LINKING KIBS, ENTREPRENEURIAL DYNAMICS AND MACROECONOMIC DEVELOPMENTS. FOCUS ON ROMANIA

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ABSTRACT

The knowledge intensive business services (KIBS) sector includes firms where knowledge/information are both the input and output of their activity, offering their clients sophisticated, high-value services, stimulating them to discover and enlighten their own knowledge potential. Taking into account the decisive role of the knowledge-based economy and the importance of the ventures fostering the use of innovation and incorporating knowledge, KIBS are both a challenge and an opportunity for world economies on the path to modernisation, performance and prosperity. Originally associated with the services sector, but productivity being their weak point, KIBS have overcome these circumstances, being, in numerous cases, drivers of regional and sectorial development, leading, directly or indirectly, to increases in labour productivity. In the present paper we intend to examine the multifaceted relation between knowledge intensive business services (KIBS) and entrepreneurial dynamics (as firms' creation or closure), or economic growth and labour productivity. Our analysis, which was performed on the Romanian economy between 2010 and 2017, using quarterly data, provides interesting results, highlighting a complex but contradictory relation between KIBS and economic activity.

KEYWORDS: *knowledge-based services, KIBS, entrepreneurial activity, growth, labour productivity.*

1. INTRODUCTION

Scientific interest in understanding the role of innovation and innovation-related services in economic growth and welfare is relatively recent, but numerous researches in recent decades have been trying to provide a broader and more objective image of their role in the dynamics of the knowledge-based economy. In order to understand this influence, of great importance is the research of the knowledge intensive services sector (KIS) and, in particular, the Knowledge Intensive Business Services (KIBS) subgroup, which includes the activity of firms providing services that embed a high level of knowledge, to other companies and businesses. Initially, definitions of KIBS and most of the scientific literature were limited to a relatively small number of such services – research & development (R&D) and ICT related services. Gradually, studies in this field "embraced a broader view on the type of actors involved, on the innovative services exchanged, on the type of interactions taking place between KIBS and client industries" (Evangelista, Lucchese & Meliciani, 2013, p. 120). Knowledge based services (KIBS) were first defined in the literature as being "services that involve economic activities which are intended to

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result in the creation, accumulation or dissemination of knowledge"(Miles, et al., 1995, p. 18). Den Hertog defines KIBS as being "private companies or organisations who rely heavily on professional knowledge, i.e. knowledge or expertise related to a specific (technical) discipline or (technical) functional-domain to supply intermediate products and services that are knowledge based"(Den Hertog, 2000, p. 505). Thus, KIBS are expert companies that provide services to other companies and organizations, relying on knowledge to develop a customized service or product to meet customer needs (Bettencourt, Ostrom, Brown & Roundtree, 2002), (Toivonen, 2006).

According to the OECD, KIBS refers to the following services: i) services directly related to innovation, such as research and development consultancy and strategic management; ii) accounting and taxation services, which contribute to improving the maintenance and management of different business subsystems; iii) legal services that help businesses deal with legal and regulatory issues; and iv) network services such as production networks, facilitating knowledge sharing and resource sharing (OECD, 2006). Even though most of these services are associated with the business sector, there is also a methodological overlap with knowledge-intensive services (KIS), broader in terms of providers or beneficiaries of these kinds of services (Eurostat, 2016). An important feature of KIBS is their consultancy activity, i.e. the "process of problem solving in which KIBS adapt their expertise and expert knowledge to the need of the client" (Strambach 2008, p. 156) and (European Commission, 2012), thus, they create value when adapting and converting knowledge to higher levels, to enhance the ability to solve their clients' problems (Allee 2008, p. 10). Starting from the above-mentioned studies on the role of KIBS in fostering entrepreneurial activity and macroeconomic results at an EU level; the present paper approaches this relationship at the level of an EU member state - Romania. The paper is organised as follows: in the first part we review the relevant literature; in the second part we present the research methodology, including data sources, the indicators used and the research hypotheses; in the third part we present and discuss the relationship between KIBS and the dynamics of the entrepreneurial activity, and especially the risk of firms discontinuing, and between KIBS and labour productivity and GDP. In the final part we present and discuss the results of our research and draw the main conclusions.

2. KIBS IMPACT ON ENTREPRENEURIAL DYNAMIC, GROWTH AND LABOUR PRODUCTIVITY: AN OVERVIEW

Starting from the assertion that "KIBS are likely to be one of the main engines for future growth within the European Union" (European Commission, 2007), we have tried to identify whether there is a link between KIBS and entrepreneurial dynamics (firm's creation and closure) and between KIBS and macroeconomic indicators - GDP and labour productivity, both at international or European level, but also in Romania.

2.1. KIBS fostering entrepreneurial dynamic and regional development

Koch and Stahlecker (2006) or Stahlecker (2014) assert the impact of KIBS and R&D services on creating knowledge-based business opportunities and increasing the number of regional-based companies, yet still depending on geographical proximity to suppliers and clients, the attraction of metropolitan areas and, certainly, by the structure and configuration of the regional knowledge base. Trying to identify whether there is a link between regional economic development and KIBS, some studies (Chadwick, Glasson, & Smith, 2008), (Simmie & Strambach 2006) show that KIBS are connected to metropolitan areas with high employment rates in these innovative sectors, their number increasing relative to the size of the city. Simmie and Strambach (2006) describe three types of advantages related to the spatial concentration of KIBS in metropolitan areas. The first is related to the production and distribution of knowledge and the individual and collective learning processes, so geographical concentration would facilitate access to information and knowledge. The

second advantage is related to the opportunities found in metropolitan areas. In a metropolitan context, KIBS have different opportunities to use the information and knowledge generated inside the region than in more remote areas. The third advantage of metropolitan areas is related to the presence of agglomeration economies (Simmie & Strambach 2006). According to Malmberg (1997), the access to markets and suppliers, to a skilled and various workforces, to specialized business services and a developed technological infrastructure are essential for enterprises, especially for KIBS. This is because KIBS needs to collect and process knowledge and contributions from other organizations from this environment, in order to quickly respond to the needs of their customers (Malmberg 1997).

KIBS's role in promoting innovation and supporting the creation and development of new firms seems obvious, but should not be overestimated, and the existence of a direct and effective relationship between the KIBS sector, the creation of new ventures and the renewal of economic growth is difficult to assert. The financial sector and the business services sector itself, seem to be primary users of KIBS, while, in productive sectors, KIBS play a complementary role, supporting "internal" (firm-level) innovation and, generally, the performance of national economies (Evangelista, Lucchese & Meliciani 2013, p. 139).

Moreover, Varis, Tohmo & Littunen (2014) found out that the impact of KIBS on the regional economy (and reciprocally) is not remarkable. A possible explanation is that relations between KIBS companies and other local industries (especially low-tech ones) are not proximity-dependent. Finally, Hyytinen et al. consider that innovative start-ups in high-tech field or KIBS are not necessarily more likely to survive or capable to create more stable jobs than other start-ups (Hyytinen, Pajarinen & Rouvinen, 2015, p. 565). In other words, the relatively scarce literature on this subject cannot assert with certainty that KIBS companies are more resistant (or longer-lasting) than firms in other sectors, or whether the presence of KIBS could influence (accelerate or slow down) the rhythm of firm closure. What can be stated with more certainty about these companies is that the closure of an entrepreneurial/innovative/knowledge intensive firm doesn't automatically create a gap in the economy or it is a sign of failure or waste of private initiative (Badulescu, Badulescu & Sipos-Gug, 2018). KIBS and business creation produce positive intertemporal and spatial externalities (Hyytinen, Pajarinen & Rouvinen, 2015, p. 577), leaving behind resources, knowledge, and business ideas that may enable new firms launching (Pe'er & Vertinsky, 2008).

2.2. Relation between KIBS and economic growth and labour productivity

Regarding the role of KIBS in ensuring GDP growth and increases in labour productivity, Kox and Rubalcaba distinguish between a direct effect, stemming from the KIBS' own rapid growth, and an indirect one connected to the positive effects that these business services have on the rest of the economy via the diffusion of specialized and knowledge intensive inputs (Kox & Rubalcaba 2007). KIBS influence GDP growth either through internal dynamics (KIBS' growth rates being well above the industry average growth rate) or through the positive effects of KIBS on the rest of the economy (Kox & Rubalcaba 2007), as "the engine of the accumulation of competencies and knowledge" (Antonelli 1998, p. 192), an effect comparable to traditional production factors. Windrum and Tomlinson (1999) find that KI(B)S have a positive and significant impact on GDP and labour productivity for all countries, but, beyond the size of the knowledge-based service sector, the added-value is brought by the degree of connectivity between services and other economic activities, by spill-over effects (Antonelli 1998), (Camacho & Rodriguez 2007), increasing the output of users of these services, without necessarily introducing new products and services (Evangelista, Lucchese & Meliciani 2013, p. 119).

Regarding the issue of labour productivity, the effects are more nuanced. On the one hand, there is a general idea that the service sector has, overall, a lower productivity compared to industrial sectors, but also critics who consider that the manufacturing productivity concept cannot be applied to

services due to their specific characteristics (intangibility, heterogeneity, strong connectivity to clients and the distinctive importance of the human factor), due to the decisive contribution of some services to the performance of the productive sectors, or due to the (not always straightforward) relation between customer perceived quality and labour productivity. Knowledge-intensive (business) services promote innovation, and thus help increase labour productivity, accompany regional prosperity and attractiveness. Dynamic and prosperous regions typically have a high concentration of KIBS, superior patenting activity (Europa Innova 2009, p. 2), thus, we could say that, together with other factors recognized as boosting (sectoral, regional) labour productivity, the KIBS's contribution is notable. Desmarchelier et al (2013) consider that, regardless of a proven and strong relation between KIBS, knowledge and innovation, the impact of KIBS on the economic growth process is difficult to address, being primarily influenced by the demand for KIBS (for consumption or for investment). The authors suggest that "an increase of KIBS share in production and employment can induce a de-growth in the capital goods sector, which is traditionally at the source of the productivity gains within the modern economies" (Desmarchelier, Djellal & Gallouj, 2013, p. 204). KIBS are obviously a factor for economic and labour productivity growth "even if the driving force of the tertiarisation process remains the industrial sectors" (Desmarchelier, Djellal & Gallouj, 2013, p. 204) and economic growth is often explained by the demand of industrial firms for KIBS. Our previous research (Badulescu, Badulescu & Sipos-Gug, 2018) and (Badulescu, Badulescu, Sipos-Gug & Herte, 2018), on the subject of KIBS' effect on entrepreneurship, growth and labour productivity at EU level (2008-2013) found that the impact of KIBS on entrepreneurial activity in European Union is rather indirect, "although no evidence was found that the share of KIBS companies in the total number of active companies is directly fostering the entrepreneurial activity, the density of KIBS has been proved to be a factor preventing the closure or discontinuing of the companies, as well as a factor leading to increased labour productivity" (Badulescu, Badulescu, Sipos-Gug & Herte, 2018, p. 10).

Researches on relations between KIBS and entrepreneurial dynamics, economic growth or labour productivity on Romania's case are relatively few, but most of them find a strong relationship between KIBS and GDP per capita, skilled workforce, number of enterprises and turnover of local enterprises (Bujdosó, Pénzes, Dávid & Madaras, 2016), (Cătoiu, Tudor & Bisa, 2016), (Strat, Davidescu, Grosu & Zgura, 2016), (Sava & Badulescu, 2018). The main competitive advantages of KIBS are knowledge/ information, which are largely embedded in the experience of their staff. For this reason, KIBS are often developed by small firms with an important share of highly skilled, professional staff, but facing the same problems and difficulties as other, innovative or not, small businesses or start-ups.

3. RESEARCH

3.1 Data and methodology

In our research we employed as indicator of KIBS density the share of KIBS firms in the total of active firms per trimester in Romania. Data were obtained from the National Trade Register Office of Romania/ONRC (2017) and EUROSTAT for the timeframe 2010-2017, using the NACE Rev. 2 classification system. We included in the analysis firms whose activity code is associated (Schnabl & Zenker, 2013; European Commission, 2012, p. 12) to KIBS activities (NACE 2 Rev.2 codes: J62, J63, M69, M70, M71, M72, M73, M742, M743, N782), taking into account certain restrictions, especially those related to the availability of data only at class level. As for the other analysed indicators, namely entrepreneurial activity, labour productivity (*real labour productivity per hours worked)* and GDP per capita, we employed quarterly data available in the EUROSTAT databases. Data analyses were performed using the Eviews software and rely on a simple linear model and a multiple linear model.

Starting from the above-mentioned indicators, we intend to test 2 hypotheses for the case of Romania:

Hypothesis 1: KIBS are a diminishing factor of the number of closed/liquidated firms.

Hypothesis 2: KIBS are a stimulating factor of labour productivity within enterprises.

The results of our research will be interpreted and compared by analysing the results of our similar studies on the same topic, at EU level and during a similar period of time, in addition to other researches on the same topic.

3.2. Results and discussion

H1: The relation between KIBS and the number of closed companies

Results highlight that, in Romania, the share of KIBS companies in the total of active firms negatively influences the number of closed firms for any of the 32 trimesters studied. In order to determine the relationship between the two indicators we employed a linear regression model on trimestral data from 2010-2017, the value of the ANOVA test for the coefficients of the regression model being $F(1.32)=2.34$, with a significance threshold $p=0.1$. The coefficient of this relationship is -0.14, so that an increase by 10% in the share of KIBS firms is associated with a 1.4% drop in the number of closed firms.

These results appear to confirm our previous research (Badulescu, Badulescu & Sipos-Gug, 2018), according to which, during the analysed period (2008-2012), the share of KIBS firms has a positive influence on the number of closed firms per 1.000 working-age inhabitants, in most EU member states.

Table 1. The relationship between closed companies - KIBS, labour productivity and GDP

Constant (a)	Coefficient (b)	F-statistic ANOVA	The residual tests		
			Durbin Watson	**White**	**Jarque Bera**
			H_0 – the errors are independent	H_0 – the errors are homoscedastic	H_0 – the errors are normally distributed
Model: Closed companies=$\alpha+\beta$*KIBS					
4.8057 (0.00)	-0.1423 (0.1)	2.3470 (0.1)	0.3150	0.7167 (0.49)	0.6785 (0.71)
Model: Closed companies=$\alpha+\beta$*GDP					
118.01 (0.00	-0.01828 (0.00)	37.4086 (0.00)	0.78260	1.6725 (0.20)	2.7249 (0.25)
Model: Closed companies=a+β*Labour productivity					
	-0.1848 (0.00)	17.1785 (0.00)	0.9249	1.6357 (0.21)	1.9767 (0.37)

Note: () the probabilities. For 1 Per Cent Significance, the number of observation T=32 and k=1 we find $d_1=1.160$ and $d_2=1.283$

Source: own calculation

Additionally, we also analysed two potential factors which influence the number of closed firms, namely: GDP (starting from the premise of a negative impact of a GDP drop on the demographics of firms) and labour productivity within the firm, respectively. Results have shown that, in the case of Romania, for all of the 32 trimesters, both labour productivity and GDP per capita negatively influence the number of closed firms. The values of the ANOVA test for the coefficients of the regression model are $F_{(1.32)}=14.623$ for GDP and $F_{(1.32)}=17.17$ for labour productivity with a significance threshold $p=0.00$. The results of Table 1 point out that labour productivity is more strongly correlated to the number of closed firms than GDP per capita (-0.018 and -0.184). However, the estimated regression models cannot be used to make predictions, as they do not verify the independence of errors hypothesis.

H2: KIBS are a stimulating factor of labour productivity

Consequently, we have analysed the relationship between GDP and the proportion of KIBS firms using quarterly data for 2010-2017.

Table 2. The relationship between KIBS and GDP and, respectively, labour productivity

Constant (a)	Coefficient (b)	F-statistic ANOVA	The residual tests		
			Durbin Watson	White	Jarque Bera
			H_0 – the errors are independent	H_0 – the errors are homoscedastic	H_0 – the errors are normally distributed
Model 1: KIBS=$\alpha+\beta$*GDP					
11.5892 (0.00)	0.0015 (0.10)	2.7373 (0.10)	1.4016	0.7051 (0.50)	0.3503 (0.83)
Model 2: GDP=$\alpha+\beta$*KIBS					
1093.80 (0.03)	54.86 (0.10)	2.7373 (0.10)	0.9113	1.3305 (0.28)	0.6043 (0.73)
Model 3: Labour productivity =$\alpha+\beta$*KIBS					
65.1212 (0.01)	3.7597 (0.03)	4.7250 (0.03)	1.943546	1.4066 (0.26)	0.1564 (0.92)
Model 4: Labour productivity =$\alpha+\beta$*KIBS+γ*GDP					
-	β=1.5600 (0.00) γ=0.051 (0.00)	179.85 (0.00)	2.0912	0.8832 (0.46)	0.3611 (0.83)

Note: () the probabilities. For 1 Per Cent Significance, the number of observation T=32 and k=1 we find d_1=1.160 and d_2=1.283, while for k=2 we find d_1=1.10 and d_2=1.35.

Source: own calculation

The results highlight that GDP per capita has a significant influence on the evolution of the share of KIBS firms in Romania. The ANOVA test for the regression model has a value of F (1.32) = 2.73, with a significance threshold p=0.1. Subsequently, the evolution of the share of KIBS firms in the total of active firms depends on the levels of the macroeconomic aggregate indicator GDP. Results indicate that the share of KIBS firms positively influence GDP per capita, for all of the 32 trimesters analysed. Thus, an increase of 1% in the share of KIBS firms in the total of active firms is correlated to an increase in GDP per capita of 54.86 with a significance threshold p=0.10.

Additionally, we have identified that KIBS firms are a significant factor of labour productivity, the ANOVA test of the regression model having a value F (1.32) = 4.72 and a significance threshold p = 0.03. If the relationship between the share of KIBS and labour productivity is analysed by including GDP per capita as a factor of productivity, the model remains valid (F(1.32)= 179, p=0.00). Moreover, the model is more efficient in terms of the strength of the correlation, 91% of the variance of labour productivity being explained by this model, compared to 13% for the KIBS-only model ($R^2 = 0.91$ versus $R^2 = 0.13$). In order to determine whether the regression models are valid, we also need to check the quality of the residue. Thus, we tested autocorrelation using the Durbin Watson test, homoscedasticity using the White test, and normality using the Jarque Bera test.

According to the results present in Table 2, for models 1, 3 and 4, we can conclude that the null hypothesis is accepted for any of the 3 tests of the residual variable, considering that the probabilities associated to the tests of the 3 hypotheses are higher than the 5% threshold (p-value = 0.05). Therefore, the correct representation of the residue of the estimated models is validated. For model 2, although we have identified for the 32 observations a direct and statistically significant correlation, it cannot be used for predictions because it doesn't confirm the independence of errors hypothesis.

Our previous researches on the same topic, on a EU level, for the timeframe 2008-2012, have found that "the change in the share of KIBS in total active companies is apparently independent of the level of the aggregated macroeconomic indicator GDP" (Badulescu, Badulescu, Sipos-Gug & Herte, 2018). On the other hand, a higher percentage of KIBS companies in the economy allows reaching higher levels of labour productivity, even though we admit that the relationship between KIBS and labour productivity is significantly influenced by other factors, and including in our model an interaction between GDP and KIBS with respect to labour productivity allows us to obtain more credible results.

4. CONCLUSIONS

In recent times, KIBS have come into spotlight for their potential to enhance economic growth and modernisation, to foster technological progress and the evolution of knowledge-based industries, fundamentally changing our perception on a services sector where labour productivity was not its strongest point. However, the indisputable proof of a close connection between the evolution of KIBS and entrepreneurial dynamics and, in particular, between KIBS and GDP or labour productivity has proven elusive.

Our research has attempted to answer a number of questions regarding the relations between KIBS and entrepreneurial activity, labour productivity and economic growth. We first investigated the impact of the share of KIBS firms (of the total number of active firms) on entrepreneurial dynamics, in particular on firm closure. The results of our analysis support, to a considerable extent, the results of previous studies on the EU member states, expressing the importance of KIBS in maintaining the companies' activities (by extending the firms' "life expectancy"). We have concluded that our hypothesis, according to which KIBS are a factor acting to reduce the number of closed (discontinued) companies, is valid for Romania during the studied period. Secondly, when

analysing whether KIBS increase labour productivity, as well as the role of GDP in that relationship, we have discovered that GDP per capita is a significant factor of the evolution of the share of KIBS firms in Romania, and that KIBS firms are a significant factor of the growth of labour productivity within firms. Returning to our previous, similar research on the topic, we can state that our results (on a Romanian level) are not entirely consistent with our previous result, which stated that, for EU member states, variations in the share of KIBS do not appear to influence or be influenced by the level of the aggregated GDP. The inconsistency is partial, as both the present and previous researches have concluded that a higher percentage of KIBS companies allow reaching higher levels of labour productivity (even though other factors are involved in the relationship). Our attempt to explain these connections is impaired by the limited period of time for which KIBS data is available, which determined us to rely on quarterly data, in order to attain a satisfactory amount of information, allowing us to elaborate a suitable economic model. We intend to deepen our research through a more detailed analysis of the relation between KIBS and firm closure per sectors of economic activity, or the relation between KIBS (broken down by NACE codes) and the indicators studied in the present paper (firm closure, labour productivity, GDP).

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Appendix 1. Romania's Quarterly dataset for KIBS, Closed companies, GDP and Labour productivity

Period	KIBS*	Closed companies*	KIBS in the total number of active companies (%)*	GDP per capita**	Real labour productivity per hour worked ***
2010Q1	4899	29818	16.75	1200	84.4
2010Q2	4588	37379	14.44	1500	89.5
2010Q3	3469	24016	13.17	1700	108.7
2010Q4	3419	34065	9.64	1800	117.4
2011Q1	4525	17726	13.65	1300	84
2011Q2	4608	13226	11.73	1600	90.9
2011Q3	4395	13007	12.67	1800	112.8
2011Q4	4226	33372	16.02	1900	116.5
2012Q1	4445	22071	10.28	1300	95.8
2012Q2	3820	24268	13.53	1600	100.9
2012Q3	4045	23112	14.12	1800	122.9
2012Q4	4045	26373	15.76	1900	129.6
2013Q1	4434	28585	14.84	1400	98.9
2013Q2	4262	25216	10.18	1700	104
2013Q3	4287	22728	14.9	2000	130.1
2013Q4	4178	26336	17.31	2200	137.3
2014Q1	4727	27134	16.14	1400	101.8
2014Q2	4339	22769	16.94	1800	106.6
2014Q3	4204	19674	17.45	2100	133.8
2014Q4	4312	22694	19.06	2200	143.1
2015Q1	4511	24695	15.26	1600	109.9
2015Q2	4024	25970	12.29	1800	111.8
2015Q3	4244	24289	15.11	2200	140.5
2015Q4	3668	37118	16.1	2400	150.4
2016Q1	4979	44797	15.4	1600	113.9
2016Q2	3929	29683	12.74	2000	120
2016Q3	3564	24469	14.58	2400	148.2
2016Q4	3344	26082	15.81	2600	157.9
2017Q1	4305	25358	13.32	1900	118.7
2017Q2	6535	23496	13.93	2200	121.3
2017Q3	4944	22517	15.01	2600	157
2017Q4	3625	27304	14.78	2900	165.7

Source: * National Trade Register Office, Statistics, https://www.onrc.ro/index.php/en/statistics
** Eurostat, Main GDP aggregates per capita, [namq_10_pc] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=namq_10_pc&lang=en,
*** Eurostat, Labour productivity and unit labour costs, [namq_10_lp_ulc], http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=namq_10_lp_ulc&lang=en