

EXAMINING ASPECTS OF ACADEMIA - BUSINESS KNOWLEDGE INTENSIVE SYNERGIES IN GREECE. DATA AND TRENDS

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Abstract

In this paper, we present evidence in relation to the synergies established between the academic and business communities. We do so by examining a variety of relevant indicators, namely by making use of a combination of qualitative and quantitative data on research, development and innovation-related activities. More importantly, the data is timely and refers to the most recent years. Findings give out a mixed signal. Whereas some aspects of this synergetic relationship, namely, co-publications, can be improved, other aspects, such as innovative enterprises collaborating with the academia indicate a clear and growing collaboration pattern. Correcting the former and enhancing the latter constitute steps which are especially important in the post-crisis era, where a new growth model and productive restructuring towards a knowledge-intensive pattern is a prerequisite for sustainable growth. On a wider level, this paper contributes to the theorisation on the knowledge intensive synergies between academia and businesses, thus offering empirical level findings towards the “triple helix” debate.

Keywords

Academia, Businesses, knowledge-intensive synergies, Greece

1. Introduction

Entering the post-crisis era, Greece is actively seeking a new growth model that places a premium on productive restructuring and initiatives for boosting investment. It is in this context that knowledge-intensive activities have been upgraded in the policy agenda by virtue of their impact on production restructuring and an investment boom that make use of the domestic research- and technology-relevant comparative advantages (e.g. human capital) [1]. Conducive to these factors, has been the introduction of a national strategy for research and innovation, as part of 2014-2020 smart specialisation strategy implementation in Greece, as well as the wider academic and policy debate on Higher Education Institutes (HEIs) and their role in this knowledge-intensive economy. The latter discussion fits well within HEIs' third mission in the context of the existing knowledge triangle approaches. Within this framework, this paper wishes to contextualise the existing level of interaction between Universities and Technological Educational Institutes, on the one hand, and the business sector (BES), on the other. The geographical scope of this is Greece, and it will be conducted by way of presenting various relevant indicators. Overall, this paper aims to put forward a wide ranging descriptive account, providing an-across-the-board and up-to-date descriptive statistic and numeric indicators of the BES-HEIs interaction. On the wider level, this paper wishes to contribute to the theorisation on the knowledge intensive synergies between academia and businesses.

2. Theoretical background and methodology

Synergies between HEIs and the private sector has been a hot issue, consistently recognised as important in international literature regarding economic development and sustainable growth [2, 3, 4]. According to evidence, enabling knowledge interaction and flows between HEIs with the private sector contributes to economic growth, productive transformation, applied research, technology transfer, etc. Both theoretically and empirically, this aspect of HEIs' operation is directly related to the promotion of the so-called "third" mission of universities [4]. Based on this, multiple theoretical and analytical schemes have been developed, such as the so-called "triple helix" theory, the knowledge triangle approach as well as more nuanced approaches, introducing extra components to the framework of interactions between university, industry and government, such as the civil society, media and the environment.

The underlying thesis has been the need to come forward with a hybridisation of the age-old University, industry and Government activities to generate new institutional and social formats for the production, transfer and application of knowledge. A common underlying feature of all these approaches has been the focus on the interaction of research, education and innovation [6, 7, 8], and the issue of promoting and implementing the idea of modern and "entrepreneurial university". A university, that is, able to re-invent itself and its operation by way of "stepping on two boats": that is holding steadfast in its historical mission improving the wider dissemination of knowledge as well as delivering on various societal needs and market realities.

It is in this context that this paper wishes to depict the current state-of-affairs concerning the Greek HEIs-BES nexus. As far as the methodology used in the paper is concerned, this paper makes use of qualitative and quantitative data. In this paper, emphasis is laid on presenting relevant official indicators as gathered by Eurostat and the National Documentation Centre (EKT). Since 2012, the latter has been designated as the national institution responsible for the production of the official national statistical data on RDI. Of special value is the fact that since 2012, a comprehensive, regular time series of these statistical indicators has been made available. In addition, a range of other relevant indicators that refer to the formal/informal HEIs – businesses collaboration in knowledge-intensive activities that are also collected by EKT by virtue of its role in the national innovation system, are also presented.

In more detail, variables that are made use of herein include:

- i) R&D statistics on synergies for performing and funding R&D activities,
- ii) entrepreneurial metrics on innovation based on results of the Community Innovation Surveys (CIS) - the latter explicitly focus on examining potential BES-HES co-operation for producing innovation,
- iii) metrics on recent public initiatives for supporting BES-HES cooperation for applying R&D projects,
- iv) a bibliometric analysis of co-authored publications, and
- v) qualitative data drawn from a recent field survey on HEIs' interactions as part of an OECD initiative on the knowledge triangle.

In the cases where cross-country indicators on the above mentioned-empirical data are available, this paper makes use of such indicators to make comparisons on an international (namely, European) scale.

The objective of the paper is to provide up-to-date data on the HEIs-businesses collaboration, thus shedding light on the existing situation of this interactive aspect of knowledge intensive activities in Greece.

Provision of such indications can be "tied" to specific and actual comparative advantages and weaknesses of the national innovation system, as well as provide a sign-post of its potential for the future, post-crisis era in Greece.

3. Factual analysis

This section aims to present the relevant data on the various aspects of the HEIs-businesses collaboration in various areas of RDI-relevant activities.

In the following table (Table 1), we present evidence concerning the range of R&D collaboration between HEIs and businesses in R&D projects. When referring to R&D statistics on synergies for performing and funding R&D activities, data shows that the share of R&D that is performed by HEIs and is funded by the business sector is of highly relevant statistical information since it provides a percentile account of this kind of collaboration. More to the point, we estimate this particular indicator, both as a percentage of higher education expenditure on R&D (HERD) and gross expenditure on R&D (GERD), in order to compare the Greek performance to the average of EU. In this case, for the 2011-2016 period, Greek HERD (as a share of gross expenditure on R&D (GERD)) funded by the business sector reaches the approx. 3% and actually almost double the EU28 average (e.g. GR: 2,9% vs EU: 1,5% in 2015).

This finding can be also viewed in relation to the Greek HEIs expenditure on R&D funded by the business sector as a share of total HERD. According to the data, the difference between the Greek performance and the EU average is not significant (e.g. GR: 7,6% vs EU: 6,4% in 2015), although the former still exceeds the latter (Table 1). This trend may be attributed to the fact that Greek HEIs have been diachronically the principal R&D performer in Greece. As a result, HERD stood –at least until 2017– as a substantial share of GERD, especially compared to international trends.

Table 1 R&D Performed by Higher Education Sector and Funded by Business Enterprise Sector (as % of HERD and GERD)

	2011		2012		2013		2014		2015		2016	
	as % of HERD	as % of GERD	as % of HERD	as % of GERD	as % of HERD	as % of GERD	as % of HERD	as % of GERD	as % of HERD	as % of GERD	as % of HERD	as % of GERD
EU28	6,5	1,5	6,4	1,5	6,4	1,5	6,4	1,5	6,4	1,5	6,5	1,5
Greece	9,0	3,6	7,9	3,1	5,5	2,0	6,0	2,2	7,6	2,9	7,3	2,3

source: EKT, Eurostat, authors' calculation

Another indicator that provides evidence on the networking potential between HEIs and businesses can be derived from the CIS survey. In more detail, this indicator refers to innovative enterprises that establish collaborations for carrying out product and/or process innovation activities. The following figure refers to evidence from the latest CIS round (2014-2016), illustrating a cross European country comparison, according to which Greek enterprises indicate a higher than the EU average degree of engagement in cooperation with HEIs. Indeed, Greek firms stand in 5th place among EU countries.

Seen across time, significant fluctuation can be observed. This fluctuation is observed when comparing the CIS 2014-2016 results to those of past series of the survey (e.g. in the 2012-2014 CIS round, the country is ranked in 20th place and in 6th place in the 2010-2012 survey).

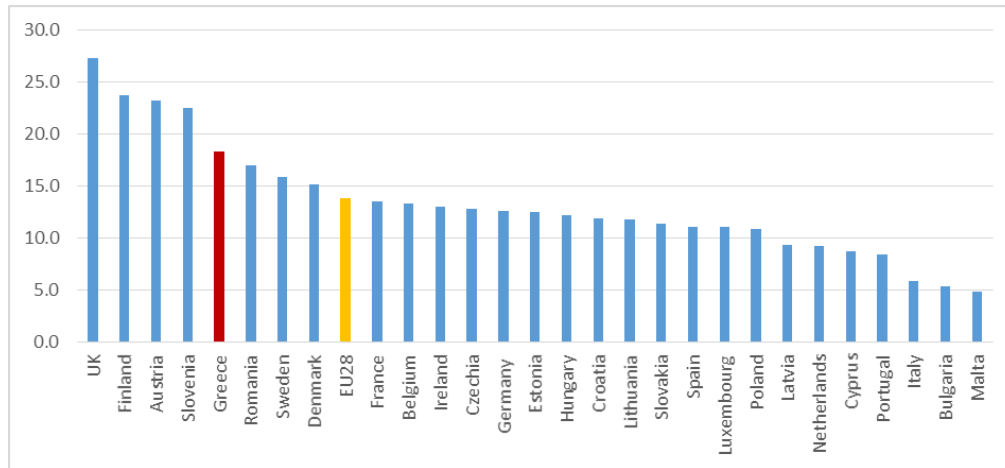


Figure 1 Share of enterprises engaged in product and/or process innovative activities in co-operation with HEIs, 2014-2016

source: EKT, Eurostat, own calculation

A third data source on the level of collaboration between HEIs and the private sector can be found by way of making use of R&D related public tenders and calls. Sachini et al. [16] recently analysed the joint publicly funded R&D projects of the Greek General Secretariat for Research and Technology. They conclude that the level of such collaboration is strongly related to the binding terms and conditions of the tenders and calls at hand. More specifically, only for those programmes, projects, etc. wherein collaboration between HEIs and the private sector was deemed as a formal requirement according to the rules for participation (i.e. obligatory), can a substantial collaboration pattern be observed. In all other cases of programmes, projects, etc. where the decision to collaborate or not is left up to the will of the participants (i.e. optional), the rate of collaboration is decidedly lower. Thus, it appears that these programmes insufficiently nurture the creation of innovation-targeted linkages (Table 2). This implies sub-optimal exploitation of research and knowledge production, as well as inadequate technology diffusion throughout the economic and social fabric.

Table 2 The range of Business-HEIs R&D collaboration in GSRT programmes, 2007-2013

No.	Programme no.	Sectoral focus	Type of collaboration between HEIs/PRIs and business collaboration	% of GSRT's programmes budget (*)
1.	22+	HEIs/PRIs	Non existent	25%
2.	10	HEIs/PRIs and businesses	Optionally	10%
3.	7	Businesses	Non existent	11%
4.	2	HEIs/PRIs and businesses	Obligatory	30%

(*) For the remaining % of GSRT R&D actions, no detailed data was available.

source: [16]

An additional data source is data collected through other public interventions such as “Activities concerning Tertiary Education” that aim towards upgrading the research potential of HEIs, such as support of post-doctoral research, PhD candidates and research teams consisting of young scientists, funded by the 2014-2020 National Strategic Reference Framework. While these interventions mainly aim towards replenishing the declining academic/teaching personnel by way of funding teaching and R&D-relevant activities, a series of enterprise-friendly indicators can be derived. Specifically, when asked whether young scientists would collaborate in the future with firms in order to further exploit their current research idea/project, approx. 70%-80% of the beneficiaries responded that they would be willing to do so (Figure 2).

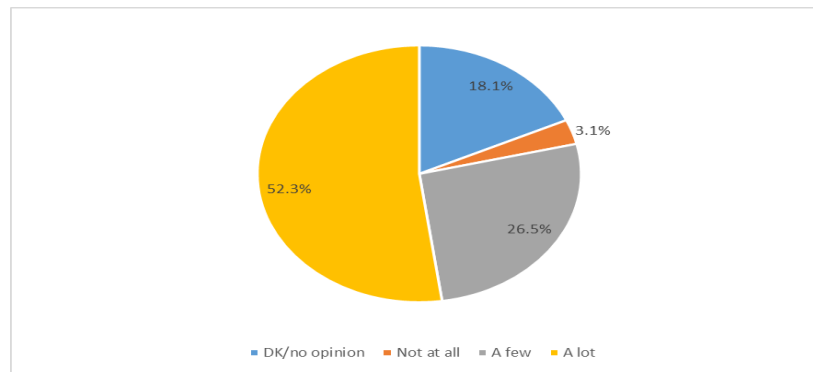


Figure 2: Potential R&D collaboration between young scientists and enterprises (as % of beneficiaries' responses), source: [17-19]
source: [17, 18, 19, elaborated data]

Bibliometric analysis is another data source upon which BES-HEIs interaction can be observed. Bibliometrics is the process of extracting measurable data through statistical analysis of published research studies and how the knowledge within a publication is used. Specific bibliometric indicators (university–industry co-publications (UICs)) can be used as a proxy for examining the level of interaction between the academic community with the business world.

The following figure (Figure 3) presents the relevant European Innovation Scoreboard data for the period 2011-2018. Greece hovers around 31,5 for the entire period, reaching an all-time high value of 36,6 in 2016, whereas the EU average is 78,8, with an all-time high value of 83,3 in 2017. This indicates a case of significant lagging at the level of public-private co-publications in international journals in Greece in comparison with the majority of EU countries (Figure 3).

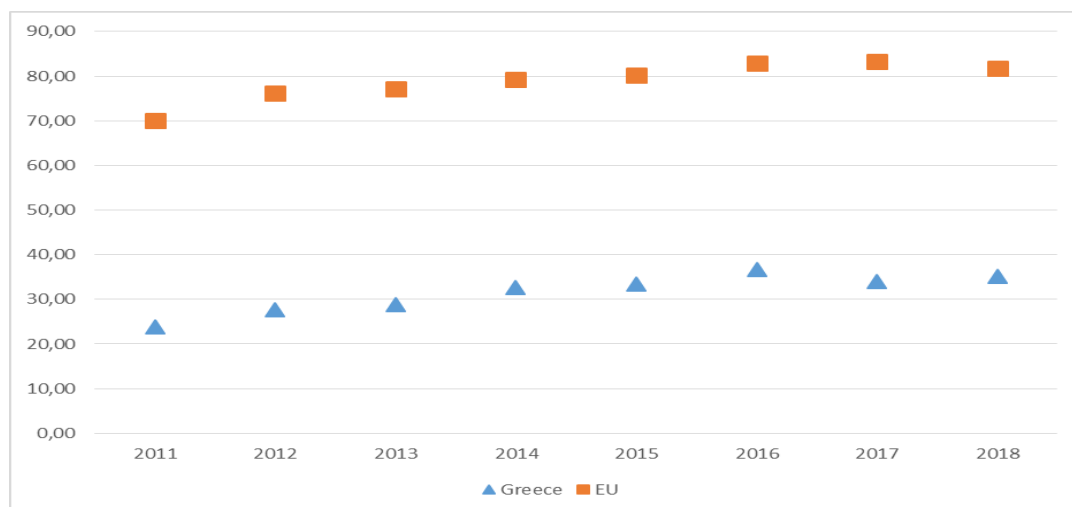


Figure 3: Greek and EU average, public-private co-publications (per million of population), 2011-2018
source: [20]

Furthermore, another data source refers to qualitative data, drawn from a recent field survey on HEIs' interactions within economy, as part of a 2016 OECD initiative on the knowledge triangle in its member states. According to the evidence, one of the unforeseen effects of the economic crisis seems to be directly related to an enhanced intention of both HEIs and enterprises to participate in RTI-related synergies. This came as a result of the significant decrease of public funding for HEIs, which made academics realise the need to establish links with the private sector. Similarly, the private sector responded that realised the need to collaborate with HEIs so as to tap the potential of a growth-related, knowledge-intensive university pool [14].

4. Discussion

The issue of BES-HEIs interaction as a means of contributing to the wider socio-economic development has been hovering high on the policy agenda [2, 3]; in addition to relevant declarations and the introduction of incentives, a continuous need for introducing and applying more and better indicators revealing broader dimensions of this complex and critical phenomenon have been put forward. Given that synergies between HEIs

and the private sector are multidimensional activities for both actors of national innovation systems, an increased appetite for combined, quantitative with qualitative data analysis, is in demand. This has been the scope of this paper, as it relies both on official data, produced by EKT, the Greek statistical agent on RDI metrics, coupled with other various numerical and qualitative indicators.

The evidence put forward indicates that the quality and leverage of the academia-enterprises nexus is rather mixed regarding research and innovation-related activities. In more detail, up to 2016, the business sector's contribution to R&D funding and performance had been rather low, indicating on the one hand specialisation in productive sectors of low to medium technology intensity, and on the other, inadequate technology diffusion throughout the economic and social fabric.

However, the broadly accepted view about the problematic relationship between academic community and the business sector seems not to be fully validated from recent data. For example, data on R&D synergies reveal a rather satisfactory level of cross-sectoral collaboration when examining R&D performed by HEIs, which is funded by enterprises. This is the case, despite the fact that when referring to the high level of Greek performance in the R&D conducted by HEIs and funded by the business sector (as % of GERD), one should bear in mind that HEIs have persistently been the main R&D performer. This remains at odds with EU and international cases, even though during the last years firms have been significantly boosting their R&D spending. In addition, Greek and average EU28 performance in terms of higher education expenditure on R&D (HERD) is similar.

The same complex situation is also presented when examining the collaborative activities of innovative enterprises. On the one hand, synergies with HEIs do exist, but, as reported by the enterprises themselves, they do not stand as the main source of inspiration for carrying out innovative activities.

At the same time, synergies on joint publicly funded R&D projects are rather few. This is related to the fact that NSRF funding directed to R&D activities has followed by and large the pattern of previous CSFs. That is, HEIs actively seek to co-operate with businesses (and vice versa) only in those R&D projects where such synergetic behaviour has been an obligatory precondition to participate, indicating the importance of legislative arrangements as a means to incentivise such collaborations. Furthermore, a number of issues arise in this context, as funding for R&D, in general, and funding that links HEIs and businesses, in particular, is limited to approximately 1% of total NSRF funding [16].

In terms of public financial intervention schemes targeting young researchers, results indicating that the approach of the latter towards engaging with enterprises is more optimistic. More than half of them express their strong willingness to engage with the private sector to further their academic research and enhance the potential uptake of their research by firms [17-19]. This, however, should be viewed for what it is – that is, a statement on future intentions as coming from the researchers and not actualised synergies.

In relation to public-private co-publications, Greek performance is significantly lower than the EU average. Importantly, this indicator remains diachronically low and stands as one of those stumbling blocks that need to be addressed in a comprehensive manner [20].

Overall, and in line with some aspects of the triple helix approach that lay emphasis on interaction between HEIs and businesses [22, 23], the domestic business sector has been making inroads towards increasing their contribution to research production. Similarly, HEIs approach towards the private sector has been, by and large, similarly accommodating. Both observations indicate a potential path towards a growing and more effective exploitation of knowledge production.

In the same vein, according to the CIS data, innovative companies have been forging academic ties and collaborations for the purposes of carrying out product and/or process innovation activities. Obviously, this trend should be further made use of in a positive manner. A manner that would enable a collaborative spirit among academia and enterprises.

5. Conclusions

This paper presented various indications detailing the existing level of interaction in Greece between Universities and Technological Educational Institutes, on the one hand, and the business sector, on the other. The aim has been to provide an-across-the-board descriptive statistical analysis of the BES-HEIs interaction. In this spirit, this paper contributes to theorising knowledge intensive synergies between academia and businesses, shedding some light on the growing need to address the degree to which HEIs and the business sector interact in terms of knowledge- and technology-co-production. Building upon up-to-date data, the highlighted channels of collaboration provided new insights on the level of sophistication indicated by these particular synergies and the potential for the future.

The approach in this paper built upon factual analysis and indicated that the existent level of this kind of synergies brings to the fore a more complex picture compared to the broadly accepted and the broadly accepted view that there is major lack of HEIs-business collaboration in the Greek research and innovation system.

Specifically, data and trends when examining aspects of knowledge intensive synergies between academia and businesses in Greece, send out a mixed signal. While some aspects of this relationship (namely, co-publications) should be assessed carefully, other aspects (innovative enterprises collaborating with HEIs) indicate a clear and

growing collaboration pattern. Correcting the former and enhancing the latter constitute steps which are especially important in the post-crisis era, where a new growth model and productive restructuring towards a knowledge-intensive pattern is a prerequisite for sustainable growth.

On the other hand, the issue of collaboration arrangements and its sustainability beyond the scope of specific programmes or projects, as in the case of GSRT calls in the 2007-2013 programming period, is a point worth further considering [16]. In addition, building robust linkages and synergies between HEIs and BES is a crucial parameter, for which trust and consistency are important. On this, bringing to the fore successful collaboration schemes and analyzing the manner in which this was made possible so as to replicate, is a case for future research. While HEIs have an important role to play in respect to economic and social growth, full potential can only be accomplished with enacting collaborative arrangements with the private sector. EKT, as the national statistical agency on R&D, aims to shed more light on this particular subject producing relevant indicators that would enable more comprehensive analysis.

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