelling to Greece.

There is an urgent need for building up a modern, well-functioning, unified innovation system (by linking R&D, In-

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novation, Innovative Knowledge-Intensive Entrepreneurship and Capabilities Building) as a prerequisite for promoting Structural Competitiveness, Recovery, Resilience and Upgrading the position of the Greek Production in the International Division of Labor.

In addition, a vision for aspiration and development should be cultivated in order to mobilize all those interested and get them involved.

### From lab to market

Despite the fact that Greek researchers produce many and high-level publications, few patents derive from them.

## ▶ Making a difference – Stories of success

There are certainly examples of “good practice” mainly related to entrepreneurial ventures in high technology sectors such as Information and Communication Technologies, biotechnology, and medical devices and even low and medium-tech sectors such as the food industry. For instance,

Think Silicon, a firm originally

established in Patras Science Park which designs ultra-low power graphics processors for mobile devices was acquired in 2020 by the American giant Applied Materials. ResQ Biotech, a spin-off company of the National Hellenic Research Foundation which develops drugs against protein misfolding diseases (Alzheimer’s disease, cancers, etc.) was one of the 44 companies worldwide honored with the Nature Research Spinoff Prize 2020 (published by the renowned scientific journal) and Merck. DeepSea, a start-up maritime technology company with extensive expertise in the fields of software, hardware, and Artificial Intelligence, has recently secured €3 million from London’s ETF Partners, the firm’s first investment in Greece.

In addition some newly established knowledge-intensive entrepreneurial ventures emerged (InAccel, SIBA, PhosPrint, Purposeful, Scientia Mares, Voltage Stability Monitoring Tool, Coffee-eco, Trimsignal etc.) from the Invent ICT coaching programme, a joint initiative of the incubator Invent (NTUA/Institute of Communication and Computer Systems) and the Greek Mobile Operators Association.

To multiply such ventures, the development of the Greek startup ecosystem should be structurally founded on promoting collaboration between, large enterprises, academic institutions, and start-up firms, enriching the country’s start up workforce with specialized formal and soft skills (e.g., entrepreneurial skills, digital skills etc.), ensuring ongoing funding, and building a business environment that is conducive to growth.



ResQ was awarded the Spinoff Prize 2020 by Nature Research in collaboration with Merck



DeepSea specializes in vessel performance monitoring and optimization

## Building Capacity and Skills



Just one in four companies has an R&D department (in big companies, with more than 250 employees, the number is 40%)



3.9%

Greece traditionally spends little on education (3.9% of GDP, compared to the 4.6% European average)

Greek startups employ an average of 9 people, compared to 12.6 in EU (EU Startup Monitor, 2018)



59%

Just 59% of Greek companies had a website in 2019 (compared to 78% in the EU). The same year the electronic trade amounted to just 4% of the total turnover (compared to 18% in the EU)



4%

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There are several reasons for that divergence. First, it is very much related to the Greek Research and Development Subsystem structure, and specifically to the mismatch between the research activity undertaken by Universities and Public Research Institutes (PRIs) and the valorization and commercialization of the generated research results. In this regard, until recently, the IPR and spin-offs regime was not well defined and most of the Universities and PRIs (with some notable exceptions e.g. the Aristotle University of Thessaloniki and the Democritus Research Centre) did not have a clear IP Strategy and a relevant Technology Transfer Office. Furthermore, the funding of research teams willing to file and maintain patents was minimal. Second, due to their size (too many “micro-firms” and self-employed) and market orientation (mainly targeting domestic and local markets), the vast majority of Greek firms are not performing research and innovation activity. They usually consider technology as a commodity and therefore use ready-made process

technology and equipment. Moreover, University-Industry Research and Development collaboration is very limited. Third, the Greek Public Sector does not pursue a coherent Public Procurement for Innovation Strategy.

The conversion of research results to new products, processes, and new entrepreneurial ventures is usually a non-linear and complex process. In the case of academic research teams, it requires guiding, individualized coaching and mentoring services, and early seed capital or the search for willing to pay customers, and above all considerable commitment to the new venture of one or more members of the team. As innovation and entrepreneurship are systemic phenomena, creating a unified innovation (eco) system should become a top public policy and business strategy priority. A number of institutions for supporting the creation of the system and the motivation of young students and researchers to become aware of why valorization of their research is important, and knowledge-intensive entrepreneur-

ship could be part of their career path are essential, especially for students of engineering, science, business, and management studies. In this regard, it would be necessary to set up or transform existing Innovation and Entrepreneurship Units (IEU), coaching organizations, accelerators, incubators, Tech Transfer Offices. In addition, the legal framework for spin-offs should be activated, and the protection of Intellectual Property Rights where needed should be clarified and supported. In addition, University-Industry Forums for Industrial research should be established to encourage collaboration and valorization of research and technical ideas to solve industrial problems. In this framework the broader introduction of Industrial PhD programmes would be of significant added value.

### Attracting researchers from abroad

Greece has a remarkably high-quality, excellent, and globally active diaspora active in the academic and research community. Many of them are willing to collaborate with Greek Universities and PRIs provided that a flexible scheme would be established. This also applies to non-Greek researchers. In addition, the set-up of joint postgraduate and PhD programmes with other European and non-European top Universities, which already exist in other EU countries, would create an inflow of competent researchers. Finally, enhancing the trend for the establishment of Centers for Research and Innovation both by International Corporations and International Foundations could create a “brain gain” effect. 

The research was undertaken under the scientific coordination of Yannis Caloghirou, Professor Emeritus at NTUA, and Aggelos Tsakanikas, Associate Professor at NTUA. The team of researchers of the Laboratory of Industrial and Energy Economics also included Dr. Aimilia Protogerou, Dr. Panagiotis Panagiotopoulos, Dr. Evangelos Siokas, Georgios Siokas, and Dimitrios Stamopoulos.

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