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RESEARCH ARTICLE

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THE EFFECT OF THE 2008 GLOBAL FINANCIAL CRISIS ON THE EFFICIENCY OF LARGE U.S. COMMERCIAL BANKS

SEYED MEHDIAN[*], RASOUL REZVANIAN[**], OVIDIU STOICA[***]

Abstract *The 2008 financial crisis, originated by securitization of sub-prime mortgage loans, had a huge impact on U.S. financial institutions and markets. We hypothesize that due to this crisis, the commercial banking industry has changed their portfolio structures and risk-taking behavior. To shed light on the response of U.S. banks to the 2008 financial crisis, we use the non-parametric approach to measure and compare the overall efficiency of large U.S. banks pre- and post-2008 financial crisis. We then decompose the overall measure of efficiency into allocative, overall technical, pure technical, and scale efficiency measures to better understand the sources of banking inefficiencies. The results indicate that large U.S. banks indeed changed their portfolios structure, and the efficiency of large commercial banks in the United States declined substantially during the financial crisis. Although it has been recovering since then, it still has not reached to the pre-crisis efficiency level.*

Keywords: *banks, financial crisis, efficiency, productivity, U.S.A.*

JEL Classification: *G01, G21*

1. INTRODUCTION

The global financial crisis of 2008 was created by the real estate sector of the U.S. economy through introduction of the sub-prime rate, relaxed methods taken by banks in the process of the credit evaluation of applicants, the expansion of mortgage backed securities, and the introduction of exotic financial instruments. As

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the result of the 2008 financial crisis, financial markets collapsed, housing prices plummeted, and bankruptcies and foreclosures increased drastically. Following this crisis, many banks and other financial institutions in the United States and abroad faced considerable liquidity pressure, which resulted in higher than usual default risk on non-performing assets. This phenomenon pressed policymakers in the United States to intervene in market through the introduction of the Troubled Asset Relief Program.

The aim of this paper is to examine the potential effects of the 2008 financial crisis on the behavior of commercial banks following the crisis at least for two reasons. First, we believe that in response to the 2008 financial crisis, banks repositioned their portfolio of earning assets by focusing on less risky assets to avoid further financial problems and insolvency. We argue that this repositioning affected the production process of large banks, as well as their efficiency. Second, as Assaf et al. (2019) demonstrated, the high cost efficiency of banks is associated with good management, and the high cost efficiency of banks during normal times helps reduce failure probabilities and decrease risk subsequent to the financial crisis. This study supports the above assertions, as increased understanding of the impact of financial crisis on banks' cost efficiency may help policymakers better protect the banking system from the negative impact of a potential future financial crisis. Therefore, the objective of this paper is to measure the efficiency of large U.S. banks during pre- and post-2008 global financial meltdown time periods to shed light on the impact of the crisis on the efficiency of large banks. Results indicate that in response to the 2008 crisis, large U.S. banks modified their assets and liability portfolios. Further, there was statistically significant reduction in the cost efficiency of large U.S. commercial banks in the post-crisis period when compared to the pre-crisis period.

This paper is organized as follows: Section 2 provides a brief review of literature. Section 3 explains the data, while Section 4 discusses the input and output variables and the linear programming methodology used in the study. Section 5 describes the empirical results, and Section 6 presents a summary and conclusions.

2. REVIEW OF LITERATURE

During the last two and half decades, there have been numerous cost efficiency studies using banking data from all parts of the world. Concerning the study of cost efficiency in U.S. banking, researchers have used different methodologies, time periods, corporate structures, sizes, and combinations of inputs and outputs to answer a variety of cost efficiency questions. A few of these

studies conducted in the 1990s include Aly et al. (1990), Hunter and Timme (1991), Berger (1993), Elyasiani and Mehdian (1990 and 1995), DeYoung and Hasan (1998), and Wheelock and Wilson (1999). Alam (2001), Berger and DeYoung (2001), Akhigbe and McNulty (2003), DeYoung and Rice (2004), Berger et.al. (2005), and Ho and Wu (2009) conducted studies during the 2000s. Finally, Lee and Rose (2010), Feng and Zhang (2014), Ghosh (2015), Feng, Peng and Zhang (2017), Doan, Lin and Doong (2018), and Wheelock and Wilson (2018), examine these questions in the 2010s. A general conclusion reached from the above studies indicates that, on average, U.S. banks are operating at 65 to 70 percent of overall cost efficiency.

Surprisingly, despite the importance of the impact of financial crisis on banking cost efficiency, we are not aware of any study that examined the impact of the 2008 financial crisis on the cost efficiency of U.S. banks. However, there are a limited number of studies that examine the impact of financial crisis on bank efficiency using banking data from other countries. Isik and Hassan (2003) examined the response of Turkish banks to the 1994 financial crisis in Turkey. They report that the 1994 financial crisis in Turkey resulted in a 17% reduction in banking productivity, of which 10% was attributed to technical regress and the remaining 7% was due to efficiency decline. Maredza and Ikhide (2013) reported similar results using South African banks in response to the 2008 financial crisis. Sufian (2010) examined the impact of the 1997 Asian financial crisis on the technical efficiency of banks in Malaysia and Thailan and reports that the technical efficiency of banks in both countries declined substantially during and a year after the 1997 Asian financial crisis. Moradi-Motlagh and Babacan (2015) examined the impact of the 2008 financial crisis on the technical efficiency of Australian banks and found that the 2008 financial crisis had an inverse effect on the pure technical efficiency of Australian banks. Andrieş and Ursu (2016) examined the impact of the global financial crisis on banks' efficiency across the European Union (EU). They reported that in terms of cost efficiency, the most effected by the crisis are large publicly traded EU banks from the old members of the EU. Ferreira (2019) also examined the impact of the 2008 financial crisis on European banks and reported a statistically significant decline in the technical efficiency of European banks in the aftermath of the 2008 financial crisis.

3. DATA

The data for this study was collected from the bank "Call Report," published by the Federal Financial Institutions Examination Council (https://cdr.ffiec.gov/public/) on the website "FFIEC Central Data Repository's Public Data Distribution." The data covers a period of 12 years from 2005 to 2016. We excluded four years, from 2009 to 2012 from the data, as this period is considered to be the crisis period and a necessary transitionary period for banks following the 2008 financial crisis. Additionally, we limited our results only to large U.S. banks, those with total assets of 2 billion USD or higher for two reasons: (1) the portfolio of liabilities and assets (source and uses of funds) of large and small banks are different, and (2) because of that, the large banks should respond faster and stronger to a major financial crisis. The final data set containing the information on the banks presented in Table 1.

4. INPUT AND OUTPUT VARIABLES AND THE METHODOLOGY

4.1 Variables

We define inputs and outputs using the intermediation approach, in which the bank is assumed to convert three inputs into four outputs. We define the input, price of input, outputs, and total costs as follows:

X1 = Number of full-time equivalent employees;
X2 = Premises and fixed assets;
X3 = Total liabilities;
P1 = Unit price of labor = Wages & benefits expenses / # of full-time equivalent employees;
P2 = Unit price of fixed assets = Total expenses of fixed assets / Total fixed assets;
P3 = Unit price of interest = Total interest expenses / Total interest-bearing liabilities;
Y1 = Commercial and industrial loans;
Y2 = Real estate loans;
Y3 = Other loans;
Y4 = Total investment securities;
TC = Total cost, the sum of total interest expense and total noninterest expense;
TA = Total assets, same as included in the bank's balance sheet.

4.2 Efficiency Indices

We computed several efficiency indices for each bank from the period between 2005 and 2016, excluding 2009 to 2012, using the non-parametric methodology introduced by Farrell (1957), Färe, Grosskopf, and Lovell (1985), and Turk-Ariss, Rezvanian, and Mehdian (2007). This methodology involves solving several linear programs using data on inputs, outputs, input prices, total cost, and total assets data. The solutions of linear programs and derivations of the results provide us with overall efficiency (OE), allocative efficiency (AE), overall technical efficiency (OTE), pure technical efficiency (PTE), and scale efficiency (SE). Specifically, for a given bank, *k*, we can write the following ratios:

$$OE_k = OTE_k \times AE_k$$
$$OTE_k = PTE_k \times SE_k$$
$$OE_k = PTE_k \times SE_k \times AE_k \qquad (1)$$

where

$$AE_k = \frac{OE_k}{OTE_k} \quad and \quad SE_k = \frac{OTE_k}{PTE_k}$$

To compute the OE empirically for bank *k* in year *t*, we first solve the following linear programming (LP1) to find the minimum potential total cost:

$$C_k^* = \min\ p \times x$$
$$subject\ to$$
$$y_k \le zY, x_k \ge zX, z \in R_+^K$$

Where

k = 1, ..., *K* is number of banks in the sample, *P*, *X*, and *Y* are as defined earlier, and *z* is the intensity factor.

Given the solution of LP1, the OE for bank *k* is found using the following ratio:

$$OE_k = \frac{C_k^*}{C_k}, \qquad (2)$$

In order to estimate OTE for the k^{th} bank, a new linear program (LP2), given below is solved:

$$\min \delta$$

subject to

$$s.t.\ \ y_k \le zY,\ \delta x_k \ge zX,\ z \in R_+^K$$

The calculated OTE, δ, measures for bank k's overall technical efficiency under the assumption that the bank operates at constant returns to scale in the production process.

In order to compute PTE (denoted by ψ) for bank k, LP2 is solved with an additional constraint as $\sum_{k=1}^{K} z_k = 1$ and replacing δ by ψ. Then, SE for bank k is obtained by the ratio in (3):

$$SE_k = \frac{OTE_k}{PTE_k} = \frac{\delta}{\psi} \qquad (3)$$

Bank k is called scale efficient if $SE_k = 1$. It follows if $0 \le SE_k < 1$, k is called inefficient. In order to identify the source of scale inefficiency of bank k, we resolve LP3 after replacing $\sum_{k=1}^{K} z_k = 1$ by $\sum_{i=1}^{K} z_i \le 1$ and δ by ω.

Following Färe, Grosskopf and Lovell (1985) and Turk-Ariss, Rezvanian, and Mehdian (2007), if $SE_k \neq 1$ and ω = ψ, the source of scale inefficiency of k is decreasing returns to scale (DRS). On the other hand, if $SE_k \neq 1$ and ω ≠ ψ, then the scale inefficiency of k is due to increasing returns to scale (IRS).

To *facilitate* the comparison of efficiency indices between pre-crisis and post-crisis, we use the following approach in the process of calculating efficiency indices:

1) Combine 2005 to 2016 (excluding 2009 to 2012) and calculate OE, AE, TE, PTE, and SE;
2) Combine 2005, 2006, 2007, and 2008 and calculate OE, AE, TE, PTE, and SE (before the financial crisis); and
3) Combine 2013, 2014, 2015, and 2016 and calculate OE, AE, TE, PTE, and SE (after the financial crisis).

5. EMPIRICAL RESULTS

As described previously, this study uses data obtained from the balance sheets of a sample of large U.S. banks from 2005 to 2016. Because the purpose of the study was to examine the impact of the 2008 financial crisis on the efficiency measures of large banks, we divided the period of study into three distinct sub-periods: (1) pre-crisis (2005-2008), (2) crisis (2009-2012), and (3) post-crisis (2013-2016). We removed the crisis period from the study because we believe this period is not representative of typical banking environment and isolating this period allowed us to have a more unbiased picture of the impact of the 2008 financial crisis on bank efficiency.

Table 1 displays the annual descriptive statistics of the variables used in this study for the pre-crisis (2005-2008) and post-crisis (2013-2016) periods. Comparing the raw data from the pre- and post-crisis periods reveals some worthwhile information; that is, the average percentage of earning assets (non-earning assets) to total assets has been lower (higher) in post-crisis period when compared to the pre-crisis period. This is expected since banks were not willing to invest in earning assets in post-crisis period due to high systematic risk. Although the mix of portfolio of earning assets have been stable, the share of real estate loans in portfolios of earning assets has been consistently lower in post-crisis period compared with the pre-crisis period. It seems that in response to the 2008 crisis, large banks became more conservative by holding less liquid (earning) assets and real estate loans. Again, this is an expected response since the major source of the 2008 financial crisis was long-term real estate loans.

The next obvious reaction by large banks has been a steady reduction in the number of full-time equivalent employees, with a simultaneous increase in the average salary and wages of the remaining employees. The combination of the lower number of employees accompanied by higher salary and wages per employee resulted in a steady increase in labor cost per unit of earning assets. Furthermore, the amount of interest paying liability has been increasing since the crisis, but at the same time, the interest cost of these liabilities has been declining sharply so that the combinations of larger interest paying liabilities accompanied by historically lower costs of borrowing result in a much lower cost of sources of funds in the post-crisis period.

Concerning the unit cost of fixed assets, the unit cost of fixed assets has been steadily higher in pre-crisis period, and this ratio has been declining since 2013. The cumulative impact of the lower cost of borrowing and fixed assets,

accompanied by a lower level of employment and high wages and salary per employee has resulted in a lower cost per unit of output in the post-crisis period. Overall, the preliminary cost per unit of output analysis from the raw data in response to the 2008 financial crisis is not surprising, but rather reaffirms the common reaction of financial institutions to the economic crisis; that is, reduce the number of employees but increase the quality of labor force by hiring highly-educated, expensive employees, take advantage of lower market rates, and limit the use of fixed assets.

Using the pooled data provided in Table 1 and linear programs 1-3 presented in the methodology section, we calculated five different measures of efficiency for each bank relative to the efficient frontier. The average and descriptive statistics of the efficiency measures relative to the pooled sample efficient frontier is given in Table 2. The mean values of all efficiency measures, except scale efficiency (SE), are very low compared with their historical values reported in previous studies. For example, the overall measure of efficiency for the period is only 39.8%. This low overall efficiency measure is the result of low allocative and overall technical efficiencies. Concerning the volatility of the efficiency measure, we used two proxies: standard deviation and the range of efficiency measures. As evident from Table 2, both measures of volatility indicate the major cause of high volatility in overall efficiency is the result of high volatility in AE rather than OTE and its components (PTE and SE).

To better understand the negative impact of the 2008 financial crisis on large U.S. banks' efficiency measures and its high volatility, we divided efficiency results into pre- and post-crisis periods. Tables 3 and 4 present the descriptive statistics of efficiency measures relative to the pooled sample efficient frontier for the periods of pre- and post-crisis, respectively. As evident from Table 3, the average OE measure of efficiency of large banks in the pre-crisis period was 0.638. This level of efficiency is very similar to the findings of comparable studies**.** The major cause of overall inefficiency during this period was the low level of AE (0.737) rather than OTE (0.863). The high level of OTE in turn is the result of both high levels of PTE (0.907) and SE (0.952)**.** A review of Table 4 provides a different picture on the efficiency values for the post-crisis period. The overall efficiency measure for the post-crisis period is only 37.8%, which is significantly lower than the historical value reported by other studies for the pre-crisis period. The major cause for the low level of OE during this period has been the decline in both AE and OTE; however, a sharp decline in AE (from 0.737 to 0.474) is more noticeable. The differences between means of efficiency

measures in pre- and post-crisis are all significant at the 1% level. Concerning the volatility of efficiency measures, both the average standard deviation and the range of the OE (and its components AE and OTE) are higher than the corresponding values for the pre-crisis period.

To examine the trend of changes in efficiency measures in pre- and post-crisis periods, we present the yearly efficiency measure along with the descriptive statistics for the period of study in Table 5. As shown in Table 5, the overall efficiency measure and its components (AE and OTE) has been increasing during the pre-crisis period. However, there was a sharp decline in OE during the crisis period of 2009 to 2012, caused by a sharp decline in AE. This decline in efficiency measures (OE and AE) persisted in the period of post-crisis until 2016. We also examined the volatility of efficiency measures. It is evident from Table 5 that both the standard deviation and the range of overall efficiency measures are much higher in the post-crisis period compared to the pre-crisis period. The higher volatility of OE measures in the post-crisis period is the result of higher volatility in AE than OTE and its components (PTE and SE).

6. SUMMARY AND CONCLUSIONS

In this paper, we used the raw data to compare portfolios of assets and liabilities of large U.S. banks from the pre-crisis (2005-2008) and post-crisis (2013-2016). We also used a non-parametric approach to calculate overall efficiency measures of large U.S. banks during pre- and post-2008 financial crisis. We then decomposed the overall measure of efficiency into allocative and overall technical, pure technical, and scale efficiency measures to determine the sources of inefficiencies. We focused on large U.S. bank performance, and compared and contrasted their performance pre- and post-2008 financial crisis. We hypothesized that due to this crisis large U.S. commercial banks repositioned their portfolio of assets and liabilities toward less risky holdings, which in turn impacted their efficiencies.

Our results indicate large U.S. banks modified their portfolios of assets and liabilities in response to the 2008 financial crisis. Further, the results indicate that before the 2008 financial crisis, large U.S. banks had high levels of cost efficiencies compared to levels reported in previous studies. The financial crisis of 2008 resulted in a sharp decline in banking efficiency, which has been stabilized since then, but still has not reached to the pre-financial crisis level. These findings have important policy implications that the policy makers who are responsible for

the stability of banking system should carefully monitor the cost efficiency of banks during the normal economic times to better prepared for the future financial crisis that negatively impact banks cost efficiency and may lead to financial instability.

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REFERENCES

1. Akhigbe, A., and J. E. McNulty. 2003. "The profit efficiency of small US commercial banks." *Journal of Banking & Finance* 27 (2): 307–25. doi:10.1016/S0378-4266(01)00250-3.
2. Alam, I. M. S. 2001. "A Non-Parametric Approach for Assessing Productivity Dynamics of Large Banks'." *Journal of Money, Credit and Banking* 33 (1): 121–39. doi:10.2307/2673875.
3. Aly, H. Y., R. Grabowski, C. Pasurka, and N. Rangan. 1990. "Technical, Scale, and Allocative Efficiencies in U.S. Banking: An Empirical Investigation." *Review of Economics and Statistics* 72 (2): 211–18. doi:10.2307/2109710.
4. Andrieş, A. M., and S. G. Ursu. 2016. "Financial crisis and bank efficiency: An empirical study of European banks." *Economic Research-Ekonomska Istraživanja* 29 (1): 485–97. doi:10.1080/1331677X.2016.1175725.
5. Assaf, A., A. N. Berger, R. A. Roman, and E. G. Tsionas. 2019. "Does Efficiency Help Banks Survive and Thrive during Financial Crises?" *Journal of Banking & Finance* 106:445–70. doi:10.1016/j.jbankfin.2019.07.013.
6. Berger, A. N. 1993. "Distribution free estimates of efficiency in the US banking industry and test of the standard distributional assumptions." *Journal of Productivity Analysis* 4 (3): 261–92. doi:10.1007/BF01073413.
7. Berger, A. N., and R. DeYoung. 2001. "The Effects of Geographic Expansion on Bank Efficiency." *Journal of Financial Services Research* 19 (2/3): 163–84. doi:10.1023/A:1011159405433.
8. Berger, A. N., N. H. Miller, M. A. Petersen, R. G. Rajan, and J. C. Stein. 2005. "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks." *Journal of Financial Economics* 76 (2): 237–69. doi:10.1016/j.jfineco.2004.06.003.
9. DeYoung, R., and I. Hasan. 1998. "The Performance of De Novo Commercial Banks: A Profit Efficiency Approach." *Journal of Banking & Finance* 22 (5): 565–87. doi:10.1016/S0378-4266(98)00025-9.
10. DeYoung, R., and T. Rice. 2004. "Noninterest Income and Financial Performance at U.S. Commercial Banks." *Financial Review* 39 (1): 101–27. doi:10.1111/j.0732-8516.2004.00069.x.
11. Doan, A. T., K. L. Lin, and S. C. Doong. 2018. "What drives bank efficiency? Interaction of bank income diversification and ownership." *International Review of Economics & Finance* 55:203–19. doi:10.1016/j.iref.2017.07.019.
12. Elyasiani, E., and S. M. Mehdian. 1990. "A Non-Parametric Approach to the Measurement of Efficiency and Technological Change: The Case of Large U.S. Commercial Banks." *Journal of Financial Services Research* 4 (2): 157–68. doi:10.1007/BF00352569.

13. Elyasiani, E., and S. Mehdian. 1995. “The comparative efficiency performance of small and large US commercial banks in the pre- and post-deregulation eras.” *Applied Economics* 27 (11): 1069–79. doi:10.1080/00036849500000090.
14. Färe, R., S. Grosskopf, and C. A. K. Lovell. 1985. *The Measurement of Efficiency of Production (Studies in Productivity Analysis)*. Springer. doi:10.1007/978-94-015-7721-2.
15. Farrell, M. J. 1957. “The measurement of productive efficiency.” *Journal of the Royal Statistical Society. Series A (General)* 120 (3): 253–90. doi:10.2307/2343100.
16. Feng, G., and X. Zhang. 2014. “Returns to scale at large banks in the US: A random coefficient stochastic frontier approach.” *Journal of Banking & Finance* 39:135–45. doi:10.1016/j.jbankfin.2013.10.012.
17. Feng, G., B. Peng, and X. Zhang. 2017. “Productivity and efficiency at bank holding companies in the U.S.: A time-varying heterogeneity approach.” *Journal of Productivity Analysis* 48 (2): 179–92. doi:10.1007/s11123-017-0515-5.
18. Ferreira, C. 2019. “Efficiency of European Banks in the Aftermath of the Financial Crisis: A Panel Stochastic Frontier Approach.” *REM Working Paper Series in Economics and Mathematics*. 1–26. https://rem.rc.iseg.ulisboa.pt/wps/pdf/REM–_WP_084_2019.pdf
19. Ghosh, A. 2015. “Banking-industry specific and regional economic determinants of non-performing loans: Evidence from US states.” *Journal of Financial Stability* 20:93–104. doi:10.1016/j.jfs.2015.08.004.
20. Ho, C.-T. B., and D. Wu. 2009. “Online banking performance evaluation using data envelopment analysis and principal component analysis.” *Computers & Operations Research* 36 (6): 1835–42. doi:10.1016/j.cor.2008.05.008.
21. Hunter, W. C., and S. G. Timme. 1991. “Technological change in large U.S. commercial banks.” *Journal of Business* 64 (3): 339–62. doi:10.1086/296541.
22. Isik, I., and M. K. Hassan. 2003. “Financial Deregulation and Total Factor Productivity Change: An Empirical Study of Turkish Commercial banks.” *Journal of Banking & Finance* 27 (8): 1455–85. doi:10.1016/S0378-4266(02)00288-1.
23. Lee, S. J., and J. D. Rose. 2010. “Profits and Balance Sheet Developments at US Commercial Banks in 2008.” *Federal Reserve Bulletin* 96:A1–36.
24. Maredza, A., and S. Ikhide. 2013. “Measuring the Impact of the Global Financial Crisis on Efficiency and Productivity of the Banking System in South Africa.” *Mediterranean Journal of Social Sciences* 4 (6): 553–68. doi:10.5901/mjss.–2013.v4n6p553.
25. Moradi-Motlagh, A., and A. Babacan. 2015. “The Impact of the Global Financial Crisis on the Efficiency of Australian Banks.” *Economic Modelling* 46:397–406. doi:10.1016/j.econmod.2014.12.044.

26. Sufian, F. 2010. “The Impact of the Asian Financial Crisis on Bank Efficiency: The 1997 Experience of Malaysia and Thailand.” *Journal of International Development* 22 (7): 866–89. doi:10.1002/jid.1589.
27. Turk Ariss, R., R. Rezvanian, and S. M. Mehdian. 2007. “Cost Efficiency, Technological Progress and Productivity Growth of Banks in GCC Countries.” *International Journal of Business* 12 (4): 471–91.
28. Wheelock, D. C., and P. W. Wilson. 1999. “Technical Progress, Inefficiency and Productivity Change in the US Banking, 1984–1993.” *Journal of Money, Credit and Banking* 31 (2): 212–34. doi:10.2307/2601230.
29. Wheelock, D. C., and P. W. Wilson. 2018. “The evolution of scale economies in US banking.” *Journal of Applied Econometrics* 33 (1): 16–28. doi:10.1002/–jae.2579.

ANNEXES

Table 1: Summary statistics of outputs, inputs, input prices and total assets, 2005-2016 (USD in thousands)

	2005	2006	2007	2008	2013	2014	2015	2016
Mean								
Y1	3090420	3192088	3319719	3284189	3595979	3632774	3835999	3907242
Y2	9448153	10207570	9957679	10041572	9183316	8594303	8635142	8770107
Y3	4328503	3841742	3295966	3084034	4611407	4556004	4767749	4787421
Y4	4853178	4974375	4253670	4826213	5124304	4809503	4973110	5078411
X1	5817.339	5749.814	5059.605	5042	4482	4138	4004	3846
X2	266595.3	261074.6	247939.7	272523	248732	232416	225643	212640
X3	23335504	24114642	23004102	24973069	25306868	24652252	25077983	25287447
P1	66.8141	69.5009	68.5182	70.4293	87.1136	88.2066	92.0578	97.0112
P2	0.3972	0.4065	0.3813	0.3793	0.3916	0.3913	0.3839	0.3828
P3	0.0309	0.0427	0.0462	0.0342	0.0069	0.0060	0.0056	0.0059
TA	26357622	27303197	26005858	27953809	29060241	28213550	28611278	28772162
TC	1414477	1740299	1592658	1518354	998786	911154	862940	837013
N	227	242	248	255	292	320	333	343
Stand Dev:								
Y1	9578652	10138021	10855195	12793278	13580401	14293357	15215979	16227081
Y2	29456107	35030172	35611654	38691980	36483584	33793024	33109401	33110025
Y3	17524891	14164088	12635359	14063710	20220608	22737790	23875552	25092605
Y4	18981949	20725259	18154220	22628825	24545021	25602908	26763691	27615324
X1	20886.61	21545.83	19969.61	21059	19866	19110	18382	17983
X2	846251.8	826793.6	803891.9	996487	836632	804160	786070	748921
X3	80364680	87240606	89130831	112933419	108403978	114441655	116688682	120752986
P1	26.9745	29.6300	22.7687	23.6130	30.2920	29.5132	31.6212	33.1073
P2	0.2675	0.3016	0.3133	0.2801	0.3530	0.3459	0.3138	0.308
P3	0.0115	0.0129	0.0119	0.0105	0.0049	0.0046	0.0042	0.0034
TA	90805592	98689678	99962896	126031013	124303231	130681096	132721200	136835578
TC	5485935	6966802	6742273	6932572	4297109	4368028	3918941	3896469
Min:								

Y1	261	804	4442	3029	149	149	1549	50
Y2	187	9	2	287671	566	528	927	448
Y3	12	68	54	22	315	115	90	15
Y4	5522	2000	992	108	22	19	16	13
X1	15	19	19	17	129	97	96	88
X2	864	156	134	217	486	104	2337	1702
X3	1492056	1701548	1586203	1683772	1568602	1048939	1032925	1359091
P1	24.0017	16.6281	20.6684	25.8568	37.8613	19.9975	36.1653	44.1213
P2	0.0718	0.0610	0.0629	0.0587	0.0761	0.0261	0.0122	0.0046
P3	0.0036	0.0084	0.0087	0.0130	0.0004	0.0002	0.0006	0.0005
TA	2014306	2001980	2006592	2009347	2006973	2021366	2007720	2000620
TC	19998	84038	27533	77983	47250	39471	28167	32593
Max:								
Y1	89140171	98317544	113168764	141928152	143912000	161240000	181815000	199785000
Y2	308447411	386270452	390010745	395177667	436880000	445922000	460848000	475681000
Y3	149627000	125701237	125589685	129917496	181545000	257125000	270577000	286963000
Y4	226936860	208845000	208876001	264261940	259176000	278724000	302719000	292845000
X1	184489	202936	213967	176003	223040	227946	228815	235178
X2	8102000	7279360	8372089	11362837	8943000	9080000	8927000	8629000
X3	880069754	972783341	1072568510	1241678220	1196448000	1347674000	1409744000	1514068000
P1	255.9229	330.0845	196.0198	238.4118	228.4974	246.4712	268.2202	251.5773
P2	2.1226	2.0892	2.7687	1.7991	2.8807	3.1923	2.5675	2.3561
P3	0.0889	0.0887	0.0848	0.0826	0.0363	0.0391	0.0514	0.0234
TA	984153190	1084130429	1182832523	1375012989	1344741000	1493085000	1560663000	1669852000
TC	49517000	62949000	70129000	64635000	42283000	47283000	40385000	44666000

Y1 = Commercial and industrial loans; Y2 = Real estate loans; Y3 = Other loans; Y4 = Total investment securities;X1 = Number of full-time equivalent employees; X2 = Premises and fixed assets; X3 = Total liabilities; P1 = Unit price of labor = Wages & benefits expenses / # of full-time equivalent employees; P2 = Unit price of fixed assets = Total expenses of fixed assets / Total fixed assets; P3 = Unit price of interest = Total interest expenses / Total interest-bearing liabilities; TA = Total assets, same as included in the bank's balance sheet. TC = Total cost, the sum of total interest expense and total noninterest expense;

Table 2: Descriptive statistics of efficiency measures relative to the pooled sample frontier, 2005-2016

Efficiency Measures	Mean	Standard Deviation	Maximum	Minimum
OE	0.398	0.235	1.000	0.013
OTE	0.760	0.091	1.000	0.493
AE	0.520	0.293	1.000	0.022
PTE	0.837	0.097	1.000	0.531
SE	0.912	0.083	1.000	0.572

OE = Overall efficiency; OTE = Overall technical efficiency; AE = Allocative efficiency PTE = Pure Technical Efficiency; and SE = Scale Efficiency.

Table 3: Descriptive statistics of efficiency measures relative to the pooled sample frontier, 2005-2008

Efficiency Measures	Mean	Standard Deviation	Maximum	Minimum
OE	0.638*	0.135	1.000	0.130
OTE	0.863*	0.075	1.000	0.607
AE	0.737*	0.128	1.000	0.130
PTE	0.907*	0.072	1.000	0.621
SE	0.952*	0.054	1.000	0.607

OE = Overall efficiency; OTE = Overall technical efficiency; IRS = Increasing Return to Scale; DRS = Decreasing Return to Scale; and AE = Allocative efficiency.
*The mean differences of efficiency measures of pre- and post- crisis are significant at 1% level.

Table 4: Descriptive statistics of efficiency measures relative to the pooled sample frontier, 2013-2016

Efficiency Measures	Mean	Standard Deviation	Maximum	Minimum
OE	0.378*	0.188	1.000	0.034
OTE	0.777*	0.098	1.000	0.495
AE	0.474*	0.190	1.000	0.058
PTE	0.856*	0.097	1.000	0.536
SE	0.911*	0.083	1.000	0.627

OE = Overall efficiency; OTE = Overall technical efficiency; IRS = Increasing Return to Scale; DRS = Decreasing Return to Scale; and AE = Allocative efficiency.
*The mean differences of efficiency measures of pre- and post- crisis are significant at 1% level.

Table 5: Descriptive statistics of efficiency measures relative to the pooled sample common efficient frontier, year by year, 2005-2016

	2005	2006	2007	2008	2013	2014	2015	2016
Mean :								
OE	0.707	0.697	0.776	0.763	0.422	0.417	0.411	0.412
OTE	0.890	0.887	0.906	0.922	0.860	0.788	0.837	0.844
AE	0.793	0.782	0.855	0.825	0.481	0.516	0.480	0.478
PTE	0.932	0.932	0.942	0.954	0.919	0.872	0.903	0.906
SE	0.955	0.953	0.963	0.967	0.937	0.906	0.930	0.933
Stand Dev:								
OE	0.144	0.139	0.107	0.131	0.197	0.197	0.195	0.203
OTE	0.079	0.072	0.066	0.086	0.109	0.188	0.092	0.086
AE	0.132	0.119	0.091	0.115	0.192	0.188	0.190	0.200
PTE	0.070	0.066	0.061	0.055	0.074	0.103	0.087	0.081
SE	0.048	0.055	0.044	0.048	0.062	0.085	0.070	0.069
Min:								
OE	0.257	0.245	0.254	0.201	0.108	0.110	0.044	0.034
PTE	0.697	0.653	0.699	0.712	0.707	0.545	0.640	0.639
AE	0.257	0.331	0.324	0.255	0.145	0.198	0.072	0.054
PTE	0.697	0.653	0.699	0.712	0.707	0.545	0.640	0.639
SE	0.716	0.668	0.738	0.704	0.702	0.637	0.684	0.680
Max:								
OE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
OTE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
AE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PTE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
SE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

OE = Overall efficiency; OTE = Overall technical efficiency; AE = Allocative efficiency; PTE = Pure technical efficiency; and SE = Scale efficiency.

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SHADOW BANKING IN INDIA: NATURE, TRENDS, CONCERNS AND POLICY INTERVENTIONS

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Abstract *While the origin of shadow banks may be traced to the 1970s, developing countries have witnessed a massive growth of shadow banks in more recent decades. India too has seen a similar growth in shadow banks; however, the recent 2018 collapse of IL&FS Group, a major shadow bank, disrupted the credit cycle, stalled investment and even affected overall GDP growth. With experts warning that shadow banks are susceptible to systemic risks and crisis, it becomes imperative to understand the shadow banking system better. In this paper, we use exploratory data analysis – both quantitative and qualitative – to draw attention to the need for definitional clarity in the concept of shadow banks and how they operate. Trends in Indian shadow banking are discussed using data drawn from secondary sources. Systemic risks in India's shadow banking sector are identified and policy interventions are discussed. The study is imperative for highlighting the importance of shadow banking in India, its growth and the evolving policy interventions regulating this important component of the financial system.*

Keywords: *shadow banks, non-banking financial companies, mutual funds, commercial paper, financial regulation, financial crisis.*

JEL Classification: *G21, G23, G28*

1. INTRODUCTION

Shadow banking, a financial institution that has often been accused of being a major contributor to the global financial crisis (GFC) of 2008 continues to

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expand rapidly and significantly since then. Presently, global shadow banks have assets worth US$57 trillion, a 75% increase since 2010 with the US and China commanding 29 and 16 percent of total assets respectively (Cox, 2019). In India, shadow banks, also referred to as non-banking finance companies (NBFCs), are in the news recently with the collapse of IL&FS group (Business Standard, 2019). With experts warning that shadow banks are susceptible to systemic risk and crisis, it becomes imperative to understand this system better.

In this paper, we begin with an examination of the various definitions of shadow banking and its nuances by carrying out a review of the literature. Following this, we explain different mechanisms of understanding credit intermediation in shadow banks. Finally, we delve into shadow banking and trends pertaining to some aspects of shadow banking in India, which essentially calls for greater regulation of the sector given its systemic risks and concerns over financial fragility.

2. DEFINITIONS OF SHADOW BANKING

Paul McCulley, former managing director of PIMCO, conceived the term "shadow banking" as recently as 2007. Multiple definitions of the term have since emerged, with no general consensus on its exact nature. To make matters more difficult, the term is used differently across countries, which makes it harder to relate theoretical discussions to specific institutional contexts. For instance, in Europe, lending by insurance companies is sometimes called shadow banking while wealth management products offered by banks in China come under its ambit. In India, lending by bank affiliated finance companies are also considered as shadow banks. However, a discussion of some important attempts at defining shadow banking enables readers to grasp its essential features across variations in its conceptualization.

Speaking at the 2007 Annual Jackson Hole Conference, McCulley defined shadow banking as "the entire alphabet soup of levered-up non-bank conduit systems" (Mehrling *et al*, 2013). The "non-bank" aspect in shadow banking is highlighted by the Financial Stability Board (FSB) in its 2013 report as "credit intermediation involving entities (fully or partially) *outside*[1] the regular banking system or nonbank credit intermediation for short" (FSB, 2013). These definitions depict shadow banking as institutions independent from the commercial banking system, instead connoting the shadow system as something feeding upon informal

[1] Italics our own for emphasis.

financial systems and/or as something "dark", in particular, money laundering and tax evasion. However, shadow banking is not some troubling excrescence on the healthy body of traditional banking. Rather, it is the centrally important channel of credit for our times, which needs to be understood on its own terms. Guttmann (2016) and Mehrling *et al* (2013) have raised these issues who are argue that such nefarious activities are far from being the major components of shadow banking systems.

Building on these initial conceptualizations, Mitchell (2016) identifies two broad definitional categories in the shadow banking literature. The first, called the "market view, focuses on securitization and market-mediated financial transactions. From this perspective shadow banks are like banks; both are simple intermediaries between savers and investors. The shadow banking system along with its traditional counterpart is the *disaggregated web of specialized financial institutions and vehicles* that channel funding from savers to investors through a range of securitization and secured funding techniques that works in an unregulated or under-regulated environment.

These disaggregated set of intermediaries perform four transformations (Kodres, 2013):

- Maturity transformation: short-term borrowing to long-term lending or what Mehrling et al (2013) state as "money market funding of capital market lending".
- Liquidity transformation: using cash-like liabilities to buy "harder-to-sell" liabilities like loans.
- Leverage: borrow money to buy fixed assets to magnify the potential gains or losses from an investment.
- Credit risk transfer: taking the risk default of a borrower and transferring it to another party. However, while shadow banks conduct credit and maturity transformation similar to traditional banks, they do so without the direct and explicit public sources of liquidity and tail risk insurance via the central bank's discount window and insurance on deposit accounts like US Federal Deposit Insurance Corporation (FDIC) insurance.

The other perspective, or "money view", sees shadow banking as analogous to the (traditional) commercial banking system, which not only perform bank-like functions in maturity and credit transformation as simple market intermediaries, but also issue what is called as "near-monies" or "liquid short-term stores of wealth" (Mitchell, 2016:2). To Mitchell, traditional banking and shadow banks

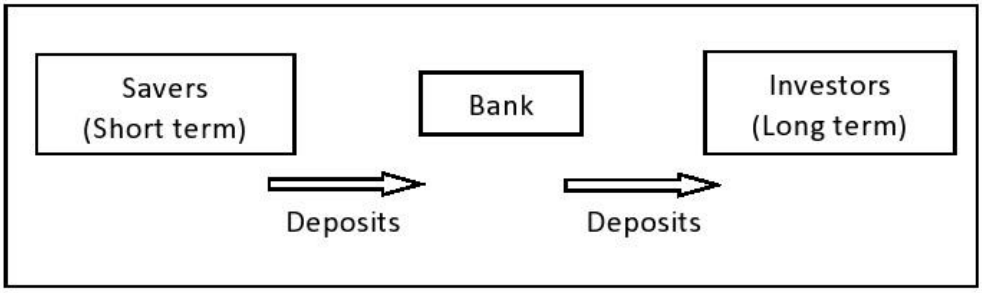
work in tandem; while the traditional banking system *endogenously* creates new credit money (McLeay, 2014), shadow banks enable this *(endogenously created)* credit money to be extinguished when savers exchange bank money for shadow bank liabilities that act as a "storage facility for credit claims, which exceed the capacity of traditional bank balance sheets." (ibid:3)

These definitions lead to subtle differences in understanding the process of credit creation and intermediation by shadow banks. The next section elaborates.

3. MECHANISMS OF SHADOW BANKING

The mechanism of how shadow banks operate from the "market view" perspective of shadow banking can best be described if we begin with plain and simple (vanilla) banks. Here vanilla banks are considered as intermediaries[2] between savers (lenders) and investors (borrowers).[3] As intermediaries, they provide the important functions bringing benefits from economies of scale and overcoming the problems of asymmetric information and high search costs in financial markets that would prevent savers and investors from making contracts. This is schematically illustrated in Figure 1.

Figure 1 – Banks as financial intermediaries



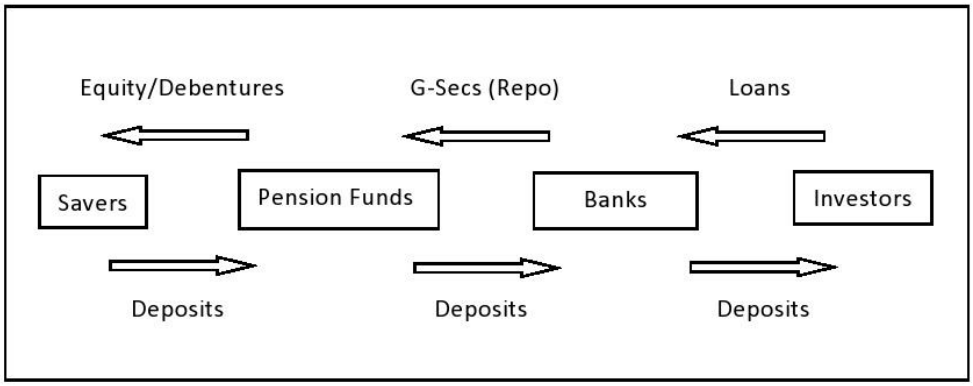
This model suffers from several problems arising from a mismatch of characteristics of assets and liabilities of the bank. First, the asset held by the bank

[2] Banks are not considered creators of money as in the case of endogenous money theory (McLeay *et al*, 2014).

[3] Throughout this paper we use a more proper terminology of economists. Savers are lenders of money and investors are typically firms and household who purchase real (investment) goods. This vanilla view of banking is how banks are depicted in the circular flow model elaborated in introductory economics textbooks.

(loan to the borrower) may be long-term while the liabilities of the bank (deposits[4] held by lenders) can be withdrawn on demand (short-term). Moreover, guaranteeing repayable deposits at *par* even when there is default by borrowers implies need for strict enforcement of capital adequacy norms and maintenance of reserves. The lender too may not benefit from the deposit as it may earn no interest as in the case of current accounts or a very low rate considering the risks to be absorbed by the bank. To overcome some of these problems a more disaggregated financial system may be conceived where shadow banks act as intermediaries between lenders and the bank, as shown in Figure 2. These shadow banks may be pension funds or insurance companies which collect deposits from lenders and lend to the bank, which then lend to the final borrower. To provide adequate security to the shadow bank, the bank enters into a repurchase (repo) agreement with the shadow bank wherein a government security is sold to the shadow bank in exchange for the deposit with a promise to repurchase it back at a later date for a deposit. In case of default by the bank, the shadow bank can sell the government security in the market and realize its value. This not only protects the lender but also yields an income flow since the sale price and repurchase price in the repo contract are not the same.

Figure 2 – The emergence of shadow banks with repo arrangements



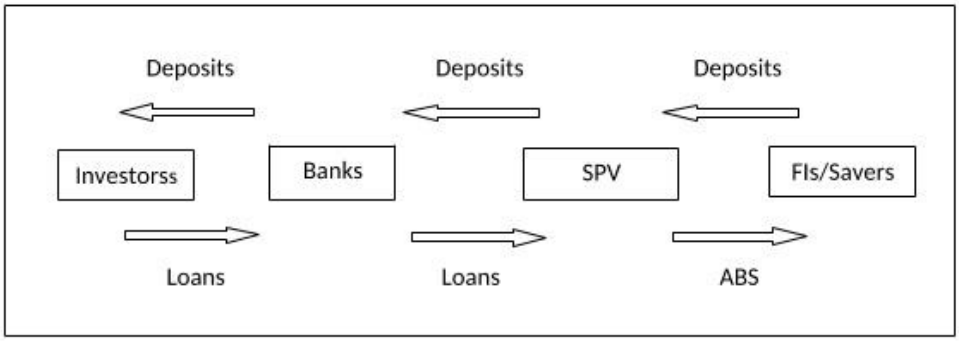
This arrangement also allowed banks to better match maturities of assets and liabilities although it called for mark-to-market monitoring of the government security price and adjustment of contracts between the shadow bank and commercial bank. However, more than this task, it was the lack of availability of

[4] "Deposits" are the liabilities of commercial banks and can be converted into cash at *par*.

government securities – due perhaps to the resentment against fiscal deficits in the 1990s – that induced financial institutions to look for novel mechanisms to replace government securities in repo agreements.

In Figure 3 we begin with borrowers[5] who approach a bank for loans against deposits/cash. The bank complies. It then sets up a special purpose vehicle or SPV (a distinct entity from the bank) which buys these loans from the bank, repackages them and sells them as asset backed securities (ABS) to lenders in the market, which could be financial institutions (FIs) like mutual funds, pension funds or insurance companies. We now have a more disaggregated banking system, each institution performing functions in which they would be specialized in.

Figure 3 – Emergence of a disaggregated shadow banking system



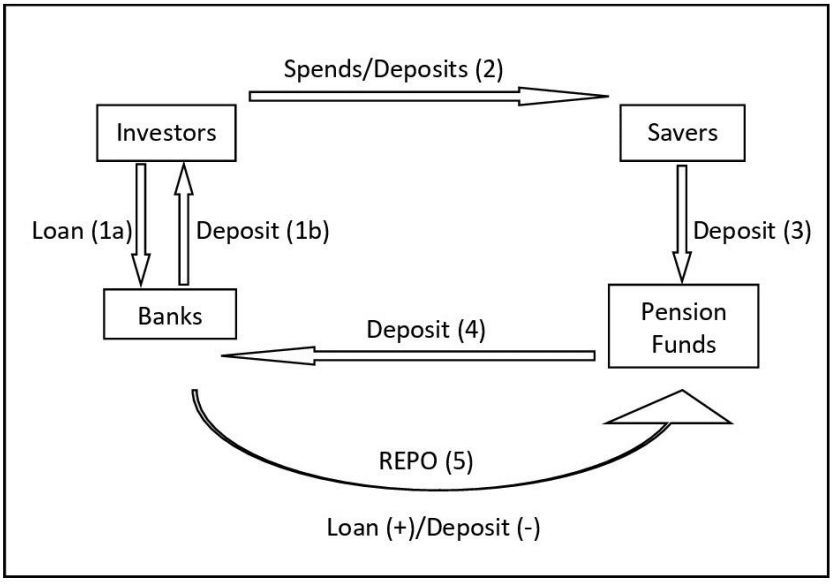
While there may be nothing wrong in the system as a means of bringing lenders and borrowers together *per se*, there are always concerns over the quality of the ABS, especially since the banks could become complacent in evaluating the quality of borrowers as it passes on the risk to the SPV and then further down the line. This indeed happened during the GFC that took the world into a Great Recession, from which some parts of the economy are still struggling to completely recover from.

Before we delve into the Indian scenario, we briefly present below (Figure 4) the money view of shadow banking. This views conceives of shadow banks as institutions which temporarily close the *money circuit* by substituting deposits (liabilities) on the banks' balance sheets with the loan liabilities of borrowers (asset to shadow banks).

[5] This considers that credit is demand constrained unlike the view that credit is supply constrained as in Figure 1 and 2.

In the money view banks create money *endogenously* (Step 1a and 1b), which passes from the borrower back into the economy and finally into the hands of savers or the owners of the factors of production (Step 2). Shadow banks collect these monies (savings), which are then credited in deposit accounts held in banks (Steps 3 and 4). These deposit accounts (liabilities of banks) are swapped for "loans" by the banks with the shadow bank; the "loans" are backed by the original loans issued by banks (assets) to the borrower in Step 1. This swap is done through a repo transaction between the bank and the shadow bank (Step 5). In this was the money created by banks (deposits) are destroyed by the repo transaction and will not appear as money on the balance sheet of banks until the shadow bank reverses the repo transaction.

Figure 4 – The money circuit view of shadow banking



While the money view has important theoretical implications, the market view offers an operational definition of shadow banking that allows for a qualitative analysis of the nature of shadow banking in India as well as quantitative basis to study its growth.

SHADOW BANKING IN INDIA

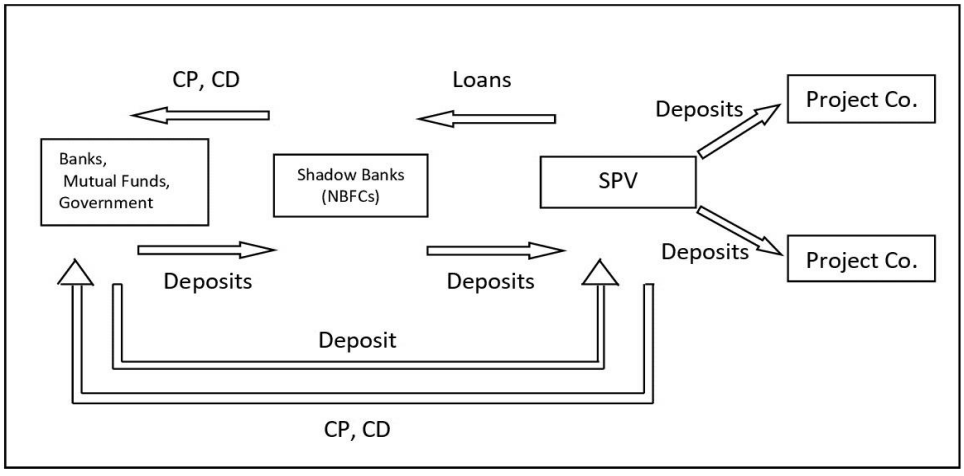
4.1. Nature of shadow banking in India

Unfortunately, shadow banking in India has come to be associated with the "dark" side on account of some recently unearthed large-scale scams; more specifically, the collapse of Infrastructure Leasing & Financial Services Limited (IL&FS). However, before we delve into concerns arising from this specific case, we present below the definition of shadow banks in India and their *modus operandi*.

According to India's central bank, the Reserve Bank of India (RBI), shadow banking pertains to activities of the Non-Banking Financial Sector (NBFC), which includes companies engaged in loans and advances and sale and purchase of securities/bonds as well as rotating savings and credit association or chit funds as they are called in India (Acharya *et al*, 2013) The peculiarity of India's credit system lies in the existence of a large informal system, organized around systems of kinship, caste and trust. However, the kind of organizations for which data is available largely falls in the purview of the formal sector, and it is their activities that we will be examining.

Following the market-view, India's shadow banks or NBFCs are a network of intermediaries connecting savers to investors, their vital service being credit transformations, more specifically, short-term borrowing through issue of commercial paper (CP) for longer-term lending in infrastructure projects like roads and highways, power plants, ports, real estate and so on. The availability of funds and cheaper costs of short-term borrowing rather than issue of long-term bonds and equity drives this activity. Figure 5 schematically shows the basic *modus operandi* of Indian NBFCs.

Figure 5 – The mechanism of Indian NBFCs



Lower interest rates and scarcity of government bonds are driving savers to NBFCs in search of higher returns albeit with higher risks. To substantiate, the RBI's benchmark repo rate have shown a steady decline since 2012, from 8.5 to 5.40 percent currently[6] while the public debt to GDP ratio has decline from 69.6 to 68.7 percent during the same period.

4.2.The growth of shadow banking in India

Several factors have contributed to the phenomenal growth of shadow banks in India; however, the trigger would be 1991 economic which saw the implementation of the three pillars of the IMF's structural adjustment program – liberalization, privatization and globalization. With financial deregulation, India saw the rise of NBFCs in the formal sector, which hitherto was widely found in the informal economy. The process of liberalization also allowed the interconnection among as well as between shadow banks and traditional commercial banks. The opening up of financial markets in India also encouraged competition in the commercial banking sector with the entry of private banks (Mohan, 2017), which were now actively seeking new avenues for lending money.

On the demand side too, the structural reforms of 1991 triggered the need for alternative sources of finance to commercial banking and informal sources of finance. The shifting on India's growth trajectory, industrial expansion, lack of availability of formal credit to small and medium enterprises, the growth of housing and automobile finance, the shift towards the private sector as the main engine of growth, curbing of fiscal deficits and private-public partnerships for infrastructure projects meant a greater need to channelize credit into productive investment.

NBFCs in India have been classified in various categories including deposit (108) and non-deposit taking as well as in terms of risk, as for instance, non-deposit taking NBFCs (9806) out of which are systemically important (276)[7]. There are different requirements for these categories of NBFCs in terms of statutory liquidity ratios (SLRs), capital adequacy, non-performing assets and foreign ownership. NBFCs are also classified sector-wise; microfinance, infrastructure,

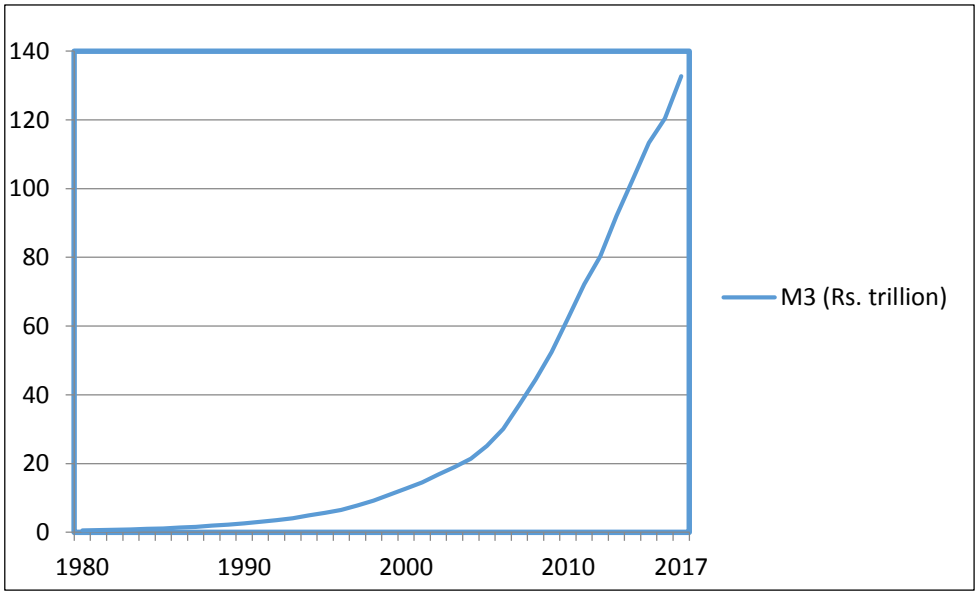
[6] Source: https://tradingeconomics.com/india/interest-rate

[7] Figures in parentheses are numbers of NBFCs as per RBI in end December 2018.(https://m.rbi.org.in/Scripts/PublicationsView.aspx?id=18745)

asset finance, and so on. In this paper, we do not delve into these categories, but look at the overall development of NBFCs.

India's first phase towards economic reforms began in the 1980s; until then borrowing was largely for production, and the returns from investment were used to repay loans, ensuring that the rate at which money and output grew was roughly the same. However, from the 1990s, money grew faster than the GDP with acceleration from the late 1990s. In 50 years, this ratio roughly tripled. Thus, banks had new instruments to expand their balance sheets, and the need for consistent liquidity created this growth spurt in broad money (Figure 6).

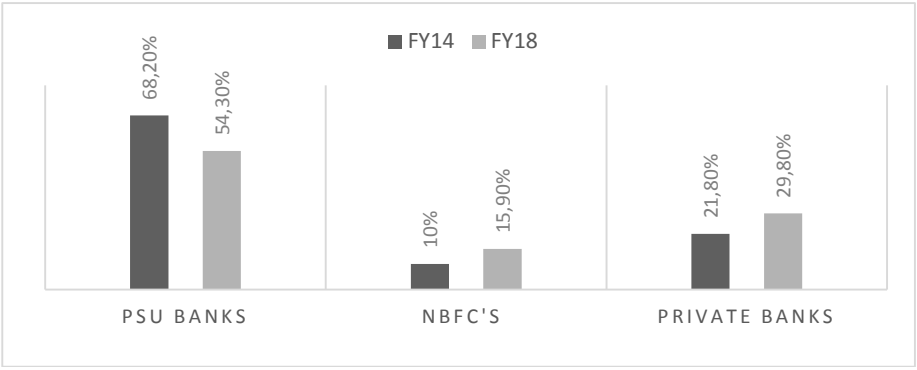
Figure 6 – Growth of broad money M3 in India since 1985



Source: *https://fred.stlouisfed.org/series/MABMM301INA189N#0*

During this phase, Indian public sector banks (PSBs) lost their share in the total market for credit to NBFCs and private sector banks (Figure 7).

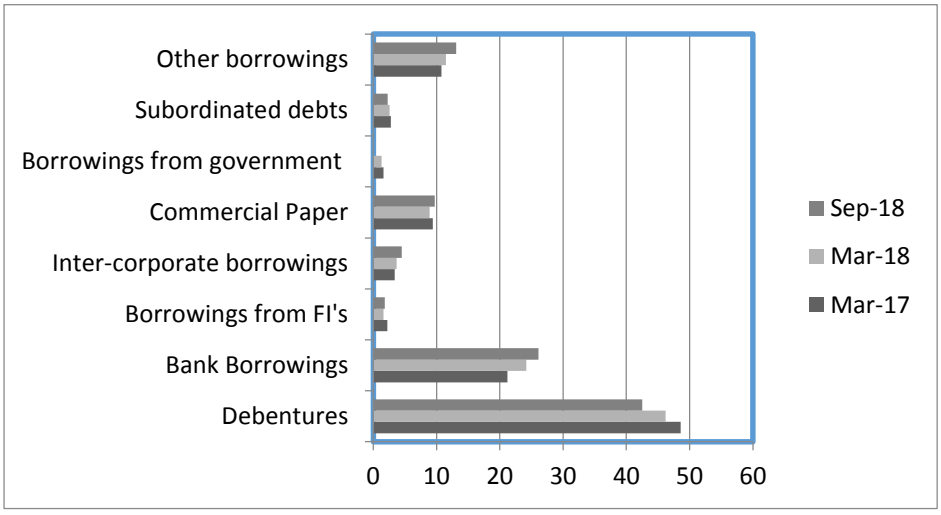
Figure 7 – Credit share of Indian banks and NBFCs, Financial Year (FY) 2014 and 2018



Source: *http://www.businessworld.in/article/NBFCs-Backs-To-The-Wall/30-10-2018-163195/*

However, an important source of funds to the NBFCs in India is commercial banks. There has been a steady increase in the share of NBFCs in total bank credit as well as the *growth* in advances from banks in the share of NBFC sources of funding (Livemint, 2018). The share of bank finance in NBFC's lending is around 26 percent (Figure 8), although there has been a decline in 2019 on account of the IL&FS crisis. This establish the close nexus between bank and NBFC credit; the latter becoming a conduit for commercial bank lending.

Figure 8 – India's NBFC sources of funds

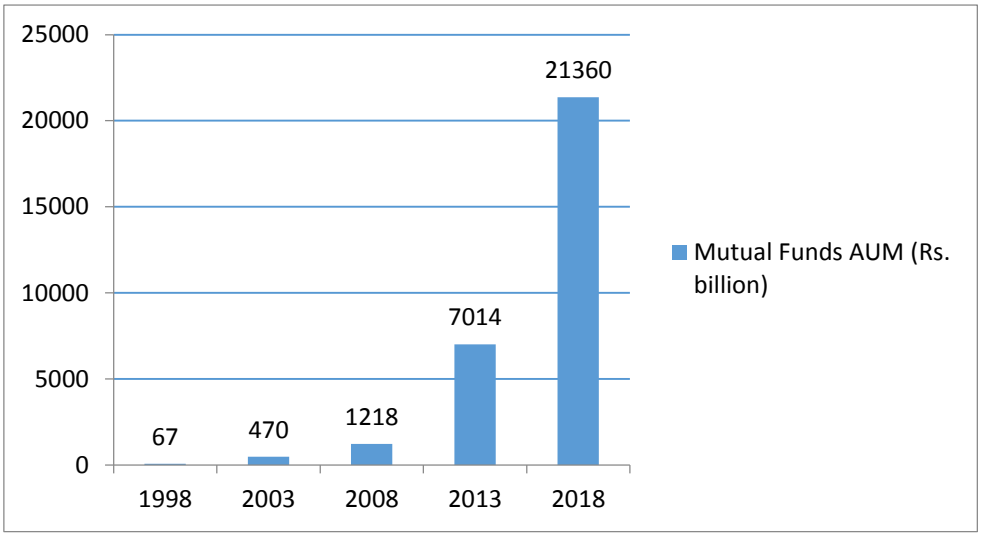


Source: *https://economictimes.indiatimes.com/industry/banking/finance/banking/for-nbfcs-2019-may-be-the-year-of-reckoning/articleshow/67342932.cms*

Apart from banks, the major lenders of funds to NBFCs are mutual funds (MFs), which stood at about Rupees 2,300 billion (US$33 billion[8]) as at March-end (2018). While the exposure to NBFC papers as percentage of debt AUM (assets under management) of MFs works out to around 18 percent, the same will be much more if we exclude government securities[9].

The growth of the MF industry, in particular the private sector, is closely linked to the rise of NBFCs and requires some elaboration. Until 1993 India's public sector held all the mutual fund assets, and it was not until the late 1990s that private sector mutual funds began to grow. Their rise since then has been meteoric, with the 2000s seeing public sector mutual funds exiting the industry while almost all-new mobilization was by private mutual funds (Figure 9). This dramatic reversal in the MF industry corresponds to the period of liberalization and financialization, the deregulation of financial markets and the growth of shadow banking.

Figure-9 – Rise and growth of India's mutual fund industry, 1988-2018



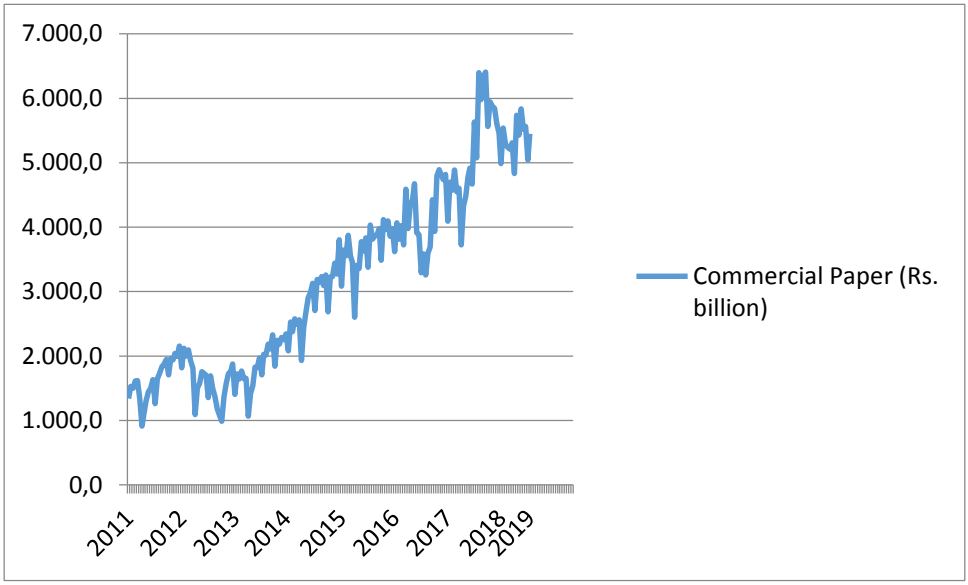
Source: *https://www.amfiindia.com/research-information/mf-history; https://www.relakhs.com/top-mutual-fund-schemes-2019/*

[8] The exchange rate is currently approximately Rs.70 = $1.

[9] Source: https://www.moneycontrol.com/news/business/mutual-funds/mf-wrap-why-mutual-funds-pared-stake-in-nbfcs-hfcs-in-september-3042691.html)/

Commercial paper (CP) or unsecured promissory notes with a fixed maturity of not more than 270 days are a major funding instrument used by NBFCs. Figure 10 shows the amount of commercial paper issued over the last 7 years. In this short period, issuance has almost tripled.

Figure 10 – Growth of commercial paper (CP), 2011-2018



Source: *DBIE-RBI, https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications*

This spurt in the issuance of commercial paper is one of the reasons for financial fragility of the system; after all, physical assets of businesses whose valuations are prone to market and macroeconomic fluctuations back CPs.

4.3.Growing concerns over shadow banks in India

Before we raise concerns over shadow banking in India, we must acknowledge its benefits:

- Provide alternatives for investors to bank deposits.
- Channel resources towards specific needs more efficiently due to increased specialization.

- Constitute alternative funding for the real economy, which is particularly useful when traditional banking or market channels become temporarily impaired.
- Constitute a possible source of risk diversification away from the banking system.

The primary activity of this system is the buying and selling of securities—securities which are, in general, collateralized by loans (or by other securities which are themselves collateralized by loans). Shadow banking therefore, in large part, involves the trading of already existing credit claims. When securities are bought and sold, the commodity which changes hands embodies credit, not goods. What is sold is a promise, by a third party, of future payment in money. When credit claims fall due, settlement requires receipt of assets higher up the pyramid in the hierarchy of money (Mehrling, 2012) than the credit claim itself. A holder of asset-backed commercial paper would usually require settlement in demand deposits. NBFC usually settle these claims with the issue of new CP. However, if banks and other financial institutions are unwilling to buy this new debt, settlement of older claims becomes difficult, inevitably causing a financial crisis in the system.

These risks in shadow banking played out in 2018 with a string of defaults by one of India's largest NBFCs, IL&FS – a company in the top 100 of the Fortune 500 companies – exposing signs of financial fragility in the system. As in Figure 5, IL&FS pyramid had three layers; the holding company, its SPVs and below them, the project companies. Money borrowed by the holding company and the SPVs from banks and other financial institutions were passed down at high rates of interest to project companies, while, at the same time, the holding company collected high fees upfront from its own subsidiaries. IL&FS also worked as a massive Ponzi scheme, with the holding company acquiring funding for its loss-making project companies, utilizing its reputation in the market that was often confused as a government entity.

With IL&FS defaulting CPs, commercial deposits (CDs) and inter-corporate deposits, it soon became apparent that the company was bankrupt with an outstanding debt of Rs.9.1 trillion (US$130 billion). The contagion effect on other companies was massive; the equity markets reverberated with selling of stocks of several financial institutions linked with IL&FS. When major institutional shareholders refused to rescue the company with infusions of capital, the government was forced to take over administration of the company out of the fear that the collapse of IL&FS would spread through the financial system (Ghosh,

2019). This intervention did prevent a crisis from erupting but it revealed the high risks which shadow banking brought to the Indian financial system. While technically the reason for default on loans was the asset-liability mismatch from long term projects being funded with short term loans, it revealed that shadow banking was turning "dark" with elements of fraud, poor corporate governance and weak risk management systems.

4.4. Policy responses and interventions in the Indian shadow banking sector

While the regulation of NBFCs comes under the ambit of the RBI, the Securities & Exchange Board of India (SEBI) lays down norms for Mutual Funds. The IL&FS debacle has triggered the regulators to increase surveillance of these institutions to safeguard savers. At the same time, they have realized the importance of shadow banks in financing of much needed investments in the economy and have therefore taken adequate steps to allow growth in and deepening of shadow banking in India.

The RBI focus in its recent announcements has been to ensure higher attention on liquidity management by shadow banks, diversification of sources of funds and harmonization of governance and supervision standards of commercial banks and shadow banks (ET Bureau, 2019). Furthermore, in a latest decision, the RBI has increased the ceiling for a bank's exposure to a single NBFC to 20% of its tier I capital from 15% earlier (Ghosh and Prasad, 2019). According to one of India's leading bankers, the deft handling of the situation through asset sales and government control over IL&FS ensured that it did not turn into a Lehman moment for India.

The SEBI has also issued new rules for the mutual fund industry including mandatory holding of liquid assets (cash and government securities), reduced sectoral exposure and greater diversification in lending, valuation of debt at mark-to-market, investment only in listed commercial papers and non-convertible debentures as well as limits on investments in debt instruments with promoters' guarantee or equity shares as collateral (Yadav, 2019).

However, although the crisis is now considered over, other NBFCs continue to face liquidity problems and difficulty to raise adequate funds. Nonetheless, important lessons have been learnt from the crisis and a consensus has emerged on the need for strict regulation and oversight of NBFCs and lending institutions while, at the same time, an acknowledgement of the shadow banking system.

SUMMARY AND CONCLUSION

Our analysis reveals the nature of shadow banking in an abstract sense as an institution interlinking three important agents; savers, investors and commercial banks. Banks serve two key functions in this process: credit creation at the commencement of the production cycle and liquidity provision in the process of credit transformation from short-term lenders (savers) to long-term borrowers (investors). Through a process of credit transformation, shadow banks channel funds from savers to investors by selling the former promises to pay by the latter. During times of a booming economy, shadow banks are easily able to access funds from the market and banks to keep up their short-term commitments to savers. Projects also yield returns in the longer-term to settle dues to savers. However, when the macroeconomic environment turns difficult and/or projects turn out dubious, the charade of credit transformation must end at some point of time. Given the inter-linkages between shadow banks and other financial institutions including banks, the systemic risk exposes the fragility in the financial system with crisis as the inevitable outcome.

This paper revealed this underlying narrative of shadow banking by first looking at different definitions of shadow banking and then presenting mechanisms or modus operandi of this financial institution. We then studied the nature, growth and emerging concerns over shadow banks in India. Since the era of financial liberalization in India in the 1990s, shadow banks have grown rapidly and becoming more interlocked with the rest of the financial sector, exposing the sector to systematic risk. This ended up in a crisis with the collapse of IL&FS, a large and significant shadow bank. Since the crisis, the RBI has increased regulatory standards for NBFCs while SEBI has laid out new norms for mutual funds exposed to shadow banks. While regulation of NBFCs in increasing, the financial system is becoming more and more fragile from within – in particular, corporate governance issues – and also from the outside – in terms of the challenging macroeconomic environment. However, shadow banks are now understood as an indispensable financial institution albeit with systemic risks.

REFERENCES

1. Acharya, V., Khandwala, H. & Öncü, T (2013), "The growth of a shadow banking system in ¨Emerging markets: Evidence from India", *Journal of International Money and Finance, Vol.*39(C), pp.207-230.
2. Business Standard (2018), *How Dewan Housing Finance stock caused a 1,128 point crash in Sensex today*, September 21, https://www.businesstoday.in/markets/–company-stock/dewanhousing-finance-stock-fell-sensex-nifty-crash/story/282695.html [Accessed on 05.23.2019]
3. Cox, J (2019), *Shadow banking is now a $52 trillion industry, posing a big risk to the financial system*, April 11, https://www.cnbc.com/2019/04/11/shadow-banking-is-nowa-52-trillion-industry-and-posing-risks.html [Accessed on 06.01.2019]
4. ET Bureau (2019), *Reserve Bank moots checks and balances to tackle NBFC stress*, May 25, https://economictimes.indiatimes.com/industry/banking/finance/banking/reserve-bank-moots-checks-and-balances-to-tackle-nbfc-stress/articleshow/69490650.cms?from=mdr [Accessed on 05.29.2019]
5. Financial Stability Board (2013), *Global Shadow Banking Monitoring Report 2013*, https://www.fsb.org/wp-content/uploads/r_131114.pdf [Accessed on 05.23.2019].
6. Ghosh, S (2019), "Big NBFCs need more scrutiny, failure can cause huge losses: RBI report", *Livemint*, June 27, https://www.livemint.com/industry/banking/big-nbfcs-need-more-scrutiny-failure-can-cause-huge-losses-rbi-report-1561648853033.html [Accessed on 07.02.2019].
7. Ghosh, S. and Prasad, G.C. (2019), "Central bank opens liquidity tap to help stressed shadow banks", *Livemint*, August 7, https://www.livemint.com/industry/banking/rbi-announces-measures-to-help-stressed-nbfcs-1565158791065.html [Accessed on 08.08.2019].
8. Guttmann, R. (2016), Finance-led Capitalism: Shadow Banking, Re-regulation, and the Future of Global Markets. London: Palgrave-Macmillan.
9. Kodres, L.E. (2013), "What is Shadow Banking?", *Finance and Development*, Vol. 50, No. 2, https://www.imf.org/external/pubs/ft/fandd/2013/06/pdf/basics.pdf [Accessed on 06.28.2019]
10. Livemint (2018), *The scorching pace of bank credit growth to NBFCs*, November 1, https://www.livemint.com/Money/bbjbHf9BdHr3Mk0O41k9WM/In-Chart-The-scorching-pace-of-bank-credit-growth-to-NBFCs.html [Accessed on 07.30.2019].
11. McLeay, M., Radia A. and Thomas, R (2014), "Money creation in the modern economy", *Bank of England, Quarterly Bulletin*, 2014-Q1, https://www.–bankofengland.co.uk/–-/media/boe/files/quarterly-bulletin/2014/money-creation-in-the-modern-economy [Accessed on 05.28.2019]
12. Mehrling, Perry (2012), "A money view of credit and debt, INET/CIGI", *False Dichotomies' Conference*, Waterloo, Ontario, Canada, https://www.cigionline.org/–sites/default/files/inet2012mehrling_amoneyviewofcreditanddebt.pdf [Accessed on 05.23.2019]
13. Mehrling, P., Pozsar, Z., Sweeney, J. & Neilson, H. D (2013), "Bagehot was a Shadow Banker: Shadow Banking, Central Banking, and the Future of Global Finance", *SSRN ElectronicJournal*, https://papers.ssrn.com/sol3/papers.cfm–?abstract_id=2232016 [Accessed on 05.22.2019]

14. Michell, J. (2017), "Do Shadow Banks Create Money?: 'Financialisation' and the Monetary Circuit", *Metroeconomica, Vol.* 68, No. 2, pp. 354-377. Mohan, R. and Ray, P. (2017), "Indian Financial Sector: Structure, Trends and Turns", *IMF Working Papers WP/17*/7, http://www.rakeshmohan.com/docs/WP1.pdf [Accessed on 05.26.2019].
15. Yadav, R. (2019), SEBI introduces new norms for debt funds: Here's how it will enhance safety level, *Business Today*, July 1, 2019, https://www.businesstoday.in/–current/economy-politics/sebi-introduces-new-norms-for-debt-funds-here-how-it-will-enhance-safety-level/story/360123.html [Accessed on 07.30.2019].

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THE ANALYSIS OF THE ECONOMIC IMPACT OF VAT ON THE ECONOMIC GROWTH IN SOUTHERN EUROPE

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Abstract: *The Southern Region of Europe is economically well-developed with highly industrialized urban areas and with great agricultural potential. The empirical analysis is based on an econometric assessment that measures the impact of the VAT on the rate of economic growth for years between 1996 and 2017. The empirical evidence highlighted a significant positive impact of VAT on economic growth, but a poor and ineffective use of the tax revenues during the period under review. Moreover, evidence revealed relatively high rates of VAT in the countries analyzed, with negative impact on the aggregate consumption and a diminishing effect of the consumer's income.*

Keywords: *indirect taxes, panel data regression, VAT, economic growth rate.*

JEL Classification: *H29, H24*

1. INTRODUCTION

The southern region of Europe, well-known as the Mediterranean Europe, is an economically well-developed area characterized by large regional and geographical extension, rich in resources, with a great agricultural potential and varied culture. Although the economic development of Southern Europe has been slow over time, the areas around the large cities are heavily industrialized and rural areas are mainly characterized by agricultural activities. The study presented in this paper includes an econometric analysis performed at the level of the following countries, which are geographically located in southern Europe: Spain, Portugal, Italy, Bulgaria, Greece, Slovenia, Croatia, Malta and Cyprus.

Furthermore, Southern Europe has two major areas with a rapid pace of economic development and industrialization such as the north of Italy (the Milan region) and northern Spain, in the Catalan region near Barcelona. Moreover, Italy

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has the most industrialized economy in the South European region and Milan is the industrial, economic and financial center of Italy. Additionally, Spain and Italy led to the formation of the European Community (ECC), which later became the European Union (EU) and facilitated these nations the export of agricultural products and the import of other necessary goods in order to compete with other well industrial-developed economies.

In general, taxes are levied by governments as a solution to the fulfillment of the duties towards the society. The financing of governmental expenses is a subject of great interest because the public financing is based on the incurring of some incomes and expenses completed by the public authorities and very often, they are influenced by the political environment. Thus, fiscal policy plays an important role in debating who should pay the taxes and how to use the revenues as effective as possible. Public revenues include collections of taxes, services and goods provided by public institutions, taxes on the profit of private companies, tariffs, fines, penalties.

At the level of Southern Europe, indirect taxes include value added taxes, custom duties (mainly applied to import operations), excise duties and environmental taxes. Also, at EU level, value added taxes and excise duties are harmonized, which means that the objectives of applying these taxes are set by European directives implemented in the national law of each Member State. On the other hand, it can be stated that the value added tax is the indirect tax with the highest share in public revenues from indirect taxes, but also the indirect tax with which frequent fraud is carried out, thus the big gap between what was supposed to be received and what is actually received, a phenomenon known as the VAT gap. Usually, indirect taxes are levied on consumption and the fiscal burden is borne by the final consumer. Therefore, in order to highlight the impact of indirect taxes on economic growth in the southern region of Europe, the study is based on empirical results at the level of nine countries in the southern region for a period of time from 1996 to 2017.

The study carried out mainly aims to estimate the economic impact of the value added tax on the rate of economic growth. For the accuracy of the model, the analysis also includes the following explanatory variables: government expenditure, the share of imports in GDP and the corruption perception index as control variable. The paper is structured as follows: the first part comprises a synthesis of the studies previously conducted based on the quantification of the economic impact of indirect taxes on economic growth, the second part includes the presentation of the research variables and the methodology addressed. Furthermore, the third part of the study includes the analysis of the empirical results and the last part presents the conclusions.

2. SYNTHESIS OF THE PREVIOUSLY EMPIRICAL EVIDENCE IN OTHER STUDIES

Ahmad S. et al. (2018) investigate the relationship between economic growth and indirect taxes for Pakistan. The analysis was based on an annual database (1974 – 2010), using as methods Philips Perron and Dickey Fuller tests to verify the stationarity of each variable. Also, the ARDL (Auto Regressive Distributed Lag) test was applied in order to check the long- and short-term impact of the variables. The authors concluded that on long run, indirect taxes have significant negative impact on economic growth, and on short term, the coefficients related to them are not significant. Much more, evidence showed that an increase with a percentage point of indirect taxes would lead to an economic downturn of 1.68%. The author's study underlines the need for a precise focus on leading the tax base to direct taxation in order to balance the economic growth.

Engen E. and Skinner J. (1996) analyze the impact of tax reforms on economic growth by considering the long-term economic growth rates in the US economy through three approaches. The first approach consisted of examining historical data in the US economy to determine if any tax cuts were associated with economic growth. The second approach presents the results at the level of other countries and the third approach uses results from the micro level by studying the job offer, the demand for investments and the increase of productivity. The authors' conclusions underline modest effects from levels of 0.2 to 0.3 percentage points difference between growth rates and tax reforms. They also believe that such small effects have significant impact on the living standards.

Poulson B.W. and Kaplan G.J. (2008) explore the impact of fiscal policies on economic growth through an endogenous growth model and with the help of a range of regression equations that estimates the economic impact of US taxes from 1964 to 2004. The findings of the study reveal significant negative impact of marginal tax rates and stress on the importance of controlling the regressive, convergent and regional influences in order to isolate the effects of taxation on economic growth. Furthermore, and among the first studies to analyze the effects of indirect taxes on economic growth, are those of **Harberger (1964)**, who showed that the effects of indirect taxes on investments are insufficient to stimulate economic growth. Within the model tested, possible changes of the fiscal components do not impact the labor force and the investments, fact which leads to insignificant changes of the economic growth. Moreover, **Harberger**'s study focuses on analyzing the effect of indirect taxation on labor growth.

For the analysis of the effects of indirect taxation on economic growth in South Africa, **Koch, Schoeman and Van – Tonder (2005)** use series of data for the period 1960-2002, analysis in which they firstly consider the relationship between taxation and economic growth and secondly the effects of the ratio between indirect taxes measured as percentage of total tax revenues and economic growth. They note that an increase in indirect taxes, compared to direct taxes, has the effect of reducing the economy. At the level of 22 OECD member countries, for the period 1960 – 1990, **Madsen and Damania (1986)** note that a change from direct to indirect taxation has no impact on long-term economic activities.

Musanga (2007) investigates the relationship between indirect taxes and economic growth in Uganda using a database from 1987 to 2005. The conclusions of the study show that a change with a percentage point in indirect taxes leads to an economic downturn of 0.53%, which indicates a great potential to generate tax revenues based on the quotas imposed. Another study conducted for the Turkish economy, investigates the relationship between direct and indirect taxes and economic growth, using data for the years 1968 – 2006. The authors, **Arisoy and Unlukaplan (2010)** concluded that indirect taxes are significantly and positively correlated with economic growth in Turkey.

Aamir et al (2011) analyze the impact of indirect taxes on economic growth in Pakistan and India for 2000-2009 and conclude that for Pakistan, indirect taxes are statistically significant and have positive impact on growth. Moreover, **Scarlet (2011)** uses standard growth functions to investigate the relationship between taxation and economic growth in Jamaica. The study covers quarterly time series from 1990 to 2010 and shows that there is a significant positive relationship between indirect taxes and long-term economic growth.

Boussalham (2018) analyzes the impact of corruption on economic growth in countries in the Mediterranean area for a period of time between 1998 and 2007 with the help of an econometric regression and models with fixed and random effects. The dependent variable of the model is the GDP per capita as factor of economic growth and as explanatory variable, the perception index of corruption. Following the study, it has been shown that the economic growth rate is negatively influenced by the corruption in the analyzed area.

3. RESEARCH METHODOLOGY AND DATABASE

In order to further analyze the economic impact of VAT on economic growth rate in Southern Europe, an econometric model is estimated with EViews software. The econometric model is based on a multiple regression equation and the estimation method it the "least squares".

The following is the regression equation:

$$y_{it} = \alpha + \sum_{k=0}^{n} \beta_k x_{k,it} + \varepsilon_{it}$$

$$PIB\_grate_{it} = \alpha + \beta_1 \cdot VAT_{it} + \beta_2 \cdot Gov\_exp_{it} + \beta_3 \cdot Imports_{it} + \beta_4 \cdot Corr\_index_{it} + \varepsilon_{it}$$

Where y – dependent variable, α – constant, β_k – coefficients of explanatory variables, x_k – explanatory variables, i – country, t – year/date, ε_{it} – error coefficient.

The dependent variable of the model is the rate of economic growth measured in real values of the Gross Domestic Product (GDP). GDP is an element that measures economic activity in terms of goods and services produced within a country, less the value of goods and services in their production process. The growth rate compares the economic evolution of a country in time as it highlights similar or different aspects between economies of different sizes.

Table-1. Descriptive statistics of the dependent variable (Southern Europe)

Variable	Average	Mean	Maximum value	Minimum value	Standard deviation	Observations
Economic Growth Rate	2.120101	2.818565	9.621648	-9.132494	3.209105	198

Source: Author's own processing using EViews;

The values of the variables are measured on a yearly basis between 1996 and 2017. Depending on the availability of the data, the characteristics of the research variables are presented in the table below.

Table-2. Variables

Name	Description	Source
I. Dependent Variable		
PIB_grate	Real GDP growth rate	Online Eurostat and World Bank databases
II. Explanatory Variables		
VAT	VAT values measured as percentage of total fiscal revenues	Online Eurostat database
Imports	Imports of goods and services measured as GDP percentage	
Gov_exp	Public government expenditure, measured as GDP percentage	
Gross_capital	Gross capital formation measured as percentage of GDP. Represents the net procurement of goods and services by resident units, produced during the period under review, but not consumed. Includes gross fixed capital formation and stock changes.	Online Eurostat and World Bank databases
Corr_index	This variable is based on the Corruption Perception Index (CPI), a composite index that measures, with the help of questionnaires, the level of corruption perceived by the population of 183 countries. For the measurement it is considered a score from 0 (very corrupt state) up to 100 (very low level of corruption).	The Heritage Foundation online database

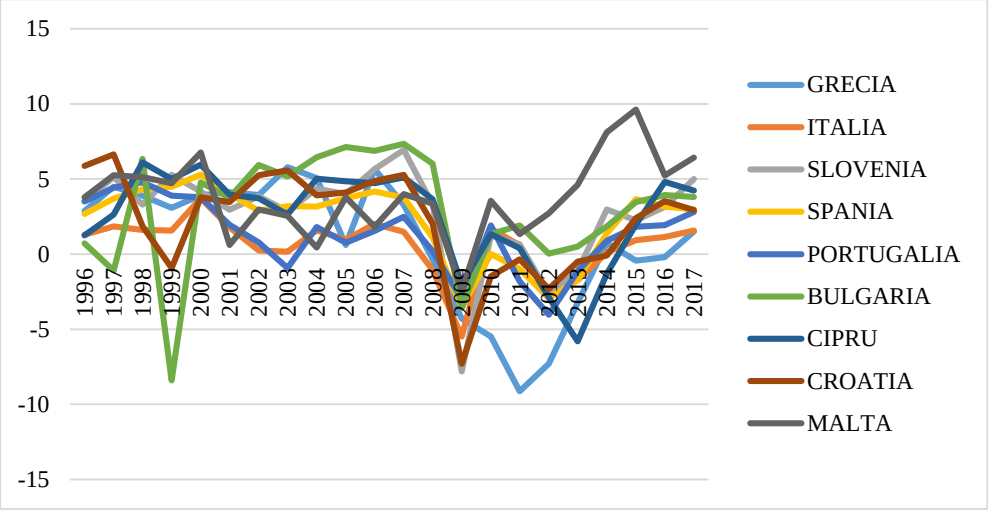
Source: Author's own processing;

The minimum value of economic growth was -9.13% recorded by Greece in 2011 and the maximum value of 9.62% was registered by Malta in 2015.

4. Conclusions and Analysis of the Empirical Evidence

The figure below shows the evolution of the economic growth rate in Southern Europe for the period under review. During 2009 – 2010, the aftermath of the financial crisis of 2007 is visible and significant.

Figure-1. Economic growth rate in Southern Europe (1996 – 2017)



Source: Author's own processing using Eviews 7;

The results of the estimation of the variables highlight negative values for VAT, government expenditure and corruption perception index. Therefore, at an increase with one unit of the above-mentioned variables, an economic downturn of 0.06%, 0.6% and 0.03% will be recorded. The explanatory variable related to the VAT revenues affects the economic growth rate in a negative way, as a result of the high VAT rates in the analyzed countries, which have negative effects on the aggregate consumption and an effect of diminishing the disposable income of the consumers.

The gross capital formation represents the accumulation of fixed assets and services needed by the resident units in order to carry out their economic activities. The growth coefficient related to gross capital formation, confirms a high degree of economic development. Furthermore, government spending leads to economic downturn, which accentuates an inefficient allocation of public revenues.

Table-3. Estimation results

Dependent Variable: PIB_GRATE
Method: Panel Least Squares
Sample: 1996 2017
Periods included: 22
Cross-sections included: 9
Total panel (balanced) observations: 198

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.048280	2.447423	3.697064	0.0003
VAT	-0.060024	0.026216	-2.289609	0.0231
GOV_EXP	-0.636264	0.104631	-6.081043	0.0000
GROSS_CAPITAL	0.297608	0.036756	8.096922	0.0000
IMPORTS	0.023151	0.005981	3.870464	0.0001
CORR_INDEX	-0.031515	0.014635	-2.153387	0.0325

R-squared	0.398239	Mean dependent var	2.120101
Adjusted R-squared	0.382568	S.D. dependent var	3.209105
S.E. of regression	2.521614	Akaike info criterion	4.717510
Sum squared resid	1220.839	Schwarz criterion	4.817154
Log likelihood	-461.0335	Hannan-Quinn criter.	4.757842
F-statistic	25.41266	Durbin-Watson stat	1.276877
Prob(F-statistic)	0.000000		

Source: Author's own processing using EViews 7;

Table-4. Probabilities and coefficients of the explanatory variables

Explanatory variables	Coef	Prob	Effect
C	9.048280	0.0003	
VAT	-0.060024	0.0231	Economic downturn of 0,06%
GOV_EXP	-0.636264	0.0000	Economic downturn of 0,6%
GROSS_CAPITAL	0.297608	0.0000	Economic growth of 0,3%
IMPORTS	0.023151	0.0001	Economic growth of 0,02%
CORR_INDEX	-0.031515	0.0325	Economic downturn of 0,03%

Source: Author's own processing using EViews 7;

Legend: * 5% significance level;

5. CONCLUSIONS

The results of the empirical study for Southern Europe show positive impact of VAT on economic growth. Government spending leads to a statistically significant decrease, which indicates the inefficient and unproductive use of public expenditure. Imports, measured as percentage of the Gross Domestic Product, have positive impact (economic growth by 0.02%) on the economic growth, also the VAT revenues lead to economic downturn, which reveals a high level of VAT rates in the countries analyzed, which also has negative effects on the aggregate consumption and a diminishing effect of the disposable income of the consumers.

Gross fixed capital formation has positive impact on economic growth and underlines a high degree of economic development. Corruption is considered a strong impediment to economic growth and development, moreover, the corruption perception index is a useful tool in quantifying the level of corruption in a country. Thus, the results obtained in this study confirm a negative link between corruption and economic growth, as has been shown in other reference studies (**Boussalham**, 2018).

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REFERENCES

1. Aamir, M., Qayyum, A., Nasir, A., Hussain, S., Khan, K. I., & Butt, S. (2011). Determinants of tax revenue: Comparative study of direct taxes and indirect taxes of Pakistan and India. International Journal of business and social sciences, 2 (18),171-178.
2. Ahmad S., Sial H.M, Ahmad N. (2018), INDIRECT TAXES AND ECONOMIC GROWTH: An Empirical Analysis of Pakistan, Pakistan Journal of Applied Economics, Vol.28 No.1, (65-81), Summer 2018;
3. Boussalham, H. The Consequences of Corruption on Economic Growth in Mediterranean Countries: Evidence from Panel Data Analysis. Preprints 2018, 2018020065 (doi: 10.20944/preprints 201802.0065.v3).
4. Engen, E. și Skinner J. (1996), Taxation and economic growth, National Tax Journal, 49:617-42.
5. Harberger, A. C. (1964). Taxation, resource allocation and welfare, in NBER' and the Brookings Institution, The Role of Direct and Indirect Taxes in the Federal Reserved System. Princeton: Princeton University Press 25 – 75.
6. http://ec.europa.eu/eurostat/data/database;
7. https://www.heritage.org/index/explore;
8. Madsen, J., & Damania, D. (1996). The macroeconomic effects of switch from direct to indirect taxes: An Empirical Assessment. Scottish Journal of Political Economy, 43 (5), 566-578.
9. Musanga, B. (2007). Effects of taxation on economic growth (Uganda's experience: 1987-2005) Unpublished miscqualitative economics. University of Makerere.
10. Poulson, B.W. și Kaplan J.G. (2008), State income taxes and economic growth, Cato Journal, 28(1): 53-71.
11. Scarlett H. G. (2011), Tax Policy and Economic Growth in Jamaica, Research Services Department, Research&Economic Programming Division, Bank of Jamaica;
12. Statistical Review, 55 (2), 16-172.Koch S.F., Schoeman N.J., Van Tonder J.J. (2005), Economic Growth and the Structure of Taxes in South Africa: 1960-2002, South African Journal of Economics, 73(2): 190-210.

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THE INNOVATION PERSPECTIVE OF THE ACQUIRERS: EMPIRICAL EVIDENCE REGARDING PATENT-DRIVEN M&AS

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Abstract: *Economic entities get involved in mergers and acquisitions (M&As) because they are interested in external growth strategies which can lead to an increase in the wealth of the shareholders of the participating entities. In M&As, from an acquirer or a target's perspective, a company brings its resources, which can be material or immaterial (knowledge). In the post-M&A phase, through the integration process the shareholders expect synergy gains, or that the combined firms to report efficiency gains higher than if they would activate separately. In nowadays, in a boundaryless economy, one of the most appreciated resources is knowledge. In this respect, the intangible assets, in general, and patents, in particular, are the accounting representation of knowledge in a company. They are also considered to be predictors for the deal value paid to the target company. To those we add the size of the target company, its core activity and the value of the research and development expenses, the latter being a significant mediator variable for the proposed models.*

Keywords: *innovation, theories of the firm, M&As, innovation, performance*

JEL Classification: *G34, M16, M20*

1. INTRODUCTION

The history of humankind can be seen as technological progress in control over nature. As Betz (2003: 11) stated in his book, *Managing technological innovation: Competitive advantage from change*, the humans manipulated innovation over time, through material, biological, power and information technologies in order

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to advance through centuries. Out of these, technological innovations are most often the result of efforts over time and not the discovery or the result of the research of a single individual (Carr *et al.*, 2016). In the opinion of the same author, "the story of the human species turns on two themes of evolution – biological evolution and cultural evolution – with the latter dependent on technological progress. [...] Economy is the social process of the human use of nature."

The subject of innovation is discussed in many papers, especially after the year 2000, because it is considered to be one of the means to create sustainable competitive advantages (Johannessen *et al.*, 2001). On the same note, innovation is one of the driving forces of the 21st century and continues to be so, being the source of the growth in global economy. But how can companies achieve innovation or improve the one they already have? A company can create its own resources that improve innovation, it can purchase them or even get involved in partnerships that can be source for innovation.

Cyret and Kumar (1994) are among the first authors that understood the fact that companies should be able to adapt, at one point in time, to technological innovation. Later, the decision on to ways to achieve synergy depends on the resources of the company: if it has human resoures with specific capabilities, the company can produce innovation; if it has cash, it can purchase it or it can acquire/merge to a company that owns the needed innovation.

The complementarity in the innovation strategy, which means combining internal R&D and external knowledge acquisition, is one topic of interest for Cassiman and Veugelers (2006). According to the authors, these activities are complementary, but sensitive to elements composing firm's strategic environment. Rigby and Zook (2002) argued about the benefits of opening to acquiring innovation from an "open-market", while Makri *et al*. (2010), in their study of high technology M&A, found that complementary scientific knowledge and complementary technological knowledge can both contribute to post-acquisition performance. There are studies which confirm that acquired R&D can successfully substitute for internal R&D (King *et al*., 2008; Heeley *et al*., 2006).

There are a lot of companies which prefer to involve in M&As, to purchase innovation, instead of producing it, because one of the ways of getting external knowledge flows is purchasing a company which owns the innovation needed by the acquiring company. In other cases, the knowledge can belong either to the acquirer or the target and it is transferred from one company to the other, it can also be shared with the other company or, eventually, taught after the integration process is over (Gupta and Roos, 2001).

The key elements in the decision of purchasing innovation are time, costs and the ease of success. According to the resource-based theory of the firm and the knowledge-based view, differences in innovative performance between firms are a result of dissimilar knowledge sources (Cloodt *et al.*, 2006). According to Grant (1996) and to Bromiley and Rau (2016), the resource-based view (RBV) of the firm is a way of explaining that some companies succeed in establishing positions of sustainable competitive advantage and, in so doing, earn superior returns because they own resources that are rare, valuable, hard or impossible to imitate or duplicate, and hard to substitute. Resources can be separated into those that are tangible and property based, and those that are intangible and knowledge-based (Hörisch *et al.*, 2014, Wiklund and Shepherd, 2003). The emerging 'knowledge-based view' is not, as yet, a theory of the firm. There is insufficient consensus as to its precepts or purpose, let alone its analysis and predictions, for it to be recognized as a 'theory'. To the extent that it focuses upon knowledge as the most strategically important of the firm's resources, it is an outgrowth of the resource-based view.

The study attempts to show if the intangibles and the R&D expenses belonging to the target company significantly influence the deal value paid in acquisitions. To these variables, we add some characteristics of the target company (its size, using the value of total assets as indicator, and its core activity, industry or services, which will be used as control variable).

2. THEORY AND HYPOTHESES

Among the partnerships which can lead to knowledge sharing or transfer, full integration of innovative capabilities through mergers and acquisitions remains a very popular option. Recent contributions in the innovation literature have clearly pointed at the growing importance of mergers and acquisitions in the knowledge acquisition process (Hagerdoorn and Duysters, 2002). Whereas strategic alliances started to emerge in the 1970s, mergers and acquisitions have a much longer-standing history, which, according to De Man and Duysters (2005), started at the beginning of the century, evolved in waves and the wave around the year 2000 was mainly induced by technological change. Today, M&As are found to be increasingly used to absorb complementary external technological capabilities needed to compete successfully in radically changing economies.

Usually, the M&A motives that are mostly invoked for justifying the transaction include synergy success, efficiency gains, market growth or ease of

access on new markets, diversification, to name a few, but there is a scarce literature regarding the effect of M&As on innovation.

M&As can stimulate, but also they can reduce or even inhibit innovation. Taking the first instance, M&As can be associated with *innovative renewal* (De Man and Duysters, 2005; Nonaka and Toyama, 2015). This can be achieved through R&D and complementarity of knowledge.

Research and development expenses are representative in describing the innovative side of a company, given the fact that they usually enclose projects that are currently on deck, due to the internal needs of the company or as a result of the research the company is doing in its main field of activity. If the R&D expenses exist in the balance sheet of a company, they reflect its ongoing innovative projects. Also, in transactions like M&A, they can be a factor in choosing and purchasing another company, because they represent a motivation for the acquirer and an advantage for the target company. The M&A market encourages innovation, especially in the case of small firms (Phillips and Zhdanov, 2013). In this situation, we can have two possibilities. One, large companies prefer to outsource the R&D function to small firms and finally to acquire the successful innovative company. Second, there are situations in which large companies acquire small ones, because the first have cash and the second own projects. This last case is known as financial synergy, more precisely cash slack (Bruner, 1988; Kang, 1993; Bettinazzi *et al*., 2018; Kumar and Oberoi, 2019; Duan and Jin, 2019). Practitioners consider it a good strategy to sell a constrained firm to a cash-rich firm. According to authors Duan and Jin (2019), any positive net present value (NPV) of a project can be fulfilled if there is no financial constraint; otherwise, without the acquisition, the positive NPV project can be ceased because of the lack of capital. One example for this situation is the case of the acquisition of Atlas Energy, Inc. by Chevron, in 2010. Atlas developed new technologies that unlocked huge troves of natural gas locked in a type of dense rock known as shale, but the Chevon was the one that had cash slack, so the acquisition was finalized for 3.2 mil. dollars.

On the other hand, M&As may represent a *barrier to innovation*. And the most common and easy to be understood situation is the one of monopoly or of limited/insignificant competition. If a company doesn't have competition, its innovative side won't be as well developed as in the case when there is a competitor, which can represent a stimulus for innovation (e.g. Samsung and Apple, which are constantly converging and modifying, despite their different business models. Samsung has been a force on the market for a longer period of

time and it has a large range of products under the brand, while Apple has a more focused and targeted market).

Another negative effect of acquisitions is related to reduced managerial commitment to innovation because of the significant amounts of executive time used in the concentrations (Hitt *et al*., 1991). Even when the merger is successful in terms of the integration of R&D departments, other areas may not integrate so well, thus the M&A may not be a success, prompting a disintegration of the company (De Man and Duysters, 2005). Positive effects on innovation will then be undone by the overall state of the M&A.

In M&A literature, the idea that the acquisition performance will be higher when the acquiring and target firm's resources are complementary is quite common (Capron and Pistre, 2002; Hitt *et al.*, 2001; King *et al.* 2003; King *et al*., 2008). In the opinion of some authors, the expectation is that the larger a target company's R&D resources, the greater the number of possible combinations with the resources and projects of the acquiring company (King et al., 2008), which may increase the chances that a firm will develop technological innovation.

On the other hand, in the case of acquisitions, a resource redundancy resulted from acquirer's limited absorptive capacity is possible, which leads to redeploying target firm technology resources. Second, the likelihood of any resource redundancy in a combined firm is possible to increase with the size of a target firm's R&D investments. If R&D investments exceed the specific needs of an acquirer, a target's technology resources become less beneficial and potentially counterproductive (Uhlenbruck *et al*., 2006).

Sears and Hoetcker (2013) discuss the notion of *technological overlap,* which means the amount of knowledge that is duplicated between the companies involved in mergers and acquisitions, but also its effect on the creation or destruction of value. Their findings underline the fact that, when target and acquirer overlaps are high, knowledge redundancy decreases the acquirer's ability to create value, while when the target overlap is low, it doesn't seem to negatively affect the value creation.

The M&A literature shows that one of the most frequently cited reason for such operations is to achieve synergy, concept that is firstly invoked in the pre-merger and acquisition phase and, later, remains an objective of the involved companies. Also, there are authors who consider that, in the case of M&As based on innovation, aside of the well known synergies that may appear (operational or financial) which take time to manifest, at least three years after the completion of specific operations (Weber and Dholakia, 2000, Loukianova *et al.*, 2017), there are

other types of synergies that may arise. Thus, Harrigan *et al*. (2017) discuss technological synergies, which may be *additive synergies* and *multiplicative synergies*. The first mentioned ones are built incrementally on existing technologies, while the latter contribute to enhancing technological skills instead of combining them. Overall, Chesbrough (2003) addresses the importance of timeliness in purchasing R&D through mergers and acquisitions, given the fact that there must be a complementarity in the research of the companies involved, so the technological synergies may appear. Moreover, the acquiring firm must have a program for integrating the purchased R&D into their own, so they create synergy.

In order for a company to achieve technological synergies, it has to own resources that lead to these types of synergies. A company addresses the innovation part of its activities, by constantly reviewing its capabilities to respond to industry change. Consequently, a company should ensure that investment in innovation matches the strategic objectives of the company/post-merger companies. Also, the entity must integrate post-concentration IT&C resources to achieve synergy (Chen, 2012). These issues must be correlated with the resource-based approach, which argues that the competitive advantages of a company are indissolubly linked to its valuable, rare and irreplaceable resources. Patents and any assets resulting from innovations may support this theory if a company is involved in transactions such as M&As.

The need to obtain and transfer the knowledge based resources requires a high degree of post-M&A integration in order to realize the anticipated benefits (Puranam *et al.*, 2003, Ranft and Lord, 2002) or to exploit potential synergies between the acquired and acquiring firms, related to resources one of them possesses. In the context, Gomes *et al*. (2012) consider that, in M&A, the resources based on knowledge are difficult to transfer from one company to another, because it may lead to loss of autonomy and employee turnover for the purchased company, and to a high level of commitment from the management of the acquiring company.

Mendenhall (2005: 21) consider that there are four basic categories of synergies: cost reduction, revenue enhancements, increased market power and synergies related to intangibles. The latter are the most difficult to capture, but also are difficult to transfer across organization and geographic extentions.

The focus on technological synergies is of great importance, especially when the study involves small, technology-intensive target firms, because they allow the analysis of value creation, minimizing the impact of other types of synergies, based

on different factors, such as cost synergies or market share related synergies (Sears and Hoetker, 2013; Puranam *et al*., 2006).

To date, little, or only weak, empirical support exists for assessing the influence of intangibles on the price paid by an acquirer for a target company. Considering the opinion of Harvey and Lusch (1997), there are a number of situations which necessitate the valuation of intangible assets for legal as well as accounting transactions: (1) an exchange in which intangibles are transferred between companies; (2) in an allocation of purchase price during acquisition when all the assets of a business, both tangible and intangible, are valued; (3) in support of the determination of royalty rates or license fees; (4) to estimate a loss due to abandonment or casualty; (5) in support of enterprise valuation, when the company is involved in a business concentration, like M&As; and (6) for their use as collateral in financing. Thus, they can influence, positively or negatively, the M&A and, indirectly, the deal value paid by the acquirer.

Filip *et al*. (2018) investigate the relation between acquirers' disclosures about growth, synergies and intangible resources and the characteristics of the M&A deals, considering the use of term intangibles in pre-M&A phase in announcements and press releases and the influence on the deal value, relative to the size of the acquirer.

Taking into account the aforementioned information, we consider that the value of intangibles significantly influences the value paid in the transaction. In order to use the deal value as dependent variable, we divide it by the value of the shareholders' funds one year before the completion of the transactions. Thus, the value over 1 signifies that a premium was paid, while the value between 0 and 1 represents a value which is less than the corresponding shareholders' equity.

H_1: The value of the intangible assets and the size of the target company have a positive effect on the deal value paid in M&As, reported to shareholders' funds.

The success of M&As, also the related synergy anticipation and gains, can be analized and estimated for a sample of transactions (809). In order to better explain de results there are authors that analyze the success of M&As by controlling the result for industry and services, using the statistical classification of economic activities specific to the companies in the sample (Rozen-Bakher, 2018a and 2018b).

H_2: The value of the intangible assets and the size of the target company have a positive effect on the deal value paid in M&As, reported to shareholders' funds, in industry M&As.

H_3: The value of the intangible assets and the size of the target company have a positive effect on the deal value paid in M&As, reported to shareholders' funds, in services M&As.

External sourcing of R&D investments can represent a powerful motive for an acquirer to participate to M&As and can be a solution to the uncertainty of positive results on innovation (Heeley *et al.*, 2006). Thus, uncertainty can be reduced if companies can access the needed technology resources through acquisition (King *et al.*, 2008). We argue that the value of R&D expenses, reported by the target companies, positively and significantly influence the deal value paid in M&As, especially in the type of M&A considered for our sample (the one that is motivated by the existance of patents). In order to improve the situation of own intangibles, the acquirers are more interested to purchase companies involved in research projects, which are to be developed in knowledge resources than to buy companies that already have intangibles which may overlap on those that already exist in the balace sheet of the acquiring companies. Thus, we argue that the value of R&D expenses is the only scale variable that significantly influences the dependent variable.

Given the importance of R&D expenses in mergers and acquisition and the fact that they can improve innovation, we want to test and validate the hypothesis that they can influence the value paid in M&As, in those transactions that are motivated by the existance of patents in the balance sheet of the target companies, according to the information found in the Zephyr database. We use the R&D expenses (reported to total assets) as a mediator for the previous model. The assumption of causality is implicit in the definition of mediation, as a mediator is defined as an explanatory mechanism through which one variable affects another (Wood *et al.*, 2007). This variable is considered for the year before the merger, given the fact that there are studies which validated its significance in influencing a financial dependent variable (Aevoae *et al.*, 2019; Robu and Istrate, 2015).

H_4: The R&D expenses of the target have a positive effect on the deal value paid in concertation, reported to the value of the shareholders' funds of the acquired company.

These hypotheses will be tested and validated using the statistical software SPSS 25.0.

3. RESEARCH METHODOLOGY AND DESIGN

To test and to validate the first three proposed research hypotheses, the study analyses the empirical data related to 809 M&As, for the 2011 – 2017 period of time, considering the target companies that are involved in M&As because they declared patents, as a motive for concentration. Also, in all the acquisitions, the purchased stake is over 50%, which means that, after the transaction, the acquirer controls the target company. The last hypothesis will be tested and validated using a sample of 150 M&As, due to the fact that only in those M&As the target companies have reported R&D expenses.

To reach the proposed research hypotheses, we use linear regression, mediation analysis and crosstabulation.

3.1. Target population and analyzed sample

To confirm the research hypotheses, the data regarding M&As were gathered from two databases, for the 2011-2017 period of time. The information regarding the deals representing M&As was collected from the Zephyr database (target name, target country, acquirer name, acquirer country, deal type, deal value, the motive – patents, primary NACE Rev.2 code for the target); financial information was collected from Orbis database (shareholders' funds, intangibles, total assets for the target company).

3.2. Models proposed for analysis and data source

This paper examines a series of factors influencing the deal value in M&As which involved target companies owning patents. The deal value was pondered with shareholders' funds. Because the target companies are the ones that own the patents, the financial information are referring to them and include data related to assets, intangibles, the size of the company and NACE main section.

The proposed variables are presented in Table 1.

Table- 1: The variables proposed for the analysis

Symbol	Representation	Description	Explanation
Deal value/ shareholders' funds (DV)	%	Dependent variable	The ratio of deal value in the shareholders' funds of the target company. Information collected from Zephyr database (deal value) and Orbis database (equity), for the 2010-2017 period of time.
Intangibles/ Total assets (IA)	%	Independent variable/ numeric	The ratio of intangible assets in the value of total assets; information collected from Orbis database, for the 2010-2017 period of time.
Size of the company (SC)	Ln(total assets)	Independent variable/ numeric	
Category of the company (CTG)	1. Small company 2. Medium-size company 3. Large company 4. Very large company	Independent variable/ categorical	The size of the target company; information collected from Orbis database, for the 2010-2017 period of time.
NACE main section (NACE)	1. Industry 2. Services	Independent variable/ categorical	According to EU, sections A-G from NACE Rev. 2 are associated to industry, sections H-U are composing the services. The data regarding the NACE main section for the target company are collected from Orbis database, for the 2010-2017 period of time.
R&D/Total assets (RD)	%	Mediation variable/ numeric	The ratio of R&D expenses in the value of long-term assets; information collected from Orbis database, for the 2010-2017 period of time.

Source: Authors' own processing

Dependent variable. This variable represents the ratio between deal value paid in the M&A and the shareholders' funds, for the year before the concentration. Thus, this ratio reflects the excess amount paid over the value of the equity of the target company. If the variable is over 1, the acquirer paid more than the net worth of the target company.

Independent variables. These variables are presented in Table 1 and they are calculated for the target company, considering the financial information for the year before the M&A. According to Rozen-Backer (2018a), the data from the year

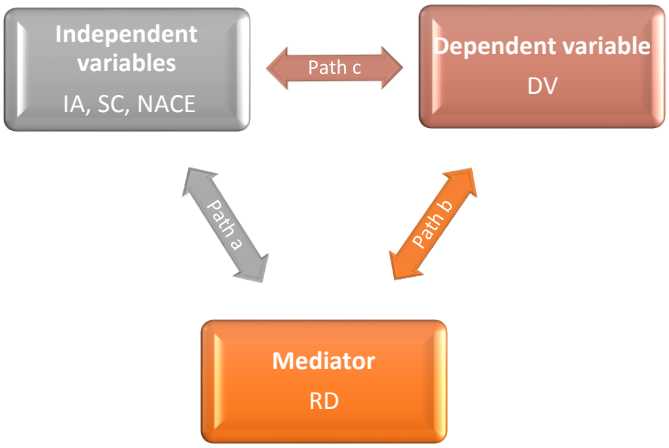
before the concentration are specific to pre-M&A stage and they are collected from Orbis database.

The first three hypotheses are to be tested using the regression model presented in Eq. (1):

$$DV = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \beta_4 \cdot CTG + \varepsilon \quad (1)$$

Mediation variable. The fourth hypothesis is examined using mediation analysis. There are multiple ways to test a mediation model (Frazier *et al*., 2004, Wu and Zumbo, 2008). When paths a and b are controlled, a previously significant relation between IV and DV is no longer significant (complete mediation) or its significance is dropping (partial mediation). In our case, the paths are presented in Fig. 1:

Figure- 1: The proposed mediation model



Source: Authors' own processing

Our *mediation model* includes the following steps:

1) path *c* is predicting the dependent variable *DV* from independent variables *IA*, *SC*, *CTG* and *NACE* (without the mediator); the model is presented in Eq. (2):
$$DV = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \beta_4 \cdot CTG + \varepsilon \quad (2)$$
2) path *a* is predicting the mediator *AccP* from the independent variables *IA*, *SC*, *CTG* and *NACE*; the model is presented in Eq. (3):
$$RD = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \beta_4 \cdot CTG + \varepsilon \quad (3)$$
3) path *b x c* is predicting the dependent variable *DV* from independent variables *IA*, *SC*, *CTG* and *NACE* (including the mediator); the model is presented in Eq. (4):

$$DV = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \beta_4 \cdot CTG + \beta_5 \cdot RD + \varepsilon \quad (4)$$

The used method is *hierarchical linear regression* (HLR) because it is a way to show if variables of our interest explain a statistically significant amount of variance in our DV after accounting for all other variables. Also, our study includes *variance inflation factor* (VIF), to identify multicollinearity problems. The VIF and tolerance are both widely used measures of the degree of multi-collinearity of the i^{th} independent variable with the other independent variables in a regression model (O'Brien, 2007).

4. RESEARCH RESULTS

The study will present a series of descriptive statistics for the analyzed variables (per total and on categories considered in the analysis), of the values of the Pearson correlation coefficients and the estimations of the parameters of the proposed regression models.

4.1. Descriptive statistics

Table 2 shows the descriptive of our sample of 809 acquisitions.

Table- 2: The descriptive statistics for the chosen sample of M&As

Variables	Categories	N	Mean	St. Dev.	Median
NACE	Industry	452	.9860	17.88613	.0270
	Services	357	1.0299	18.76620	.0324
Year	2013	129	.0280	.91175	.0219
	2014	148	.1109	.84442	.0311
	2015	166	2.4131	29.42119	.0291
	2016	214	1.6229	24.20649	.0271
	2017	77	-.0358	1.52142	.0369
	2018	75	.6427	3.46419	.0408
SC	Small	51	7.2620	49.18307	.0408
	Medium	163	.3271	2.67851	.0405
	Large	303	1.2366	21.92447	.0399
	Very large	292	.0513	.28424	.0196
Total		**809**	**1.0054**	**18.26828**	**.0301**

Source: Authors' own processing using SPSS 25.0

For our sample of M&As, the target companies report patents, according to Zephyr database, and we consider only the transactions that involve one acquirer and one target company (809 acquirers and 809 targets). Out of the 809 targets,

55.87% are activating in industry and 44.13% in services, considering that sections A-G from NACE Rev. 2 are associated to industry, while sections H-U are composing the services (European Commission, 2008). Referring to the year, the large part of the transactions in our sample were completed during 2016 (26.45%). According to Table 2, the vast proportion of the entities involved in M&As as targets are large entities (37.45%), followed by very large entities (36.09%). In the same time, we acknowledge the fact that, for medium and large entities, the acquirers paid up to 7.26 times the value of shareholders' funds purchased in M&A, in the case of small entities, which means the acquirers are willing to pay more for small companies that record patents.

The correlations between numeric variables are presented in Table 3.

Table- 3: Pearson correlation between numeric variables

Variables	Deal value	Size	Intangibles	R&D
Deal value		-.083	.038	.200***
		150 observations		
		-.212***	.015	
		809 observations		
Size	-.083		.260***	-.380***
		150 observations		
	-.212		.220***	
		809 observations		
Intangibles	.038	.260***		-.085
		150 observations		
	.015	.220***		
		809 observations		
R&D	.200***	-.380***	-.085	
		150 observations		

Level of significance: *** – p <0.01
Source: Authors' own processing using SPSS 25.0

The correlations presented in Table 3 reveal expected patterns. As noticed, there is a direct and significant correlation between the deal value and the value of the R&D expenses (sig. = 0.007, r = 0.200), which means that the acquirers pay high values for companies that report this type of expenses. An opposite relation is between R&D expenses and the size of the company, which means the higher the target company, the lower these expenses (sig. = 0.000, r = – 0.380). This aspect

allows us to assess that, in our sample, acquirers bought small target companies that reported high values of R&D reported to total assets.

Also, there is a positive and significant correlation between the size of the target company, reflected in its total assets, and the value of intangible assets (sig. = 0.000, r = 0.220), which means that the target companies that are involved in innovation-based M&As report most of their assets as intangibles (patents and other intangible assets. R&D expenses are reported separate from the intangibles in the balance sheet of the target companies).

4.2. Results on the influence of determinants on the value paid for the target company

In order to test and confirm the first proposed hypothesis, we present the estimated parameters from Table 4.

Table- 4: Parameters estimation for the regression model (all M&As)

Variables	Values for all M&As			
	β	**t-values**	**VIF**	**τ**
Intangibles/Total assets (IA)	0.074**	2.129	1.066	.938
Size of the company (SC)	-0.472***	-8.296	2.841	.352
Category of the company (CTG)	0.302***	5.377	2.763	.362
NACE main section (NACE)	-0.027	-0.773	1.030	.971
R^2	0.083			
Adjusted R^2	0.078			
F	F(4,804) = 18.156, p = 0.000			
Level of significance	**p < 0.05; ***p < 0.01			

Source: Authors' own processing using SPSS 25.0

Essentially, the purpose of the analysis is to estimate the parameters for a regression model in which the dependent variable is the price paid in the transaction. Given the fact that this variable has a wide range, we reported it to shareholders' equity, because it is the simpliest way to show if the acquirers paid over the net book value of equity/a premium. For the model presented Table 4, the chosen predictors are microeconomic data, related to the target company (the ratio of intangibles in total assets, size of the company and target's core activity). The model should predict how much of the variance of the dependent variable is justified by the target country's information. The regression model is significant (F (4, 804) = 18.156; p < 0.001) but explains a small percentage of the variance in the dependent variable (R^2 = .083). The predictors account for 8,3% of the variance of

the dependent variable (the ratio between deal value and shareholders' funds). Related to the significance of the variables, most of them have a significant influence on the DV, except the core activity of the target company, reflected in NACE main section. The size of the company has a significant negative influence on the deal value paid in transaction (sig. = 0.000, β = -0.472), which means that the payments are higher for the small companies, when considering total assets as an indicator in this matter (Carcello *et al*., 2005; Blackwell *et al*., 1998; Kadioglu *et al*., 2017). Category of the company and the ratio of intangibles both have a positive and significant influence on the deal value paid (sig. = 0.000, β = 0.302 and sig. = 0.034, β = 0.074, respectively).

In order to test and validate the second and third hypotheses, Table 5 presents the estimated parameters considering the NACE binomial variable as a control variable. We will notice that the variables that are significant for the whole sample are similar in industry M&As, but in services M&As the intangibles aren't significant in predicting the dependent variable.

Table- 5: Parameters estimation for the liniar regression model, considering NACE as control variable

Variables	**Values for industry M&As**		**Values for services M&As**	
	β	**t-values**	**β**	**t-values**
Intangibles/Total assets (IA)	0.108**	2.323	0.041	0.787
Size of the company (SC)	-0.434***	-6.065	-0.504***	-5.590
Category of the company (CTG)	0.300***	4.239	0.301***	3.391
R^2	0.080		0.092	
Adjusted R^2	0.074		0.084	
F	F(3,448) = 13.015, p = 0.000		F(3,353) = 11.884, p = 0.000	
Level of significance	**p < 0.05; ***p < 0.01		***p < 0.01	

Source: Authors' own processing using SPSS 25.0

Our approach is opposite to the one of Malone and Rose (2006), who argue that the existence of intangible assets in the balance-sheet of the acquirers will determine them to expand geographically, in order to pursuit new opportunities. If these authors consider that the intangibles give the acquirers a competitive advantage, we argue that the ratio of intangibles in total assets of the target company is a significant variable in establishing the price paid in transaction. As

we can notice in Table 5, all three variables that describe the target company are significant in industry M&As, while the intangible ratio is not significant in services M&As. This means that the intangible assets are important for the management in industry (sig. = 0.021, β = 0.108), because of the specialized work and the need for patents and R&D, but are less significant in services (sig. = 0.432, β = 0.041). The intangible resources can be bought, sold, stocked and readily traded – and can be, more or less, protected. Both size of the company, reflected in total assets, and category of the company remain significant and have a positive influence on the deal value.

Next, we will present a mediation model, based on a sample of 150 M&As, out of the previous 809 transations. The selection was based on the fact that the target companies reported R&D expenses in the annual reports for the year before the M&A took place.

Table- 6: Parameters estimation for the mediation model – path a)

Variables	**Values for path a)**	
	β	**t-values**
Intangibles/Total assets (IA)	0.009	0.119
Size of the company (SC)	-0.234**	-2.240
Category of the company (CTG)	-0.221**	-2.166
R^2	0.171	
Adjusted R^2	0.154	
F	F(3,146) = 10.041, p = 0.000	
Level of significance	**p < 0.05	

Source: Authors' own processing using SPSS 25.0

According to the information in Table 6, the intangibles ratio doesn't have a significant influence on the value of R&D expenses, which is expected, due to the fact that they are separate structures of the intangibles. On the other hand, the size and the category of the company have a negative significant influence on the R&D expenses, which means, in our sample, the small companies are involved in research and development and report this category of assets (sig. = 0.027, β = -0.234, respectively sig. = 0.032, β = -0.221).

Table- 7: Parameters estimation for the mediation model – path b) x c)

Variables	Values for path c)		Values for path b) x c)	
	β	**t-values**	**β**	**t-values**
Intangibles/Total assets (IA)	0.056	.674	0.054	0.661
Size of the company (SC)	0.113	1.018	0.149	1.334
Category of the company (CTG)	-0.004***	-2.890	-0.278**	-2.551
R&D expenses/Total assets (RD)			0.159*	1.787
R^2	0.064		0.084	
Adjusted R^2	0.045		0.059	
R^2 *change*	-		0.020	
F	F(3,146) = 3.342, p = 0.021		F(4,159) = 3.343, p = 0.012	
Level of significance	***p < 0.01		**p<0.05; *p < 0.10	

Source: Authors' own processing using SPSS 25.0

Although our models presented in Table 5 don't have very high values of R^2, the last model explains better the variance of the dependent variable than the previous one in the HLR. Moreover, the difference of R^2 between our presented models is statistically significant. Thus, we can say that the added variable in the last model (mediator variable) improves the prediction of the DV. We can say that the added variable explains an additional 2% from the variance of our DV (deal value/shareholders' funds). Even though the increase has a low value, it still has a positive effect in our R^2. Also, we can notice that the value of R&D expenses is significant in predicting the dependent variable (sig. = 0.076, β = 0.159). If we add to this the category of the company (sig. = 0.012, β = -0.278), we can affirm that the acquirers pay larger premiums for small companies with high vales of R&D ratios. If we want to ask the Why? question, one possible answer is the one related to the easiness in acquiring knowledge, instead of producing it. When two large firms are combining, usually they are doing it for market share. When a company purchases a small one, it is because the latter is involved in research, and the large one has cash slack, fact known in literature and practice as financial synergy.

5. CONCLUSIONS

The analysis of the determinants of the deal value paid in a M&A transaction is of a great importance, given the fact that the difference between this deal value and the net worth of the purchased company is, in Sirower (1997)'s opinion, the first manifestation of synergy. The results obtained after the data analysis at the level of the proposed samples lead to the validation of the research hypotheses.

In patents-based M&As, we considered intangibles of great importance in negotiating and establishing the deal value, and their value, reported by the target company in the financial statements, approved for year before the M&A, has a significant influence on the prive paid in transaction. The results showed that the size and the category of the target company also have a significant influence on the deal value. When controlling for the NACE main activity of the target company, in industry M&As the results are the same, while in services M&As the intangible ratio isn't significant in estimating the deal value paid in transaction. When considering only the M&As in which the target companies reported R&D expenses in their financial statements, we can draw two conclutions. First, the size and the category of the target company have a significant and negative influence on the deal value, which means that the acquirers paid higher premiums for small companies that reported research and development expenses in their balance sheet for the year prior to M&A. Second, when we consider the second sample, the 150 M&As, the intangible ratio isn't significant anymore and the category of the company has a negative significant influence on the deal value paid, which is consistent with the first sample. When adding the R&D expenses to the model, their influence is positive and significant, which means that the acquirers pay larger premiums for small companies with high values of R&D ratios.

One of the limits of the study is represented by the fact that, although the M&As were selected based on the fact they involved patents, no information was available on their number and value, so they could be considered an independent variable. Second, although the number of patent-driven M&As in Zephyr database is 809, many involved companies which don't have their information published in Orbis database.

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REFERENCES

1. Aevoae, George Marian, Roxana Manuela Dicu and Daniela Neonila Mardiros (2019), "The determinants of ownership in M&As: An analysis of the stake purchases in Romanian acquisitions", *Proceedings of the 14th International Conference Accounting and Management Information Systems (AMIS IAAER),* pp. 253-270.
2. Bettinazzi, Emanuele, Danny Miller, Mario Daniele Amore and Guido Corbetta (2019), "Ownership Similarity in M&A Target Selection", *Bocconi University Management & Technology Research Paper Series,* no. 14
3. Betz, Frederick (2003), Managing Technological Innovation: Competitive Advantage from Change, 3rd Edition, New York: Wiley-Interscience.
4. Bromiley, Philip and Devaki Rau (2016), "Operations management and the resource based view: Another view", *Journal of Operations Management*, Vol. 41, pp. 95–106.
5. Bruner, Robert F. (1988), "The Use of Excess Cash and Debt Capacity as a Motive for Merger", *Journal of Financial and Quantitative Analysis*, Vol. 23, No. 2, pp. 199-217.
6. Capron, Laurence and Nathalie Pistre (2002), "When do acquirers earn abnormal returns?", *Strategic Management Journal,* Vol. 23, No. 9, pp. 781-794.
7. Carcello, J.V., Hermanson, D.R. and Raghunandan, K. (2005), "Factors Associated with U.S. Public Companies' Investment in Internal Auditing", *Accounting Horizons*, Vol. 19, No. 2, pp. 69-84.
8. Carr, Kayleigh, Rachel L. Kendal and Emma G. Flynn (2016), "Eureka!: What Is Innovation, How Does It Develop, and Who Does It?", *Child Development*, Vol. 87, No. 5, pp. 1505-1519
9. Cassiman, Bruno and Reinhilde Veugelers (2006), "In Search of Complementarity in Innovation Strategy: Internal R&D and External Knowledge Acquisition", *Management Science*, Vol. 52, No. 1, pp. 68–82.
10. Chen, Jian-Liang (2012), "The synergistic effects of IT-enabled resources on organizational capabilities and firm performance", *Information & Management*, Vol. 49, No. 3-4, pp. 142-150
11. Chesbrough, Henry William (2003), Open Innovation: The New Imperative for Creating and Profiting from Technology, Boston: Harvard Business School Press.
12. Cloodt, Myriam, John Hagedoorn and Hans Van Kranenburg (2006), "Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries", *Research Policy*, Vol. 35, No. 5, pp. 642-654.
13. Cyret, Richard and Promod Kumar (1994), "Technology management and the future", *Transactions on Engineering Management*, Vol. 41, No. 4, pp. 333–334
14. De Man, Ard-Pieter and Geert Duysters (2005), "Collaboration and innovation: a review of the effects of mergers, acquisitions and alliances on innovation", *Technovation,* Vol. 25, No. 12, pp. 1377–1387.
15. Duan, Yang and Yong Jin (2019), "Financial constraints and synergy gains from mergers and acquisitions", *Journal of International Financial Management & Accounting*, Vol. 30, No. 1, pp. 60-82.

16. European Commission (2008), *NACE Rev.2. Statistical classification of economic activities in the European Community*, https://ec.europa.eu/eurostat/documents/–3859598/5902521/KS-RA-07-015-EN.PDF [Accessed 10.08.2019]
17. Filip, Andrei, Gerald J. Lobo, Luc Paugam and Hervé Stolowy (2018), *Disclosures about intangible resources in M&A press releases and quality of the deal*, https://pdfs.semanticscholar.org/462d/94250af84ef45dde06b23a8375acbf49–abb1.pdf [Accessed 20.08.2019]
18. Frazier, Patricia A., Andrew P. Tix and Kenneth E. Barron (2004), "Testing Moderator and Mediator Effects in Counseling Psychology Research", *Journal of Counseling Psychology*, Vol. 51, No. 1, pp. 115-134
19. Gomes, Emanuel, Duncan N. Angwin, Yakoov Weber and Shlomo Yedidia Tarba (2012), "Critical Success Factors through the Mergers and Acquisitions Process: Revealing Pre- and Post-M&A Connections for Improved Performance", *Thunderbird International Business Review*, Vol. 55, No. 1, pp. 13–35.
20. Grant, Robert M. (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17, No. S2, pp. 109–122.
21. Gupta, Oliver and Göran Roos (2001), "Mergers and acquisitions through an intellectual capital perspective", *Journal of Intellectual Capital*, Vol. 2, No. 3, pp. 297-309
22. Hagedoorn, John and Geert Duysters (2002), "External Sources of Innovative Capabilities: The Preferences for Strategic Alliances or Mergers and Acquisitions", *Journal of Management Studies*, Vol. 39, No. 2, pp. 167-188
23. Harrigan, Kathryn Rudie, Maria Chiara DiGuardo and Bo Cowgill (2017), "Multiplicative-innovation synergies: test in technological acquisitions", *Journal of Technological Transfer*, Vol. 42, No. 5, pp. 1212-1233
24. Harvey, Michael and Robert Lusch (1997), "Protecting the core competencies of a company: Intangible asset security", *European Management Journal*, Vol. 15, No. 4, pp. 370–380.
25. Heeley, Michael, David R. King and Jeffrey Covin (2006), "R&D investment level and environment as predictors of firm acquisition", *Journal of Management Studies*, Vol. 43, pp. 1513–1536.
26. Hitt, Michael A., Jeffrey S. Harrison and Duane R. Ireland (2001), Mergers and Acquisitions: A Guide to CreatingValue for Stakeholders, Oxford: Oxford University Press.
27. Hörisch, Jacob, Matthew P. Johnson and Stefan Schaltegger (2014), "Implementation of Sustainability Management and Company Size: A Knowledge-Based View", *Business Strategy and the Environment*, Vol. 24, No. 8, pp. 765–779.
28. Johannessen, Jon-Arild, Bjørn Olsen and G.T. Lumpkin (2001), "Innovation as newness: what is new, how new, and new to whom?", *European Journal of Innovation Management*, Vol. 4, No. 1, pp. 20-31.
29. Kadioglu, Eyup, Saim Kilic and Ender Aykut Yilmaz (2017), "Testing the Relationship between Free Cash Flow and Company Performance in Borsa Istanbul", *International Business Research*, Vol. 10, No. 5, pp.148-158.

30. Kang, Jun-Koo (1993), "The international market for corporate control: Mergers and acquisitions of U.S. firms by Japanese firms", *Journal of Financial Economics*, Vol. 34, No. 3, pp. 345-371.
31. King, David R., Jeffrey G. Covin and W. Harvey Hegarty (2003), "Complementary resources and the exploitation of technological innovations", *Journal of Management*, Vol. 29, No. 4, pp. 589–606.
32. King, David R., Rebecca J. Slotegraaf and Idalene Kesner (2008), "Performance Implications of Firm Resource Interactions in the Acquisition of R&D-Intensive Firms", *Organization Science*, Vol. 19, No. 2, pp. 327–340.
33. Kumar, Rajesh and Sarbjit Singh Oberoi (2019), "Cash Richness and Propensity to Acquire –An Empirical Examination Based on Largest Deals", *International Journal of Economics and Financial Issues*, Vol. 9, No. 4, pp. 74-79.
34. Loukianova, Anna, Egor Nikulin and Andrey Vedernikov (2017), "Valuing synergies in strategic mergers and acquisitions using the real options approach", *Investment Management and Financial Innovations*, Vol. 14, No. 1, pp. 236-247
35. Makri, Marianna, Michael A. Hitt and Peter J. Lane (2010), "Complementary technologies, knowledge relatedness, and invention outcomes in high technology mergers and acquisitions", *Strategic Management Journal*, Vol. 31, No. 6, pp. 602-628.
36. Malone, Christopher B. and Lawrence C. Rose (2006), "Intangible assets and firm diversification", *International Journal of Managerial Finance*, Vol. 2, No. 2, pp.136-153.
37. Mendenhall, De Mark E. (2005), Mergers and Acquisitions: Managing Culture and Human Resources, California: Stanford University Press.
38. Nonaka I. and Toyama R. (2015), "The Knowledge-creating Theory Revisited: Knowledge Creation as a Synthesizing Process", (in Edwards J.S.-eds, *The Essentials of Knowledge Management. OR Essentials Series*), London: Palgrave Macmillan, pp. 95-110.
39. O'Brien, Robert M. (2007), "A Caution Regarding Rules of Thumb for Variance Inflation Factors", *Quality & Quantity*, Vol. 41, No. 5, pp. 673-690.
40. Phillips, Gordon M. and Alexei Zhdanov (2013), "R&D and the incentives from Merger and Acquisition Activity", *The Review of Financial Studies*, Vol. 26, No. 1, pp. 34-78.
41. Puranam, Phanish, Harbir Singh and Maurizio Zollo (2003), "A Bird in the Hand or Two in the Bush?: Integration Trade-offs in Technology-grafting Acquisitions", *European Management Journal*, Vol. 21, Issue 2, pp. 179-184.
42. Ranft, Annette L. and Michael D. Lord (2002), "Acquiring New Technologies and Capabilities: A Grounded Model of Acquisition Implementation", *Organization Science*, Vol. 13, No. 4, pp. 420–441.
43. Rigby, Darrell and Chris Zook (2002), "Open-market innovation", *Harvard Business Review*, Vol. 80, No. 10, pp. 80-89
44. Robu, Ioan Bogdan and Costel Istrate (2015), "Exploratory Study Regarding the Impact of IFRS on the Audit Opinion in the Case of Romanian Listed Companies", *Audit Financiar*, Vol. 13, No. 7, pp. 3-15

45. Rozen-Bakher, Ziva (2018a), "Comparison of merger and acquisition (M&A) success in horizontal, vertical and conglomerate M&As: industry sector vs. services sector", *The Service Industries Journal*, Vol. 38, No. 7-8, pp. 492-518.
46. Rozen-Bakher, Ziva (2018b), "Labour productivity in M&As: industry sector vs. services sector", *The Service Industries Journal*, Vol. 38, No. 15-16, pp. 1043-1066.
47. Sears, Joshua and Glenn Hoetker (2013), "Technological overlap, technological capabilities, and resource recombination in technological acquisitions", *Strategic Management Journal*, Vol. 35, No. 1, pp. 48–67.
48. Uhlenbruck, Klaus, Michael A. Hitt and Mathew Semadeni (2006), "Market value effects of acquisitions involving Internet firms: A resource-based analysis", *Strategic Management Journal*, Vol. 27, pp. 899–913.
49. Weber, John A. and Utpal Dholakia (2000), "Including Marketing Synergy in Acquisition Analysis", *Industrial Marketing Management*, Vol. 29, No. 2, pp. 157–177.
50. Wiklund, Johan and Dean Shepherd (2003), "Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses", *Strategic Management Journal*, Vol. 24, pp. 1307–1314.
51. Wood, Robert E., Jodi S. Goodman, Nadin Beckmann and Alison Cook (2007), "Mediation Testing in Management Research: A Review and Proposals", *Organizational Research Methods*, Vol. 11, No. 2, pp. 270–295.
52. Wu, Amery D. and Bruno D. Zumbo (2008), "Understanding and Using Mediators and Moderators", *Social Indicators Research*, Vol. 87, No. 3, pp. 367-392.

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EVALUATING THE PERFORMANCE OF ALTERNATIVE BLENDED LEARNING DESIGNS USING DEA

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Abstract: *The extensive demand for blended learning programs imposes the problem of selecting the most appropriate instructional design from amongst a variety of alternatives that may be feasible for a particular program. The decision-making process should consider a number of qualitative factors such as the satisfaction of learning needs, educational efficiency, ease of implementation and total financial cost. In this paper, we propose that Bates' (1995) e-learning instructional design model ACTIONS, which describes seven qualitative dimensions pertinent to selecting a design, can be used in conjunction with Data Envelopment Analysis to provide a distinct decision-making framework to aid administrators in determining which blended learning programs are the most effective. The first stage in the analysis is to explain which ACTIONS dimensions can be regarded as inputs and which can be treated as outputs for the sake of the decision process, with all seven dimensions being measurable by ordinal scores assessing the expected performance of alternative designs. In the second stage of analysis, we use Data Envelopment Analysis with ordinal data to obtain an overall expected performance index that is able to discriminate the designs most efficient and most suitable for implementation. The methodology is illustrated by an example. Discussion and Conclusions follow.*

Keywords: *e-Learning, Blended Learning, Instructional Design, ACTIONS, Data Envelopment Analysis, Ordinal Data*

JEL Classification: *A29, C61, C67, D24, I22, O39*

1. INTRODUCTION

Over the last few years, progress in information and communication technologies has created exciting new educational options for learning in business and

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academia. Insofar as these options involve computers, other new technologies, and the Internet they are generally termed "e-learning" or "online learning." Benefits of e-learning are continuous learning, educational efficiency due to the use of attractive technological means, time savings and reduced costs both for students/learners and institutions (Munro and Munro 2004; Ioakimidis, Smirlis, Hassid 2011).

Insofar as e-learning modes are combined with traditional face-to-face or classroom learning, the term "blended learning" can be applied (Bentley, Selassie, & Parkin 2012). Blended learning has been considered to constitute a new paradigm for education (Chen & Yao, 2016) and has been proposed as the most attractive and effective approach for learning (Gunter 2001). A recent meta-analysis of research on the effectiveness of e-learning and blended learning in comparison to face-to-face instruction suggests that overall, students in blended learning programs have better outcomes than those who learn solely in face-to-face settings (Means, Toyama, Murphy, Bakia, & Jones, 2010). Moreover, studies suggest that higher education students prefer blended learning to solely online learning **(**Precel, Eshet-Alkalai**,** & Alberton, 2009).

For a proposed particular blended learning program, deciding the proportion of face-to-face to e-learning and how the two modes are to be integrated is a complicated process. A blended design could range from the simple use of e-mail discussion lists in traditional classroom lectures to substantial use of video conferencing and web-based self-studying. For colleges and universities, which are often resistant to innovation, the task of deciding on and implementing blended learning programs can be particularly demanding (Garrison & Vaughn 2013). The challenges are many, including developing a substantial, appropriate, and reliable infrastructure, timely evaluation of program success and assuring that program goals of the institution are aligned with those of faculty and students (Moskal, Dziuban, & Hartman, 2013).

To determine successful blended learning for a particular program requires much effort at the planning phase, which is a discrete step of blended learning program development that requires determining the goals and objectives of the program; estimating costs for technology, personnel and infrastructure; and developing an action plan to operationalize the overall plan (Garrison and Kanuka 2004). Decisions should be made about the mixture of different types of instructional methodology and technologies to be used for each learning objective, while taking into consideration important issues such as student backgrounds, effectiveness of different technologies, budget limitations, availability of instructors and technical infrastructure. As a result, a number of instructionally attractive alternative designs

may arise, making the task of choosing the most efficient design of a blended learning program extremely complex. The challenge for instructional designers is to analyze how well available designs fulfill the objectives and goals of the program to achieve the maximum overall educational efficiency.

In this paper we present a methodology for evaluating alternative designs for blended learning that arise when the different educational, technological and implementation factors are considered. We propose that Bates' (1995) model ACTIONS can be used to describe the qualitative dimensions of a blended learning program, which can then be assessed by applying ordinal rankings for the characteristics of each different design. Initially, the model ACTIONS was proposed by Bates as an organizing principle for selecting technologies in distance education. We view application of ordinal rankings in the ACTIONS model dimensions as composing a data set suitable for Data Envelopment Analysis (Charnes et al. 1994), which can provide an overall performance score that aggregates the expected educational effectiveness, technological innovation, implementation and cost of a program. This score can be used to classify alternative designs into two distinct classes: the efficient and the non-efficient. Non-efficient designs can then be rejected and the efficient ones further considered as for possible implementation.

The structure of this paper is as follows. In section 2 we present the model ACTIONS used for the assessing of different instructional designs. In Section 3 we present the Data Envelopment Analysis model using ordinal data to evaluate the most efficient cases, and in Section 4 we illustrate the proposed methodology by providing more explanations and an arithmetic example. Discussion of the methodology and conclusions follow in Sections 5 and 6.

2. THE 'ACTIONS' MODEL FOR EVALUATING DISTANCE LEARNING DESIGNS

Current research indicates that the quality and overall performance of distance learning programs is difficult to monitor, assess and evaluate due to the lack of standards and qualitative issues such as satisfaction of particular learners' needs, effectiveness of the technologies and the media, level of organizational services provided and efforts required of the organization to implement and support the program. A number of different approaches and models have been proposed towards defining evaluation criteria in order to formally describe and compare instructional designs, particularly those that use e-learning technologies

(Thompson and Irele, 2003, Ioakimidis, 2018). These varying suggestions can be viewed as applying to blended learning programs as well.

An early and influential instructional design model was the ADDIE model, developed at Florida State University for instructional systems development (ISD) program for U.S. military interservice training (Branson, Rayner, Cox, Furman, King, & Hannum, 1975). The ADDIE model specified five stages of educational program development. As applied to blended learning, these five stages would be to analyze program objectives, design instructional components, develop the designs into an organized whole, implement the program, and evaluate the results. A brief sample of other suggestions that can be applied to blended learning includes Begičević and Divjak's (2006) view that decision making for implementing e-learning in higher education involves four phases: intelligence (identifying the central decision problem), design (establishing criteria and developing design alternatives), choice (evaluating alternatives) and implementation. They considered key factors to be availability and development of human resources; basic and specific technology infrastructure; and strategic, formal and legal readiness for e-learning implementation. Huddleston and Pike (2008) offered seven key decision criteria to take into account in choosing whether to initiate an e-learning program: determine the learning task, media attributes, instructional attributes, the learning context, learner characteristics, organizational and cultural context, and costs. Lambert and Williams (1999) developed a three-step model for selecting educational technologies, consisting of determining elements of the learning process, the technologies available to enhance the learning process, and the logistical constraints on choosing a technology.

One of the most influential decision models for selecting e-technology, and one that can also be applied to blended learning decisions, is Bates' (1995) ACTIONS model for validation and development of open and distance learning programs. (Ioakimidis, 2017). This model focuses on dimensions that are critical for determining learning objectives, instructional technologies, media, implementation and cost. The name ACTIONS is an acronym that stands for seven distinct factors that affect the design and implementation of distance learning. These are: Access, Cost, Teaching and Learning Implications, Interactivity and User-friendliness, Organizational Issues, and Novelty and Speed.

We propose that the ACTIONS model can be used as a benchmarking framework to analyze the expected performance of different designs of a blended learning program at the planning stage, prior to implementation. According to our viewpoint, the factors of the ACTIONS model define a set of benchmarking criteria for the evaluation of different design versions that could be possibly

implemented. This approach consists of a rather formal and systematic framework to describe alternative instructional designs and thereby to enable a prediction of their overall performance. Moreover, it allows applying quantitative benchmarking techniques to distinguish the most attractive and effective designs. Under this perspective, and largely following Bates' (1995) explanations, the seven factors of the ACTIONS model can be viewed as follows:

1) ***Access*** is the extent to which the proposed design is accessible by the target group of the program and how flexible it is for that group.
2) ***Cost*** is for the educational institution's expenses for implementing the particular design.
3) ***Teaching and learning implications*** describe the level of expected satisfaction of learning needs, depending on the technology and structure of the program.
4) ***Interactivity and user-friendliness*** refers to how interactive and friendly the design is for the users.
5) ***Organizational issues*** are the organizational requirements and difficulties involved in program implementation, considering infrastructure, personnel and other resources
6) provided.
7) ***Novelty*** is how the program contributes to the renewal of the institution and how new is the proposed technology.
8) ***Speed*** is how quickly the program can be mounted and materials be developed and changed.

The factors in the ACTIONS model are all of a qualitative nature except Cost, which can be estimated as a crisp real value. However, considering all of the possible variations of the actual total cost when a distance learning program is finally implemented, a more perspicuous approach at the planning stage is to define the estimated level of cost of a particular design as being at one of several levels, thereby regarding it as a qualitative variable. Indeed, it is clear that all of the seven factors of the ACTIONS model can be measured on a typical ordinal scale of, say, 3, 4 or 5 ranks. By using ordinal measurements, the estimation of an overall expected performance index for each of the seven factors can be simplified.

Notice also, in preparation for the next section, that three of the ACTIONS factors can be regarded as inputs into the decision process, while four can be regarded as outputs. In particular, the factors of Cost, Organizational issues, and

Speed can be regarded as inputs since they are non-educational variables that limit which instructional designs can be considered. In contrast, Access, Teaching and learning implications, Interactivity and user-friendliness and Novelty are all factors that refer to the educational and institutional outcomes of a design and thus can be considered outputs of the decision process.

In what follows, the relevance of the difference between what are considered inputs and outputs of the ACTIONS model will become clear. First, in the next section, we provide the description of an aggregation technique call Data Envelopment Analysis (DEA). We will then explain how DEA can be used to estimate the overall performance index which characterizes in one value the quality and effectiveness of a blended learning program design and can thereby be used as a decision-making tool for selecting the most appropriate designs for implementation.

3. DATA ENVELOPMENT ANALYSIS WITH ORDINAL DATA

Data Envelopment Analysis (DEA) (Charnes et al. 1994) is a linear programming-based technique for measuring the relative efficiency (benchmarking) of homogeneous organizational units that consume incommensurable multiple inputs and produce multiple outputs. The efficiency of the units is measured by the ratio 'weighted output' to 'weighted input,' which for a particular unit is to be maximized. The inputs and outputs are variables measured with real positive numbers. The term 'organizational units' does not strictly refer to administrative units such as departments, branches, divisions and retail shops, but is extended to include entities in general.

In DEA, each unit is left free to estimate its relative efficiency score in its most favorable way, in order to attempt to reach the maximum possible score, which is set commonly for all of the units. Each unit defines its own significance of inputs and outputs by assigning proper values to the weights. In such an arrangement, efficient units are those that have achieved, relative to the rest, the maximum efficient score. Due to the definition of efficiency (ratio output/input), the efficient units appear to have greater total output relative to their total input. The so assessed efficiency scores can discriminate the units into two different sets: the efficient units, i.e. those units which achieved to reach the maximum bound of the efficiency score; and the inefficient units, the units which, even in their most favorable combination of the weights for input and output, did not manage to reach the maximum efficiency bound.

The original definition of DEA assumes real positive values for the multiple inputs and outputs. Furthermore, the use of imprecise data, i.e. data of interval and ordinal type, has been extensively studied in many research efforts (Cook and

Kress 1991; Cook, Kress and Seiford 1996; Cooper, Park, and Yu 1999; Despotis and Smirlis 2002), and a number of different approaches and models have been proposed. A special case of this DEA extension occurs when all inputs and outputs are measured in ordinal scale, describing pure qualitative characteristics of the units. In many applications, the well-known 5-rank Likert scale is used, with the rank 1 to denote the best, "excellent", performance, the rank 5 stands for the worst, "poor", performance and the in between ranks intermediate levels of performance. Note that the ordinal scale is defined to reflect the increasing utility for outputs and the decreasing utility for inputs (excellent rank means better performance in outputs and less resource consumption for inputs). The mathematical description of the DEA model in the case of pure ordinal inputs and outputs is as follows.

Let a set of n alternatives be compared along s inputs and m outputs all of ordinal type. Without losing the generality (see Cook and Kress 1991), we assume the ordinal scale is common to all inputs and outputs and includes K distinct ranks. For each alternative j, $j=1,..,n$, we define $x_{ij}(k)$ to be a real value corresponding to the ordinal score of the rank k for the input characteristic i of the alternative j. Accordingly, let $y_{rj}(k)$ be the equivalent real value of the rank k of the output characteristic r of the alternative j. For a particular alternative j_0, the DEA mathematical model in the case of ordinal data is the following:

$$\max h_0 = \frac{\sum_{r=1}^{m} y_{rj_0}(k)}{\sum_{i=1}^{s} x_{ij_0}(k)},$$

$$\begin{aligned}
&s.t.\\
&h_j \le 1,\ \forall j = 1,..,n\\
&x_{ij}(k) - x_{ij}(k-1) \le d,\ k = 2,..,K \qquad (1)\\
&y_{rj}(k) - y_{rj}(k-1) \le d,\ k = 2,..,K\\
&x_{ij}(K), y_{rj}(K) \ge \varepsilon, \forall j, r, i, k
\end{aligned}$$

Model (1) maximizes the efficiency score h_{j_0} by estimating real values for the variables $x_{ij}(k), y_{rj}(k)$. Every unit defines its own scale by assigning corresponding real values to each ordinal rank k in its most favorable way so to maximize its own

efficiency score. The constraint $h_j \le 1,\ \forall j = 1,..,n$ sets the maximum upper bound for the efficiency value equal to 1 and ensures that all alternatives are compared in fair basis. The constraints $x_{ij}(k) - x_{ij}(k-1) \le d,\ k = 2,..,K$ and $y_{rj}(k) - y_{rj}(k-1) \le d,\ k = 2,..,K$ are set to implement the ordinal relations $x_{ij}(1) \ge x_{ij}(2) \ge ... \ge x_{ij}(K)$ and $y_{rj}(1) \ge y_{rj}(2) \ge ... \ge y_{rj}(K)$ for inputs and outputs, respectively. The parameter d is to discriminate every two consecutive ranks $k-1$ and k. The constraint $x_{ij}(K), y_{rj}(K) \ge \varepsilon, \forall j, r, i, k$ sets the positive lower bound ε for the less important rank. The parameters ε and d are constants and take positive values of a magnitude appropriate to make the linear model feasible and to better discriminate the consecutive ordinal ranks (see Ali and Seiford 1993). Model (1), due to the ratio h_{j_0}, is not linear, but it can be reformulated as a linear model as follows:

$$
\begin{aligned}
&\max h_0 = \sum_{r=1}^{m} y_{rj_0}(k), \\
&s.t. \\
&\sum_{i=1}^{s} x_{ij_0}(k) = 1 \\
&h_j \le 1,\ \forall j = 1,..,n \\
&x_{ij}(k) - x_{ij}(k-1) \ge d,\ k = 1,..,K \\
&y_{rj}(k) - y_{rj}(k-1) \ge d,\ k = 1,..,K \\
&x_{ij}(K), y_{rj}(K) \ge \varepsilon, \forall j, r, i, k
\end{aligned}
\qquad (2)
$$

Model (2) is solved n times, one for each alternative j, $j = 1,..,n$. Those alternatives that have achieved the maximum efficiency score, i.e. $h_{j_0} = 1$, are those that have better overall performance (greater output relative to input). The rest, those that achieve $h_{j_0} < 1$, are definitely not efficient, although they have been given the opportunity to define the ordinal ranks in their most favorable way.

4. DEA FOR THE BENCHMARKING OF ALTERNATIVE INSTRUCTIONAL DESIGNS

Model (2), presented in the previous section, can be used to discriminate alternative proposed designs for a blended learning program in terms of their efficiency. In this case, the efficiency is defined as the overall expected performance of a particular instructional design, expressing in a single score how useful, effective, innovative, easy to implement and low in cost a design is expected to be. As explained previously, the dimensions of the instructional designs described in the ACTIONS evaluation framework can be characterized as inputs and outputs, according to their expected utility. Thus, Cost, Speed and Organizational requirements are set as inputs. On a scale ranging from, say, 1 to 5, these factors can be given lower values to show better performance for that factor in a particular blended learning design. The other four factors, Access, Teaching and learning implications, Interactivity and user friendliness and Novelty are set as outputs, with higher values on the 1-5 scale indicating better performance. The resulting DEA model for the overall performance evaluation consists of 3 inputs and 4 outputs. The required data with the ordinal ranks for each characteristic and each alternative can be provided by instructional designers or field experts.

To illustrate the above-presented DEA model for assessing the overall performance of alternative instructional designs for blended learning, we provide the following arithmetic example. For an e-learning program of a post-graduate university course, 10 alternative designs could be possible for implementation. Each design has been graded in the seven dimensions of the ACTIONS model with a rank ranging between 1=Excellent and 5=Poor for inputs and, for outputs, the scoring is reversed, with 1 = Poor and 5 = excellent. Table 1 presents the so-formed data set. From a simple review of Table 1, it is obvious that some designs dominate others in the sense that they have better scores in all of the criteria. For example, #1 dominates #5 and #18 dominates #17. For these cases, the superiority is straightforward. In some other cases, a design may have a greater score in one criterion but lower in others. This is the case for #8 and #9. In such cases, the comparison is questionable.

Table 1: The ordinal data set and the overall performance score

	Input			Output				
	COST	SPEED	ORGANIZATIONAL	ACCESS	TEACHING	INTER-ACTION	NOVELTY	Overall Performance
#1	3	2	1	2	3	2	1	1
#2	3	2	2	4	4	2	2	0,95
#3	1	3	5	4	2	2	3	1
#4	4	1	2	3	1	1	4	1
#5	5	2	3	2	4	2	4	0,92
#6	3	4	3	3	5	3	3	0,9
#7	2	4	5	4	5	4	4	0,92
#8	4	4	3	1	3	5	2	1
#9	4	5	2	2	3	3	4	0,91
#10	4	3	4	3	2	2	4	0,94
#11	3	2	4	5	3	2	5	0,9
#12	3	5	4	4	4	4	5	0,85
#13	5	3	3	4	5	3	2	0,89
#14	3	4	5	3	3	2	5	0,89
#15	4	5	1	2	2	3	2	1
#16	5	2	2	3	1	2	3	1
#17	5	4	3	4	2	4	3	0,93
#18	3	4	3	4	2	5	5	1
#19	2	3	5	5	3	4	3	0,95
#20	1	1	5	3	4	4	5	1
#21	2	3	4	4	3	3	4	1
#22	3	5	4	4	5	2	2	0,89
#23	4	4	4	2	5	3	3	0,89
#24	5	5	2	2	3	2	1	0,94

The last column of Table 1, which shows the overall performance score, derives from the application of the DEA model (2) to this data set. The last column of Table 1 shows that designs #1, #3, #4, #8, #15, #16, #18, #20 and #21 have achieved the maximum overall performance score of 1; hence, these are the most suitable for implementation. The rest of the designs, with overall performance scores less than 1, are relatively inefficient.

5. DISCUSSION

The value of our decision framework based on Bates' (1995) ACTIONS model is that it adds clarity to the complex task an institution may face when attempting to select the most suitable blended learning program out of a range of possibilities. Clarity is added not only by identifying several factors, including educational factors that must be considered in choosing amongst alternatives, but also by dividing the seven ACTIONS factors into inputs and outputs. For each program alternative, the inputs are the alternative's estimated financial cost, the organizational changes and difficulties it implies and the time required to implement the alternative. The four outputs include three strictly educational outcomes that the alternative can be expected to result in: Access is a measure of how well the program alternative is accessible to the identified learners and how flexible it is. The teaching and learning implications factor measures how well the alternative fulfills the learning needs of the target population. Interactivity and user-friendliness measures the alternative's usability and how well it enables communication amongst learners and between learners and instructors. In addition to these three educational outcomes, a fourth output of the framework is Novelty, which measures not only the newness of the alternative's technology, but perhaps more importantly, how well the provides benefits to the institution itself.

The choice of a scale to yield a qualitative measure of each of the factors depends on how fine a measurement is desired. A scale of 1 to 3 for an input factor might be defined as indicating evaluations ranging from good to satisfactory to poor, while indicating the reverse for an output factor. A scale of 1 to 5 might indicate excellent, good, fair, satisfactory, and poor for inputs and the reverse for outputs. Whether a coarser or finer scale is used may depend on how fine users feel they can distinguish alternatives in regard to the various factors.

Clearly, substantial effort must go into determining what can be expected from various alternative blended learning programs for each factor. However, once that work is done, use of the combined ACTIONS and DEA decision method may help bring clarity to the issue of how to compare the findings for each factor in order to select the most efficient alternative.

6. CONCLUSION

In this paper, we addressed the problem of selecting the most appropriate blended learning designs out of several alternatives and proposed a methodology based on the model ACTIONS and Data Envelopment Analysis. The methodology yields an overall performance index for each design which can be useful to designers and decision makers on the part of the institution to discriminate the most efficient designs among the alternatives, i.e. those that can be further considered for implementation.

REFERENCES

1. Bates A. W. (1995), *Technology, open learning and distance education*. London Routledge.
2. Begičević, N., & Divjak, B. (2006). Validation of theoretical model for decision making about e-learning implementation. *Journal of Information and Organizational Sciences, 30*(2), 171-184.
3. Bentley, Y., Selassie, H., & Parkin, E. (2012). Evaluation of a global blended learning MBA programme. *The International Journal of Management Education, 10*(2012) 75–87.
4. Branson, R. K., Rayner, G. T., Cox, J. L., Furman, J. P., King, F. J., & Hannum, W. H. (1975). *Interservice procedures for instructional systems development: Executive summary and model.* Florida State University, Center for Educational Technology. Retrieved from http://www.dtic.mil/dtic/tr/fulltext/u2/a019486.pdf
5. Charnes, A., Cooper, W.W., Lewin, A.Y., and Seiford, L. M., (1994), "Data Envelopment Analysis: Theory, Methodology and Applications", *Kluwer Academic Publishers*, Norwell, MA, 1994.
6. Chen, W. S., & Yao, A. Y. T. (2016). An empirical evaluation of critical factors influencing learner satisfaction in blended learning: A pilot study. *Universal Journal of Educational Research 4*(7): 1667-1671. DOI: 10.13189/ujer.–2016.040719
7. Cook W., Kress M., and Seiford L., (1996), "Data envelopment analysis in the presence of both quantitative and qualitative factors", *J.Opl. Res. Soc.* 47, 945-953
8. Cook, W. D. and Kress, M., (1991), "A multiple criteria decision model with ordinal preference data", *European Journal of Operational Research* 54 191-198.
9. Cooper, W. W., Park, K. S, and Yu, G., (1999), "IDEA and AR-IDEA: Models for dealing with imprecise data in DEA", *Management Science* 45 597-607.
10. Despotis D., and Smirlis Y., (2002), "Data Envelopment with Imprecise Data" *European Journal of Operational Research* 140: 24-36
11. Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *Internet and Higher Education, 7* (2004) 95 – 105. doi:10.1016/j.iheduc.2004.02.001
12. Garrison, D. R., & Vaughan, N. D. (2013). Institutional change and leadership associated with blended learning innovation: Two case studies. *Internet and Higher Education 18*(2013) 24–28. doi: 10.1016/j.iheduc.2012.09.001
13. Gunter, G. A. (2001). "Making a difference: Using emerging technologies and teaching strategies to restructure an undergraduate technology course for pre-service teachers". *Educational Media International*, 38(1), 13–20
14. Huddlestone, J., & Pike, J. (2008). Seven key decision factors for selecting e-learning. *Cognition, Technology & Work 10*(3): 237–247. doi 10.1007/s10111-007-0102-z
15. Ioakimidis M. (2017) "Funding e-Learning: A Review of Past Studies". *European Journal of Open Education and E-learning Studies*, Vol.2, Issue 2, pp. 1-10.
16. Ioakimidis M. (2018) "Knowledge Management: Determining the Level of Blended e-Learning Using a Cost Optimization Model" *Empirical Economics Letters* Vol. 17, No 8, pp. 969-980.

17. Ioakimidis M., Smirlis Y., Hassid J. (2011), "Analysing costs of educational services for universities and e-universities: A further analysis on the student point of view", in Jórgen Backhaus, Raul Eamets, Diana Eerma (Eds.) Economics of Education: Issues of Transition and Transformation
18. Lambert, S., & Williams, R. (1999). A model for selecting educational technologies to improve student learning. HERDSA Annual International Conference, Melbourne, Australia, 12-15 July. Available online from: https://moo27pilot.eduhk.hk/pluginfile.php/415124/mod_resource/content/3/Lambert%2C%20Williams%20-%201999%20-%20A%20Model%20for%20Selecting%20Educational%20Technologies%20to%20Improve%20Student%20Learning.pdf
19. Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. DC: Washington: U.S. Department of Education Available online from: http://www2.ed. gov/rschstat/eval/tech/evidence-based-practices/final–report.pdf
20. Moskal, P., Dziuban C., & Hartman, J. (2013). Blended learning: A dangerous idea? *Internet and Higher Education, 18*(2013) 15–23 doi: 10.1016/j.iheduc.2012.12.001
21. Munro R., and Munro E., (2004). "Learning styles, teaching approaches & technology", *The Journal for Quality & Participation,* Vol. 27 No. 1, Spring pp.26
22. Precel, K., Eshet-Alkalai, Y., Alberton, Y. (2009). Pedagogical and design aspects of a blended learning course. *The International Review of Research in Open and Distributed Learning, 10*(2), Retrieved from http://www.irrodl.org/index.php–/irrodl/article/view/618/1221
23. Thompson M., and Irele M.,(2003). *Evaluating Distance Education Programs*, Handbook of Distance Education, Chapter 38, Lawrence Erlbaum Associates, Inc., ISBN 0-8058-3924-0

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FREQUENCY DOMAIN CAUSALITY RELATIONSHIP ANALYSIS BETWEEN POVERTY, ECONOMIC GROWTH AND FINANCIAL DEVELOPMENT IN ALGERIA

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Abstract: *Since the previous periods, poverty reduction has been a big concern for many countries especially in developing countries like Algeria; in this paper, we shall explore the causal relationship between poverty reduction, economic growth and financial development in Algeria during the period of 1970-2017, the aim of this research is to answer the question which sector causes the poverty reduction: real sector or financial sector? Therefore, we employed the modern frequency domain causality presented by Breitung and Candelon (2006) with a comparison with the time domain causality under Lutkepohl (2006) procedure, the results suggest that there is unidirectional causality running from the real sector (economic growth) to poverty rates in the short and long run terms, also, we found that there is an unidirectional causality running from the financial sector to poverty rates only in the long run term, while another causality running from poverty rates to the financial sector but in the short run term. This article aims at contributing to enlarge the literature review by utilizing the frequency domain causality in the field of poverty studies because of its effectiveness to test the causalities in different frequencies.*

Keywords: *Poverty reduction, Economic growth, Financial development, Time domain causality, Frequency domain causality.*

JEL Classification: *C20, G40, P46*

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1. INTRODUCTION

In Algeria like all developing countries, is striving hard to reduce poverty rates and to improve the living conditions of the lower classes of society, in this case and according to the theory, historically, and since the Global Report of Human Development (GRHD 1990, nothing was worked better that economic growth in enabling societies to improve the living conditions at the very bottom members (Ayad, 2018), where the flexibility of poverty rates to any change in the economic growth estimated is generally between -1.00 and -3.00 (Ravaillon and Chen, 1997 (-2.60); Bruno et.al, 1998 (-2.12); Collier and Dollar, 2001 (-2.00); Bourguignon, 2003 (-1.65); UNDP, 2003 (-2.00); Addams, 2004 (-1.73); World Bank, 2005 (-1.70); Ram, 2006 (-1.00); Kalwij and Verschoor, 2007 (-1.31); Tahir et.al, 2014 (-1.90); Minh Son Le et.al, 2014 (-0.95) and Ayad, 2016; (-1.43)), Nowizad and Powel (2003) and many others declared that economic growth promotes human development and this later is the biggest goal of all economics activities.

In the same stream, there is another factor that may affect the poverty rate and economic growth, Rewilak (2017) shows that the financial sector development was one of the key strategies that allowed the achievement of the millennium development goals (MDDs) in 2015 (MDG1: Halve, between 1990 and 2015, the proportion of people whose income less than 1 Dollar a day, MDG4: reduce by two thirds, between 1990 and 2015, the under-five mortality rate, …), Cihak et.al (2013) showed that after the Great Depression (2008) the financial development divided into four components that allow us to measure the characteristics of the financial sector, the first component is the size of financial sector; the second is the accessibility of it which shows us the degree of using the financial services by individuals and firms, the third component is the efficiency of the financial sector to reduce costs in the financial system, and the fourth one is the stability of financial institutions and markets, and this four categories reflect the financial development on poverty rates, this link between financial development and poverty reduction has not been widely explored over the past decades, where we could distinguish between two different ways of the financial development impact on poverty rates, the first is when the financial development affects directly the poverty rates (Kpodar, 2004; Odhiambo, 2009; Akhter et. al, 2010), such as the microfinance (micro-enterprises) which allows to poor people to diversify their sources by the self-employment, also by improving credit facilities and deposits for the very bottom members of society, the second way is when the financial development affects poverty indirectly by increase the economic growth (Schumpeter, 1912; Keynes, 1930; Mckinnon, 1973; Shax, 1973; Levine, 2005), to

this end this paper tries to answer the questions which sector leads in the process of poverty reduction in Algeria, the financial sector or the real sector? And is the impact of financial development on poverty rates has a direct or indirect effect?

The present study examines the impact of both financial development and economic growth on poverty rates to answer the two questions above, in doing so, the paper uses yearly data poverty rates, financial development, economic growth, trade openness, unemployment, school enrollment and rural population in Algeria over the period between 1970 and 2017, using various econometric tests for unit root test as NG-Perron (2001); Zivot-Andrews (1992) and Clemente-Montanes-Reyes (1998), then the co-integration test with regime shift presented by Gregory and Hansen (1996) and finally the modern test for causality proposed by Breitung and Candelon (2006) in frequency domain with a comparison with the causalities in time domain with TYDL causality.

This paper is organized as follows, section one is for the introduction where the problematic was raised and the objectives were clarified, section two throws light at the relevant literature, section three describes the data set and explains the econometric tests, section four presents the empirical results and section five concludes the paper with policy recommendations.

2. LITERATURE REVIEW

Over the last six decades, the studies that care out of the impact of economic growth and poverty rates have been very widespread especially in the developing countries which are still suffering from the manifestations of poverty, Ravaillon and Chen (1996) showed that the elasticity of poverty to economic growth is always negative for all the poverty lines, Dollar and Kraay (2000) declared that any increase in the average level of income in a country contributes to benefit indirectly to its weakest members, Bourguignon (2003); Ravaillon (1997), Epaulard (2003); World Bank (2006b); Kalwij and Verschoor (2007) and Fosu (2009) all this studies proved that inequality influences the growth's transformation to poverty reduction as explained before by Adams (2001) when he considered that inequality as the impediment to pro-poor growth, however, Ali and Thorbecke (2000) find that poverty rates are more sensitive to income inequality that it's to the level of income, by passing to the financial development and its effect on poverty reduction, it is necessary to speak about Bagehot (1873); Schumpeter (1991); Goldsmith (1969); Mckinnon (1973) and Shaw (1973) underlined the financial development has been considered as an important tool to improve economic growth and poverty reduction, moreover, some studies define that there are three different ways promote financial

sector to improve the living conditions of the poor people, Jalilian and Kirkpartick (2001) and Stiglitz (1998) suggested that financial development can improve the opportunities for the poor people to access formal finance by addressing the causes of financial market failures; Gazi et al. (2014), declared that financial sector enables the poor people to draw accumulated savings or to borrow money to start micro-enterprises, finally, while Mellor (1999); Dollar and Kraay (2002) and Fan et al. (2000) said that financial development can trickle down the poor people by influencing the economic growth which allows to reduce poverty rates.

Table-1. Some studies about the impact of economic growth on poverty rates

Study	***Growth elasticity of poverty***	***Sample coverage and period***
Ravaillon and Chen (1997)	-3.12	Cross countries, 1981-1994
Bruno, et al. (1998)	-2.12	Cross countries, 1980s
McCulloch and Baulch (2000)	-2.00	India
Ravaillon (2001)	-2.50	Cross countries, 1990s
World Bank (2001)	-2.00	Cross countries
Collier and Dollar (2001)	-2.00	Cross countries
Bourguignon (2003)	-1.65 to -7.87	Cross countries
Adams (2004)	-1.73 to 5.02	Cross countries
Ram (2006)	-1.00	Cross countries
Kalwij and Verschoor (2007)	-1.31	The mid 1990s
Lenagala and Ram (2010)	-1.42	Cross countries, 1981-2005
Ram (2011)	-0.84	Cross countries, the 1990s and 200s
Tahir et al. (2014)	-1.9	Pakistan, 1982-2005
Minh Son Le et al. (2014)	-0.95 to -0.83	Vietnam, the 1990s and 200s
Ayad (2016)	-0.13	Algeria

Source: Authors' own research.

Table-2. Some studies about the impact of financial development on poverty rates

Study	***Sample coverage and period***	***The results***
Honohan (2004)	China, Korea, Russia and United Kingdom; 1960-2000	Financial development affect poverty rates
Kappel (2010)	78 developing and developed countries; 1960-2006	Financial development affect poverty rates
Akhter and Liu (2010)	54 developing countries; 1993-2004	Financial development affect poverty rates
Jeanneney and Kpodar (2011)	75 developing and developed countries; 1966-2000	Financial development affect poverty rates
Gazi et al. (2014)	Bangladesh; 1975-2011	Financial development affect poverty rates

Dandume (2014)	Nigeria; 1970-2011	Financial development does not affect poverty rates
Sehrawat and Giri (2016)	India; 1970-2014	Financial development affect poverty rates
Cepparulo et al. (2016)	58 developing and developed countries; 1984-2012	Financial development affect poverty rates
Rewelak (2017)	Developing countries	Financial development affect poverty rates
Keho (2017)	9 African countries; 1970-2013	Financial development affect poverty rates for 5 countries
Ayad (2017)	14 Arabic countries; 1980-2014	Financial development does not affect poverty rates
Ayad (2018)	Algeria; 1970-2017	Financial development does not affect poverty rates

Source: Authors' own research.

In this paper, we shall try to fill the gap of the absence of the studies about the relationship between financial development, economic growth and the poverty reduction in Algeria to get a clear idea about these relationships in one of the oil exporting countries with a middle income and a youth financial system, on the other hand, we shall also use some modern econometric methods such as the structural break co-integration and the frequency domain causality for the first time in this area.

3. METHODOLOGY

1. Unit root tests

Dickey and Fuller (1979) and Said and Dickey (1984) are the most important and first studies in the firm of unit root tests, these tests depends on testing the null hypothesis that the coefficients on the same period lagged term Ø of the dependent variable are equal to one against the alternative hypothesis that these coefficients are less than one for three equation as follows (without constant and trend, with constant and finally with constant and trend):

$$\Delta x_t = \rho x_{t-1} - \sum_{j=2}^{k} \emptyset_j \Delta x_{t-j+1} + \varepsilon_t \quad (1)$$

$$\Delta x_t = \rho x_{t-1} - \sum_{j=2}^{k} \emptyset_j \Delta x_{t-j+1} + c + \varepsilon_t \quad (2)$$

$$\Delta x_t = \rho x_{t-1} - \sum_{j=2}^{k} \emptyset_j \Delta x_{t-j+1} + c + b_t + \varepsilon_t \quad (3)$$

NG-Perron (2001) test

NG and Perron (2001) use the GLS (Generalized Least Squares) detrending procedure of ERS (Elliott, Rotherberg and Stock) to get a modified version of the traditional PP (Phillips-Perron test (1988)) and the most important features of this test compared to PP test are:

1. The not exhibit of the severe size distortions of the old version for errors with a negative MA (Moving Average) or AR (Auto Regressive) roots
2. This test can have substantially power when Ø is close to the unity.

The NG-Peroon test have four different tests: MZ_{α}, MZ_t, MSB and MPT as follows:

$$MZ_{\propto} = \left(T^{-1} y_t^d - \lambda^2\right)\left(2T^{-2}\sum_{t=1}^{T} y_{t-1}^d\right)^{-1} \quad (4)$$

$$MSB = \left(T^{-2}\sum_{t=1}^{T} y_{t-1}^d / \lambda^2\right)^{1/2} \quad (5)$$

$$MZ_t = MZ_{\propto} . MSB \quad (6)$$

Zivot-Andrews (1992) test for structural breaks

Zivot and Andrews (1992) argue that the results of the conventional unit root tests (Augmented Dickey Fuller, Phillips Perron, KPSS and NG-Perron) may be reversed by endogenously determining the time of structural breaks, for this reason they proposed the null hypothesis which is a unit root without any exogenous structural change, and the alternative hypothesis is a stationary process that allows for a one-time unknown break in intercept and/or slope, using the same equations (4, 5 and 6) by the addition of the structural breaks estimators as follows:

$$\Delta y_t = c + \propto y_{t-1} + \beta t + \gamma DU_t + \sum_{j=1}^{K} d_j \Delta y_{t-j} + \varepsilon_t \quad (7)$$

$$\Delta y_t = c + \propto y_{t-1} + \beta t + \theta DT_t + \sum_{j=1}^{K} d_j \Delta y_{t-j} + \varepsilon_t \quad (8)$$

$$\Delta y_t = c + \propto y_{t-1} + \beta t + \gamma DU_t + \theta DT_t + \sum_{j=1}^{K} d_j \Delta y_{t-j} + \varepsilon_t \quad (9)$$

Where DU_t is an indicator dummy variable for a mean shift occurring at each possible break point and DT_t is the trend shift variable.

Clemente-Montanes-Reyes (1998) test

The CMR test is an extended version of Perron-Vogelsang (1992) methodology to test the presence of two structural breaks in the series by two different models:

1. Additive Outlier (AO) model: where the structural break has an instanteffect using binary variables (zero and one) to account for the break according the following equations to test whether the series have sudden changes or gradual shifts:

$$y_t = \mu + d_1 DU_{1t} + d_2 DU_{2t} + y_t^* \quad (10)$$

Where DU_{1t} =1 for t > TB_{Bi} and 0 otherwise and TB_1 and TB_2 are the structural breaks, y_t^* is the residual from the regression which be estimated in equation (11):

$$y_t = \sum_{i=0}^{k} \omega_i \, DTB_{1t-1} + \sum_{i=0}^{k} \omega_{2i} \, DTB_{2t-1} + \rho y_{t-1}^* + \sum_{i=0}^{k} c_i \, y_{t-1}^* + \varepsilon_t \quad (11)$$

DTB_i are pulse variables that equal to 1 if t = TB_i +1 and 0 otherwise, with the following hypothesis:

$$H_0 : y_t = y_{t-1} + a_1 \; DTB_{1t} + a_2 \; DTB_{2t} + \varepsilon_t \quad (12)$$

$$H_1 : y_t = \mu + b_1 \; DU_{1t} + b_2 \; DTB_{2t} + \varepsilon_t \quad (13)$$

2. Innovative Outlier (IO) model: the structural break in this case is supposed to affect the level of the series gradually, according to this equation:

$$y_t = \mu + \rho y_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + d_1 DU_{1t} + d_2 DU_{2t} + \sum_{i=1}^{k} c_i \, y_{t-1} + \varepsilon_t \quad (14)$$

2. Co-integration test for regime shifts (Gregory Hansen (1996) test)

Ignoring the issue of potential structural breaks can render invalid the statistical results not only for unit root tests but also for the co-integration tests (Perron, 1989), for this reason the traditional co-integration tests (Engel-Granger; Johansen-Juseluis; Saikonnen-Lutkepohl and Phillips-Oullaris) may produce spurious co-integration results because of the existence of one structural break at least in the series, the Gregory Hansen (1996) procedure can solve this issue by accounting for structural breaks in the co-integration equation as follows:

1. The level shift model (C)

$$y_t = \mu_0 + \mu_1 \varphi_{t,\tau} + \mu_2 x_t + \varepsilon_t \quad (15)$$

Where $\varphi_{t,\tau}$ is a dummy variable such that $\varphi_{t,\tau}$ = 1 if t >nτ or 0 if r⩽nτ, and $\tau \in (0,1)$ denotes the relative timing of the break point, the effect of the regime shift in this case in on the intercept μ_0 (before the break) and μ_1 is the change in intercept (at the break time).

2. The level shift with trend model (C/T): in this model the break still on the intercept but with the existence of a trend (t) in the series

$$y_t = \mu_0 + \mu_1 \varphi_{t,\tau} + \mu_2 t + \mu_3 x_t + \varepsilon_t \quad (16)$$

3. Regime shift with changes in the intercept and the slope (C/S): for this model the structural break is on both intercept and slope coefficient where μ_2 is the co-integration slope coefficient before the break where μ_3 is the coefficient of co-integration slope at the time of the break.

$$y_t = \mu_0 + \mu_1 \varphi_{t,\tau} + \mu_2 x_t + \mu_3 x_t \varphi_{t,\tau} + \varepsilon_t \quad (17)$$

4. Regime shift with changes in intercept, slope and trend (C/S/T): in this case the structural break affects all the components (intercept, slope and the trend).

$$y_t = \mu_0 + \mu_1\varphi_{t,\tau} + \mu_2 t + \mu_3 t\varphi_{t,\tau} + \mu_4 x_t + \mu_5 x_t\varphi_{t,\tau} + \varepsilon_t \quad (18)$$

And for each equation, we perform the unit roots tests on the residuals series using three tests ADF, Z_α and Z_t.

3. Frequency domain causality (Breitung Candelon (2006) test)

The term causality first proposed in (1969) by Clive Granger and it is a statistical hypothesis test for determining whether the variable y_1 can be useful to forecast the variable y_2, by other words causality could be measure the ability to future values of y_2 by y_1, but the problem whit this procedure (Granger non-causality 1969) as said by Granger and Engel (1987) is that if y_1 and y_2 are non-stationary and co-integrated variables; the standard method is invalid procedure, for this reason Lutkepohl (2006) used the VECM presentation to test both short run and long run terms:

$$\Delta y_{1t} = ECT_1(y_{2t-1} - \beta y_{1t-1} - \rho_0 - \rho_1 t) + \sum_{i=1}^{n-1}\delta_{1i}\Delta y_{1t-i} + \sum_{i=1}^{n-1}\delta_{2i}\Delta y_{2t-i} + b_1\gamma_1 + \varepsilon_{1t} \quad (19)$$

$$\Delta y_{2t} = ECT_2(y_{2t-1} - \beta y_{1t-1} - \rho_0 - \rho_1 t) + \sum_{i=1}^{n-1}\emptyset_{1i}\Delta y_{1t-i} + \sum_{i=1}^{n-1}\emptyset_{2i}\Delta y_{2t-i} + b_2\gamma_2 + \varepsilon_{2t} \quad (20)$$

The long run causality implies a significant and negative ECT_i coefficient (Error Correction Term), for example if both ECT coefficients are significantly different from zero and negative there is a bi-directional long run causality between the two variables, and for the short run causality it can be set by applying the Wald test for the following hypothesis:

$$H_0 = \delta_{21} = \delta_{22} = \cdots = \delta_{2i} = 0;$$
$$H_0 = \emptyset_{11} = \emptyset_{12} = \cdots = \emptyset_{1i} = 0$$

In the case where all series are neither stationary nor co-integrated, we shall perform a VAR (Vector Auto-Regressive) representation with ECT_i=0 because the absence of the long run relationship, so we should apply the same Wald test for short run term causality for the same hypothesis above:

$$\Delta y_{1t} = \sum_{i=1}^{n-1}\delta_{1i}\Delta y_{1t-i} + \sum_{i=1}^{n-1}\delta_{2i}\Delta y_{2t-i} + \varepsilon_{1t} \quad (21)$$

$$\Delta y_{2t} = \sum_{i=1}^{n-1}\emptyset_{1i}\Delta y_{1t-i} + \sum_{i=1}^{n-1}\emptyset_{2i}\Delta y_{2t-i} + \varepsilon_{2t} \quad (22)$$

Finally if we have different stationary properties (a mixture of I(0) and I(1) variables), Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL) proposed a new procedure depending on VAR model by introducing the series in

their levels form after a unit test denoting the maximum order of integration between the variables (d_{max}) and by estimating the VAR ($K+d_{max}$) model with K is the maximum lag length, and then we shall apply the Wald test by a chi squared distribution and n degree of freedom.

As mentioned by Pavia et al. (2008) the time domain (Granger causality and TYDL procedure) graph shows the signal change over the time but the frequency domain graph shows how the signal lies within each given frequency (ω) band of the frequencies, Geweke (1982) showed that the causality among a bivariate series can be detected at a particular frequency by composing spectral density (Geweke, 1982 and Hosoya, 1991), Yao and Hosoya (2000) developed a Wald test methodology for causality at same given frequency based on nonlinear restrictions on the auto-regressive parameters, then, Breitung and Candelon (2006) used a bivariate VAR model and they proposed a new procedure based on a set of linear hypothesis on the AR parameters and it can be easily generalized to allow for co-integration relationships and higher dimensional systems.

According to Fritsche and Pierdzioch (2016) whom used the VMA (Vector Moving Average) of the bivariate VAR model as follows:

$$y_t = \psi(L)\varepsilon_t \tag{23}$$

Where ε_t is the white noise distribution; L is the lag operator and $\psi(L)$ is the lag polynomial.

Following vector shows the partitioning of $\psi(L)$ into parts as

$$\psi(L) = \begin{bmatrix} \psi_{11}(L) & \psi_{12}(L) \\ \psi_{21}(L) & \psi_{22}(L) \end{bmatrix} \tag{24}$$

In this case Geweke (1982) suggests to test the Granger non causality as a specific frequency ω the following measure $M_{y1\ cause\ y2}(\omega)$ which can be calculated as follows:

$$M_{y1\ cause\ y2}(\omega) = \log\left[1 + \frac{|\psi_{12}(e^{-i\omega})|}{|\psi_{11}(e^{-i\omega})|}\right] \tag{25}$$

Where i is an imaginary number.

The next step is to test if y_1 causes y_2 ($M_{y1cause\ y2}$) at any frequency ω, we test the null hypothesis H_0: $M_{y1cause\ y2}(\omega) = 0$ (Geweke, 1982), Breitung and Candelon (2006) proposed a modified frequency domain causality using the VAR specification as follows:

$$M_t = \omega_1 M_{t-1} + \cdots + \omega_p M_{t-p} + \cdots + \partial_1 N_{t-1} + \partial_p N_{t-p} + \emptyset_t \tag{26}$$

And the new null hypothesis became H_0: $R(\omega)\Omega$ where Ω constitutes a vector of coefficients of N and

$$R(\omega) = \begin{bmatrix} \cos(\omega) & cos(2\omega) & \dots & \cos(p\omega) \\ \sin(\omega) & sin(2\omega) & \dots & \sin(p\omega) \end{bmatrix} \quad (27)$$

The F statistic for this equation follows F(2,T-2p) for $\omega \in (0,\pi)$, and it is necessary to be noted that the high frequencies represented the short run term causality and the low frequencies represented the long run term causality, and as considered by Toda and Phillips (1993) in co-integration systems the definition of the causality of frequency zero is equivalent to the concept of long run causality.

4. RESULTS AND DISCUSSIONS

In this research, we carried out of the causal relationship (time domain and frequency domain) between poverty rates, economic growth and financial development in Algeria for the period 1970-2017, we used annual data obtained from different sources like the World Bank database (2018) for both economic growth and poverty rates and the Trilemma database (2018) for financial development, we also use the consumption per capita as a proxy for poverty rates because the absence of other proxies (headcount ratio) as Ravallion (1992); Woolard and Leubbrandt (1999); Quartey (2005) and Odhiambo (2017); and we employed for financial development the Line Milesi-Ferreti index presented by Philip Lane and Maria Milesi-Ferreti in 2006 as the sum of total liabilities and total assets as a ratio of GDP and finally, while we considered the GDP per capita as an index for the economic growth which is the best proxy of economic growth dealing with poverty reduction.

1. Unit root test results

As usual the unit root tests are the first step at any time series analysis, for this purpose, three tests have been conducted; the NG-Perron (2001) test without structural breaks, Zivot-Andrews (1992) test with structural breaks and Clemente-Montanes-Reyes (1998) test to detect which kind of structural breaks in the series (AO or IO), the results inspired from tables (03) shows that both poverty rate and financial development series are stationary at the first differences but the economic growth series is stationary at the level (from NG-Perron test), in addition the series of economic growth has a structural break in 1998 which means is not stationary at the level and this break would disappear after applying the first difference series, on the other hand the financial development series has an additive outlier (AO) break in 2009, therefore, the three variables are I(1) variables with structural breaks at both economic growth and financial development.

Table-3. Unit root tests results

NG-Perron test								
Variables	MZ_a		MZ_t		MSB		MPT	
	Stat	Crit	Stat	Crit	Stat	Crit	Stat	Crit
POV	-4.62	-17.30	-1.51	-2.91	0.32	0.16	19.67	5.48
GRW	-22.12**	-17.30	-3.32	-2.91	0.15	0.16	4.11	5.48
FIN	-13.80	-17.30	-2.61	-2.91	0.18	0.16	6.67	5.48
Δ(POV)	-28.84**	-17.30	-3.79	-2.91	0.13	0.16	3.16	5.48
Δ(FIN)	-22.84**	-17.30	-3.37	-2.91	0.14	0.16	4.00	5.48

Zivot-Andrews test				
Variables	t- statistic	Break date	1% critical value	5% critical value
POV	-3.36	1982	-5.34	-4.80
GRW	-7.20**	1998	-5.34	-4.80
FIN	-3.81	1982	-5.34	-4.80
Δ(GRW)	-3.22	1998	-5.34	-4.80

Clemente-Montanes-Reyes test						
Variables	Additive Outlier (AO)			Innovative Outlier (IO)		
	T stat	Break	P value	T stat	Break	P value
POV	-2.02	1972	0.057	-2.12	1976	0.120
GRW	-2.97	1977	0.111	-2.22	1978	0.087
FIN	5.72**	2009	0.000	1.48	2006	0.150
Δ(FIN)	0.81	2006	0.418	/	/	/

** denote significance at 1% and 5%; Δ denote the first difference series.
POV: poverty rate; GRW: economic growth and FIN: financial development.

Source: Authors' calculations.

2. Gregory Hansen co-integration results

The next step in our study, is to test the long run relationship among the variables, and since the variables are I(1) series with two structural breaks we cannot apply the traditional methods of co-integration as Engel-Granger and Johansen-Juselius, consequently the Gregory Hansen (1996) is the best solution in our study with the estimation of equation (18) (C/S/T model) , the results obtained from table (04) shows that there is a co-integration relationship between poverty rate and financial development with a regime shift in 1985 and a co-integration

relationship between poverty rate and economic growth with a regime shift in 1985, which means that there is a long run relationship among the three variables.

Table-4. Co-integration results

Tests	Test statistic	Breakpoint	1% critical value	5% critical value
Between poverty and financial development				
ADF	-9.58**	1985	-6.02	-5.50
Z_t	-9.58**	1985	-6.02	-5.50
Z_a	-63.47*	1985	-69.37	-58.58
Between poverty and economic growth				
ADF	-8.58**	1985	-6.02	-5.50
Z_t	-8.61**	1985	-6.02	-5.50
Z_a	-58.53	1985	-69.37	-58.58

** denote significance at 1% and 5%.

Source: Authors' calculations.

3. Time domain causality results

From the outcomes obtained from the unit root tests and co-integration test it is clear that we are in the case of non-stationary (I(0)) and co-integrated variables, so before the running of the frequency domain causality (the Breitung and Candelon (2006) test) we should apply the time domain causality depending on Lutkepohl (2006) procedure according to VECM model for the long run causality and Wald test for the short run causality, and it is clear that there an unidirectional causality running from economic growth to poverty reduction for both short run and long run terms which means the effectiveness of the economic growth in Algeria to improve the consumption per capita and to reduce to poverty rates, on the other hand, there a unidirectional causality only in the short run term running from poverty to financial development and another unidirectional causality in the long run term running from financial development to the poverty reduction, this is on line with the study of Ayad (2018) who found there is no evidence of causality in short run term from financial development to poverty rates but the causality appear in the long run term.

Table-5. Time domain causality results

Long run causality							
POV=>GRW		GRW=> POV		POV=>FIN		FIN =>POV	
ECT coef	causality	ECT coef	causality	ECT coef	causality	ECT coef	causality
0.325 [2.61]	Not exist	-0.546 [-2.461]	Exist	0.009 [2.27]	Not exist	-0.748 [-3.64]	Exist
Short run causality (Wald test)							
POV=>GRW		GRW=> POV		POV=>FIN		FIN =>POV	
Wald test	causality	Wald test	causality	Wald test	causality	Wald test	causality
0.632 (0.728)	Not exist	19.417 (0.000)	Exist	4.147 (0.041)	Exist	0.191 (0.661)	Not exist

[] denotes Student statistic at 5% significance level (1.96 the critical value);
() denotes the probability of chi-squared statistic 5% significance level;
=> denotes direction of the causality.

Source: Authors' calculations.

4- Frequency domain causality results

The final step in this study is the application of the modern Breitung-Candelon frequency domain causality presented in 2006, from table 6, there is no evidence of any causation from poverty rates to economic growth at all the frequencies and it same results obtained from time domain causality (Fig. 1), but there is a causal effect running from economic growth to poverty rates when $\omega \in (0, 2.5)$ which means the long run term and the medium term but the high frequencies ($\omega \in (2.5,\pi)$) the critical value is higher the statistical value which means there are no causal effect in short run term running from economic growth to poverty rates in contrast of time domain causality when we found that there is a causal effect in short run term (Fig. 2), on the other hand; there is no evidence at any causation relationship between poverty rates and financial development at all the frequencies (Fig. 3 and Fig. 4).

Table-6. Frequency domain causality results

Frequencies	**ω = 0.00**	**ω = 1.00**	**ω = 2.00**	**ω = 3.00**	**Critical value**
POV=>GRW	1.92	2.10	0.30	0.16	6.00
GRW=> POV	6.10	9.62	14.90	3.92	6.00
POV=>FIN	0.82	0.85	1.04	1.10	6.00
FIN =>POV	0.30	0.28	0.15	0.14	6.00

Source: Authors' calculations.

Finally, this results obtained from the econometric analysis especially the frequency domain causality for the causal relationship between poverty, economic growth and financial development in Algeria for the period 1970-2017 were very agree with the previous studies in the context of the relationship between poverty reduction and economic growth as Ravaillon and Chen (1997), Bourguignon (2003), Adams (2004), Ram (2006), Tahir et al. (2014) and especially the study of Ayad (2016) in the context of Algeria, so the economic growth in Algeria is pro-poor growth and is very effective to improve the living conditions of the poor people in Algeria, but in the case of the causal relationship between poverty reduction and financial development there is no evidence of the contribution of financial liberalization to reduce the poverty rates both in short run and long run terms, this results is consistent with previous studies in the case of Algeria where there is no effect from financial sector on poverty reduction as Ayad (2018).

5. CONCLUSION

This study explored the causal relationship among poverty rates, economic growth and financial development in the context of Algeria for the period 1970-2017, using an econometric procedure with various methods, as the NG-Perron for unit root test without structural breaks and Zivot-Andrews with structural breaks, and the Gregory-Hansen methodology for co-integration test with regime shift, and finally, both of time domain causality depending on Lutkepohl (2006) procedure and TYDL (1995; 1996) methodology and frequency domain causality depending on Breitung Candelon (2006) methodology.

The results of this paper showed a long run relationship between the variables with a regime shift in 1985, and by passing to the causality results, both of time domain and frequency domain causalities showed an unidirectional causality running from economic growth to poverty reduction which means that the economic growth in Algeria is pro-poor growth, this result lend support to Dollar and Kraay (2000) where the role of economic growth is crucial for poverty reduction, and it is a confirmation of Rodrick's (1976) statement when he said that historically nothing was worked better than economic growth in enabling to reduce poverty rates.

The results showed also that there is no evidence of any causal relationship between poverty rates and financial development at all the frequencies which means the independence between the two variables though the long run relationship among the two variables according to Gregory Hansen test, this conflicting results may be due to the difference between the two approaches, but it

should be noted that according to error correction term (ECT) under Lutkepohl procedure for the long run causality which is negative and significant at 5% level of significance, so there is a long run causality running from financial development to poverty reduction in time domain causality and it's cannot be ignored, Odhiambo (2009) showed that there is no universal consensus on the causal relationship between financial development and the other variables because of the sensitivity of the proxy used for the measurement of financial development.

APPENDIXES

Figure-1. causality from poverty to economic growth.

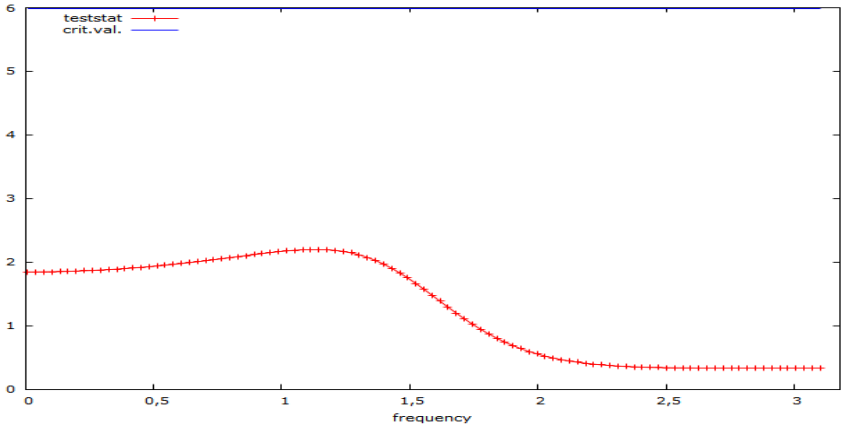


Figure-2. causality from economic growth to poverty.

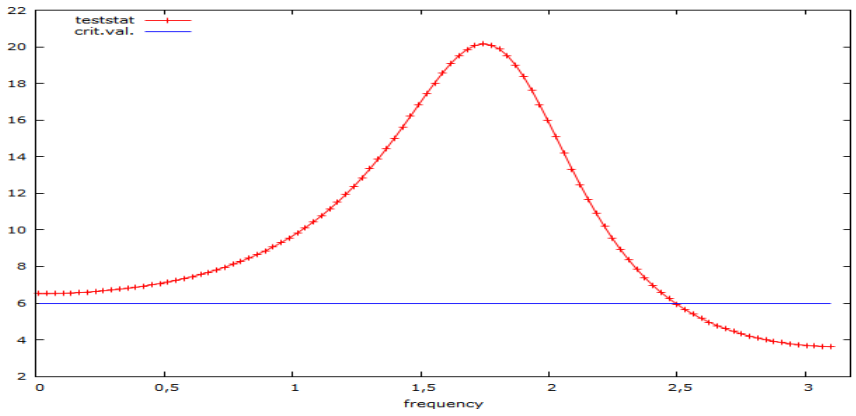


Figure-3. causality from poverty to financial development**.**

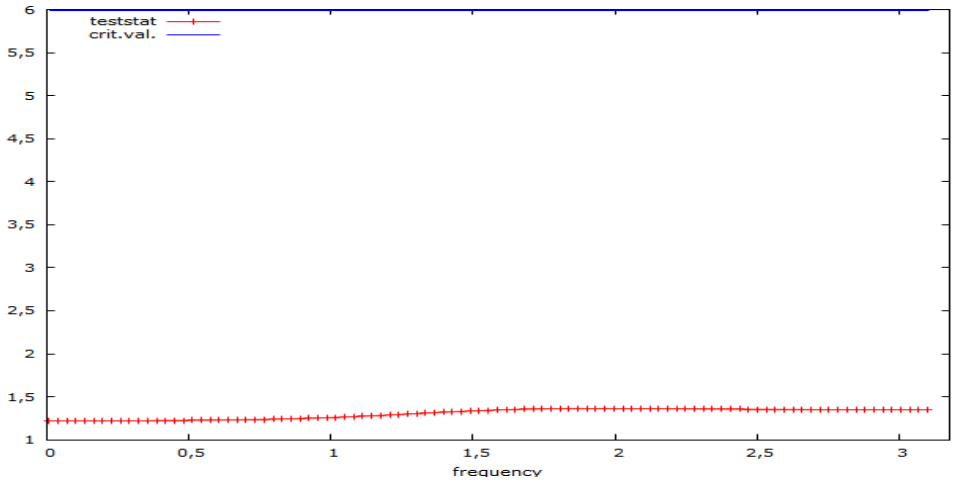
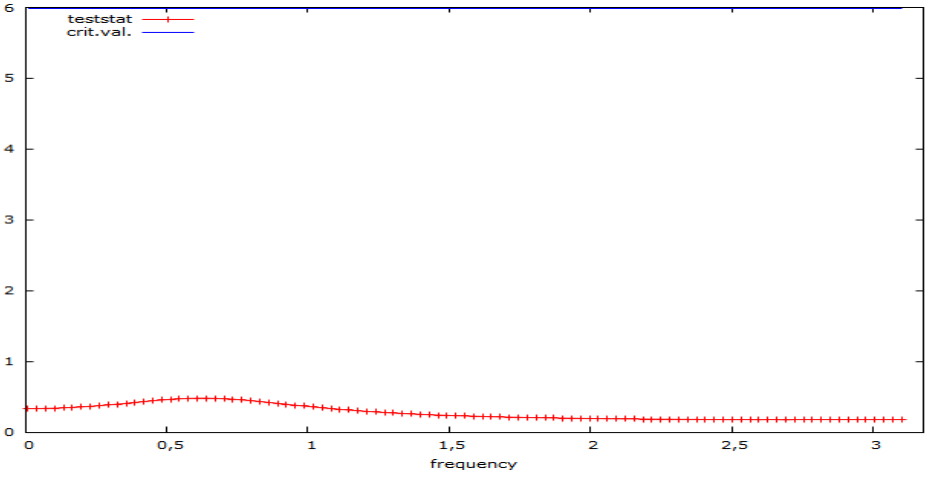


Figure-4. causality from financial development to poverty.



REFERENCES

1. Adams, R. H. (2004). Economic growth, inequality and poverty: estimating the growth elasticity of poverty. World Development, 32(12), 1989-2014.
2. Akhter, S., Liu, Y., and Daly, K. (2009). Cross country evidence on the linkages between financial development and poverty. International Journal of Business and Management, 5(1), 3.
3. Ali, A. A. G., & Thorbecke, E. (2000). The state and path of poverty in Sub-Saharan Africa: some preliminary results. Journal of African Economies, 9(Supplement_1), 9-40.
4. Bourguignon, F. (2003). The growth elasticity of poverty reduction: explaining heterogeneity across countries and time periods. Inequality and growth: Theory and policy implications, 1(1).
5. Breitung, J., & Candelon, B. (2006). Testing for short-and long-run causality: A frequency-domain approach. Journal of Econometrics, 132(2), 363-378.
6. Bruno, M. Ravallion, M., & Squire, L. (1999). Equity and growth in developing countries: old and new perspectives on the policy issues. The World Bank.
7. Čihák, M., Demirgüč-Kunt, A., Feyen, E., & Levine, R. (2013). Financial development in 205 economies, 1960 to 2010 (No. w18946). National Bureau of Economic Research.
8. Clemente, J., Montañés, A., & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. Economics Letters, 59(2), 175-182.
9. Collier, P., & Dollar, D. (2002). Aid allocation and poverty reduction. European economic review, 46(8), 1475-1500.
10. Dandume, M. Y. (2014). Financial sector development, economic growth and poverty reduction: New evidence from Nigeria. Journal of the Faculty of Economics and Administrative Sciences, 4, 2-22.
11. Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American statistical association, 74(366a), 427-431.
12. Dolado, J. J., & Lütkepohl, H. (1996). Making Wald tests work for co-integrated VAR systems. Econometric Reviews, 15(4), 369-386.
13. Dollar, D., & Kraay, A. (2000). Property rights, political rights, and the development of poor countries in the post-colonial period. World Bank Working Papers.
14. Dollar, David, and Aart Kraay (2002). "Growth is Good for the Poor." Journal of economic growth 7.3,195-225.
15. Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: journal of the Econometric Society, 251-276.
16. Epaulard, A., & Pommeret, A. (2003). Recursive utility, endogenous growth, and the welfare cost of volatility. Review of Economic Dynamics, 6(3), 672-684.
17. Fosu, A. K. (2009). Inequality and the impact of growth on poverty: Comparative evidence for Sub-Saharan Africa. Journal of Development Studies, 45(5), pp. 726-745.

18. Fritsche, U., & Pierdzioch, C. (2016). Animal spirits, the stock market, and the unemployment rate: Some evidence for German data (No. 1/2016). DEP (Socioeconomics) Discussion Papers, Macroeconomics and Finance Series.
19. Gazi Salah Uddin, Muhammad Shahbaz, Mohamed Arouri, Frédéric Teulon. 2014. Financial development and poverty reduction nexus: A cointegration and causality analysis in Bangladesh. Economic Modelling 36, 405-412.
20. Geweke, J. (1982). Measurement of linear dependence and feedback between multiple time series. Journal of the American statistical association, 77(378), 304-313.
21. Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. Econometrica: Journal of the Econometric Society, 424-438.
22. Gregory, A. W., & Hansen, B. E. (1996). Residual-based tests for co-integration in models with regime shifts. Journal of econometrics, 70(1), 99-126.
23. Gregory, A. W., & Hansen, B. E. (1996). Tests for cointegration in models with regime and trend shifts. Oxford bulletin of Economics and Statistics, 58(3), 555-60.
24. Hicham, A. (2017). Financial Development and Poverty Reduction Nexus: A Co-Integration and Causality Analysis in Selected Arabic Countries. Academic Journal of Economic Studies, 3(2), 28-35.
25. Hicham, A. (2018). Poverty Reduction, Financial Development and Economic Growth in Algeria: A Gregory Hansen Co-Integration Regime Shift Analysis. Economic Research Guardian, 8(2), 40-52.
26. Hichem, A. (2016). Poverty, Inequality and Economic Growth In Algeria: An Ardl Approach. Journal of Social and Economic Statistics, 5(1), 1-20, p.4
27. Honohan, P. (2004). Financial development, growth and poverty: how close are the links? In Financial development and economic growth, Palgrave Macmillan, London. 1-37).
28. Jalilian, H., and Kirkpatrick, C. (2005). ―Does financial development contribute to poverty reduction. Journal of Development Studies, 41(4), 636-656.
29. Jeanneney, S.G., and Kpodar, K. (2011). Financial development and poverty reduction: Can there be a benefit without a cost? The Journal of development studies, 47(1), 143-163.
30. Kalwij, A., & Verschoor, A. (2007). Not by growth alone: The role of the distribution of income in regional diversity in poverty reduction. European Economic Review, 51(4), 805-829.
31. Keho, Y. (2017). Financial Development and Poverty Reduction: Evidence from Selected African Countries. International Journal of Financial Research, 8(4), 90.
32. Kunitomo, N. (1996). Tests of unit roots and co integration hypotheses in econometric models. Japanese Economic Review, 47(1), 79-109.
33. Lane, P. R., & Milesi-Ferretti, G. M. (2006). The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970-2004, Journal of international Economics, 73(2), 223-250.
34. Lenagala, C., & Ram, R. (2010). Growth elasticity of poverty: estimates from new data. International Journal of Social Economics, 37(12), 923-932.
35. Lütkepohl, H. (2006). Structural vector autoregressive analysis for co-integrated variables. Allgemeines Statistisches Archiv, 90(1), 75-88.

36. McCulloch, N., & Baulch, B. (2000). Simulating the impact of policy upon chronic and transitory poverty in rural Pakistan. The Journal of Development Studies, 36(6), 100-130.
37. Mellor, J.W. (1999), Pro-poor Growth: The Relationship Between Growth in Africa and Poverty Reduction, Abt Associates Inc., Bethesda, MD.
38. Ng, S., & Perron, P. (2001). Lag length selection and the construction of unit root tests with good size and power. Econometrica, 69(6), 1519-1554.
39. Odhiambo, N.M. (2009). Finance-growth-poverty nexus in South Africa: A dynamic causality linkage. The Journal of Socio-Economics, 38(2), 320-325.
40. Pavia, D. L., Lampman, G. M., Kriz, G. S., & Vyvyan, J. A. (2008). Introduction to spectroscopy. Cengage Learning.
41. Ram, R. (2011). Growth elasticity of poverty: direct estimates from recent data. Applied economics, 43(19), 2433-2440.
42. Ravallion, M. (1997a). Can high-inequality developing countries escape absolute poverty? Economics Letters, 56, pp. 51-57.
43. Ravallion, M., & Chen, S. (1997). What can new survey data tell us about recent changes in distribution and poverty? The World Bank Economic Review, 11(2), 357-382.
44. Rewilak, J. (2017). The role of financial development in poverty reduction. Review of development finance, 7(2), 169-176.
45. Said, S. E., & Dickey, D. A. (1984). Testing for unit roots in autoregressive-moving average models of unknown order. Biometrika, 71(3), 599-607.
46. Stiglitz, J. E. (1998, April). Knowledge for development: Economic science, economic policy, and economic advice. In Annual World Bank conference on development economics (Vol. 20, pp. 9-58). Washington: World Bank.
47. Tahir, S. H., Perveen, N., Ismail, A., & Sabir, H. M. (2014). Impact of GDP growth rate on poverty of Pakistan: A quantitative approach. Euro-Asian Journal of Economics and Finance, 2(2), 119-126.
48. Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. Journal of econometrics, 66(1-2), 225-250.
49. Zivot, E., & Andrews, D. W. K. (2002). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. Journal of business & economic statistics, 20(1), 25-44.

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IS THE RELIGIOUS ORIENTATION A DETERMINANT OF THE ENTREPRENEURIAL INTENTIONS? A STUDY ON THE ROMANIAN STUDENTS

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Abstract *The specialized literature offers relevant support for the idea that the entrepreneurship and the private initiative represent the foundation of the economic growth. Despite this evidence, there are a lot of debates regarding the influence of the different religious orientations on the intention to become an entrepreneur. The purpose of the present paper is to analyze the impact that religion has on the entrepreneurial intentions of the Romanian students. To achieve this objective, the research methods consisted in an extensive investigation of the specialized literature and in empirical research, conducted on a sample of 682 Romanian students. Our results underline that the young Orthodox individuals are more optimistic regarding their future ability to develop businesses than the Roman-Catholics. Yet, this optimism has not been proven by the assessment of their personality traits, which may be very important for the business success.*

Keywords: *Religious orientation, Entrepreneurial intentions, Romanian students, Individuals' behaviors*

JEL Classification: *L26, Z12*

1. INTRODUCTION

Our analysis assumes that cultural factors play an important role in the expression of the entrepreneurial intentions among young people. More

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specifically, the influence of religion on social and economic behavior can be observed in the individuals' choices. As a research area, it is not a new approach, being related to the social capital theories. The novelty part of this study is the empirical one, which is based on a survey conducted on young Romanian students and on the interpretation of the results in relationship with those obtained in other studies and researches.

Religion is a very important cultural vector at a community level. Therefore, if we talk about a direct relationship between the development of a nation and its culture (Landes 1999; Inglehart and Baker 2000; Huntington 1996), then we see the influence of religion on the nation's prosperity (Barro and McCleary 2003). The one who has made a very clear connection between religion and economic behavior was the sociologist Max Weber (1930). Subsequently, the theories of social capital have developed this hypothesis in many facets. For example, Robert Putnam (1993) examines the link between trust, religion and prosperity in Catholic society. Because of the hierarchical pyramid structure inside the church, which also reflects on the society (the clerics represent God on Earth, so one has to obey and listen to their word), the trust level among Catholics is lower than in the case of the Protestants. This aspect leads to an increase in the transaction costs. However, not only trust plays an important role, but also tolerance. Landes (1999) considered that the possibility of acquiring forgiveness, in different ways, has led to dishonest practices, to breaking the contracts and to increasing the transaction costs.

When referring to religion as a cultural vector, Weber (1930) notes that there are significant differences between Catholics and Protestants in the way the economic activities are performed. Also, Sombart (1911) showed that the Jews' success in business is closely connected to religion. More recent studies underline the positive impact of the religious beliefs on the economic commitment (Gruber and Hungerman 2008; Bénabou and Tirole 2006; Becker and Woessmann 2009). There are also some empirical studies that notice the direct relationship between the religious beliefs and the economic commitment (McCleary and Barro 2006; Guiso et al. 2003, 2006; Barro and McCleary 2003). Arruñada (2010) shows that religion has a direct influence on the economic growth, because it promotes values with a great adherence among population. Like Weber, he also considers that there are differences between Catholicism and Protestantism. Catholics have better economic relations with the persons they know, having a higher level of confidence, while Protestants develop better economic relations with strangers.

The cross-country analyses emphasize a direct relationship between the religious values and the economic outcomes. A study conducted by Blum and

Dudley (2001) shows that wages from the Protestant cities grew faster than those in Catholic areas, during the pre-industrial period.

When the impact that the different religions have on the intention to become an entrepreneur is discussed, the opinions are divided. On one hand, there are some studies which certify that the Christianity and the Islam from India favor these intentions, while the Hinduism does not. On the other hand, Nunziata and Rocco (2011) found that the Buddhists and the Christians are more inclined to develop the entrepreneurial activities, while the Muslims do not have this preoccupation. The explanation is related to the fact that religion changes the individuals' behaviors (Lehrer 2004), influencing their attitude towards work and business (Yousef 2000; Tracey 2012). When a religious doctrine encourages initiative, self-reliance, risk sharing or philanthropy, then there is a higher probability of developing entrepreneurial attitudes (Audretsch et al. 2007).

There are studies that try to highlight the way in which involving religious norms in a company creates a competitive advantage (Worden 2005). Applying the Christian precepts may have a significant impact on the profitability or competitiveness (Ibrahim and Angelidis 2005), by improving the cooperation, the integrity and the responsibility.

Most of the researches show that Christianity is favorable to the development of the entrepreneurial activities. A large part of the studies present the differences between two dominant branches of Christianity, i.e. Catholicism and Protestantism (Weber 1930; Schaltegger and Torgler 2010; Minns and Rizov 2005; Kumar et al. 2011). There are studies showing that, within the Catholic doctrine, there were significant adjustments in terms of attitudes toward capitalism. Initially, according to Fanfani (2003), the Catholic doctrine was anti-capitalist, establishing the trade regulation and restricting it for the believers of other religions, restricting the bankers in handling the monetary flows, in order to foster the loan charity places around the church, encouraging church and state intervention in regulating the economic life, condemning the loans based on interest etc.

It is known that the Christian religions are generally favorable to capitalism. However, there are some remarkable differences. For example, on one hand, the Protestants show a higher trust in both interpersonal and institutional relationships. They are more prone to honesty and ethics, thus reducing the transaction costs generated by distrust. On the other hand, Catholics put more value on private property and competition, but they are less profit oriented compared to Protestants (Stulz and Williamson 2003).

However, the literature regarding the impact of Orthodoxy on the economic action and the relationship between Orthodox norms and economic efficiency is very limited. There are studies showing that Orthodox individuals have a higher level of religiosity compared to other Christian religions, fact that may represent an obstacle in taking high risk entrepreneurial decisions. Moreover, Steffy (2013) considers that the Orthodox religion is an important predictor for decision taking, for work orientation and for behavior. Orthodoxy has a firm position regarding certain attitudes that accompany the economic act, such as selfishness or promoting the self-interest. In total contrast to what was promoted by the classical economic school led by Adam Smith, a good Orthodox must put the salvation and devotion to God before everything (Smith 1904). The salvation could be achieved only through good and honest actions, which are based on generosity, caring for others, altruism and self-forgetfulness (Stăniloae 1981). Therefore, Orthodoxy is more focused, at least at dogmatic level, on redistribution and on inhibiting the desire of material gain.

Therefore, many of the papers that approach the relationship between Orthodoxy and entrepreneurship highlight the ethical norms of business administration. Some authors even talked about an Orthodox-Christian style of leadership (Fry 2003; Gotsis and Kortezi 2009), based on responsibility, justice and equality, more moral and more ethical than other well-known styles.

Considering all these, we ask the question: is religion significantly affecting the entrepreneurial intentions of young students? What are the differences between Orthodox Christians and Catholics concerning attitudes towards entrepreneurship?

2. LITERATURE OVERVIEW AND HYPOTHESIS DEVELOPMENT

The mainstream economic literature cannot explain if and why there are differences in entrepreneurial activity between men and women. There are a number of recent studies addressing this issue, both in the case of developed and developing countries. According to Kelley et al. (2012), men from developed countries are, on average, almost twice more involved in developing their own business. A relevant case could be that of Belgium, where the number of the male entrepreneurs is four times higher than that of women (Allen et al. 2008). Chen et al. (1998) also identify a higher intention among young men to develop business than among women. Chen's results are also validated by Marlino and Wilson (2002). They found that girls are rather more accurate in appreciating their own skills to become entrepreneurs than being less prepared for this. The authors link this perception to the computing ability. It was demonstrated that women's confidence in their ability to master the quantitative sciences is low (Bowen and

Hisrich 1986; Hollenshead and Wilt 2000). What determines this situation? Previous studies revealed a number of differences at the cognitive, personal and contextual level. Maes et al. (2014) group these factors, as they were studied in the specialized literature, in three main categories: an undesirable career option (Carter et al. 2003; Cromie 1987; Georgellis and Wall 2005); a perceived lack of control of self-efficacy (Langowitz and Minniti 2007; Minniti and Nardone 2007; Wilson et al. 2007); a perceived lack of environmental support (BarNir et al. 2011; Hout and Rosen 2000). The theories of social capital are also approaching these differences between men and women. According to Popielarz (1999), men and women are integrated into different social networks, fact that has an impact on the economic results. There are some studies that show that women, put in the same situations as men, develop more homogeneous social networks in terms of kin composition (Marsden 1987; McPherson and Smith-Lovin 1986; Moore 1990). This aspect was interpreted as a disadvantage in business (Liao and Stevens 1994).

If this happens in the absence of cultural factors, the situation changes quite considerably when variables such as tradition, social mores or religion are taken into account. For example, there are significant differences regarding the enrollment in educational systems of girls or boys. Religions such as Islam, Hinduism, Orthodoxy and even Catholicism consider the role of the man more important than that of the woman. Consequently, this triggers some disadvantages for women, such as the access to education. In contrast, according to the Protestant religion, both boys and girls need to be literate up to Confirmation. Then there is no social or religious restraint regarding the access to the tertiary education. Instead, Islam's acceptance of women's access in universities or in certain professions that require a high level of education is extremely difficult (Fish 2002). Moreover, the involvement of women in business is regarded with reluctance in many cases, especially in the Muslim world, but sometimes in the Christian one as well. According to Christian religious dogma, the role of woman in society is well-defined, being related to the family and household area. A woman must be a mother, wife and homemaker. The man has to deal with the prosperity of the family. He has to take part in the production and exchange activities. Therefore, any entrepreneurial intention among women is suppressed even by the way in which her role is defined in the society. The modernism has mitigated these customs, which became more attenuated along with the development. However, in the collective unconscious, we may find certain reluctance related to the woman as a business person or scientist in Islam or Orthodox cultures.

H1: There are differences between men and women regarding the entrepreneurial intentions.

H2: The difference between sexes in terms of entrepreneurial intentions is higher among the Orthodox than Catholics.

The desire for recognition lies in the human nature, as Nietzsche (2010) said. Every social being tries to position itself in a hierarchy so that it might be able to maximize the benefits. Positioning can be done by acquiring comparative advantages such as education, health, welfare etc. According to some recent studies, the social representation of power among young Romanians is identified with the triad money-authority-monopoly. Therefore, the most intensive perception is that the main foundation of individual power is money, which gives authority and advantages. The money can be obtained by conducting businesses. So, at the desire level, the power is tempting. However, it should be noted that, often, the power does not represent an option for the young Romanians, although it is desired. May this be a reaction to the perception that power corrupts (Gwinn et al. 2013; Ratcliff and Vescio 2013)? Normally, referring to Christian theology, such a situation would discourage the young Christian to fall in the temptation of business.

H3: The desire to gain social status through business is less present among young Christians.

H4: The desire to gain social status through business is more present among young Catholics than among the Orthodox.

The concept of need for achievement defines the preference for moderately challenging tasks, which involve abilities and effort and which have a significant influence on the individuals' performances (McClelland 1965). The individuals with high need for achievement exhibit an increased appetite for improving their performances, for responsibility in managing their careers and for acquiring the necessary knowledge (Loon and Casimir 2008; McClelland 1961). The need for achievement is often associated with the entrepreneurial activities (Koh 1996; McClelland 1985). Studies conducted on entrepreneurs from different countries showed that they have a high level of need for achievement (Apospori et al. 2005; Entrialgo et al. 2000; Stewart et al. 1999). Meanwhile, it was found that the need for achievement is an important precursor to the development of entrepreneurial intentions (Scott and Twomey 1988). The need for achievement, like any other personality trait, can be influenced by many factors, including the cultural ones (Rice 2003; Turan and Kara 2007).

H5: There is a significant relationship between the need for achievement and the entrepreneurial intentions of the Romanian students.

H6: The relationship between the need for achievement and the entrepreneurial intentions is more pronounced in the case of young Catholics than Orthodox.

METHODOLOGY

In order to find possible answers to our questions, we conducted a questionnaire-based survey aimed at students that were in their final year of undergraduate studies and students enrolled in master degree programs at the Faculty of Economics and Business Administration, "Al. I. Cuza" University of Iasi, Romania.

The questionnaire had several sections designed to collect data on issues such as educational background, professional status, entrepreneurial intentions and motivations, personality traits, and socio-demographic characteristics.

Respondents' entrepreneurial intentions were assessed by asking a question adapted from Wang et al. (2011): "Will you start or manage your own business in the foreseeable future (the next 2 to 3 years)?". The answer choices were "I certainly will not", "I'm taking this possibility into consideration", "I certainly will", and "I have already started the procedures to establish my own business". Those that chose the first option were attributed a 0% probability of becoming entrepreneurs in the next few years. Those that selected the second option received a supplementary opened question that required them estimate the probability of starting their own business on a scale from 0% to 100%. Respondents that chose the third or the forth answer were considered to have a 100% probability. Individuals that said, in a previous question, that they already had their own business were also allocated a 100% probability.

The three personality traits were evaluated on multi-item scales with possible answers ranging from 1 (strongly disagree) to 5 (strongly agree). High scores on these scales indicate that the respondent is more willing to take risks, more creative or that he or she has a stronger need for achievement.

The questionnaire was administered using a specialized online platform that offered the possibility to send email invitations to all the students under consideration. A stratified sampling procedure was used and the sample structure was similar to that the population of students that was considered, in terms of socio-demographic aspects and study program distribution. Partially completed

or otherwise invalid questionnaires were eliminated, resulting in a final sample of 682 responses.

FINDINGS AND DISCUSSIONS

4.1. Entrepreneurial intentions by gender and religion

In our study, overall, male respondents indicated a higher average probability of starting their own business (M=50.43%) than women (M=36.78%), p=0. This is also true within the two religious groups investigated. Catholic men's average probability was 57.77% and that of Catholic women was 25.43%, with a p value of 0.006. For the Orthodox respondents the results were M=50% for males and M=37.88% for females, p=0. As it can be noted, the gender discrepancy in entrepreneurial intention is higher in the case of the Catholics than in the case of the Orthodox, but not as we had expected, according to previous studies (Iacob et al. 2006). As we have mentioned above, in general, the theory considers that Orthodox values are less stimulating for an intense entrepreneurial life. What could then be the explanation of the fact that, in our case, the entrepreneurial intentions are more present in the case of young Orthodox than in that of the Catholics?

The secularization hypothesis (Barro and McCleary 2003) seems to be a good one to offer some explanations. The diminishing social role of the church led to the loss of religion's ability to significantly influence the economic behaviors. In the economic environment, a number of other factors, much more prominent, determine the results. According to Barro and McCleary's analysis (Barro and McCleary 2003), religious diversity is able to stimulate competition among the supporters and institutions and that may have positive effects on social and economic level (Iannaccone 1988, 1991; Stark and Bainbridge 1987). On the contrary, in a situation where there is a dominant state religion, as in the case of Romania, and some statistically not significant religions, this leads to a low participation and involvement (Chaves and Cann 1992; Iacob and Neculau 2013). Moreover, in case of centralized or former communist states, where religion and church have been sidelined, the same phenomenon happened – the regression of church's role in determining the individuals' behaviors (Barro and McCleary 2003). Again, Romania is in this group. Therefore, due to the secularization phenomenon, after which the institutional commitment to church decreases, and as a result of the long period of ideological removal of religion, the influence of the religious norms on the daily behavior considerably decreased in Romania. So, the young Orthodox people do not choose whether or not to become entrepreneurs

based on the values or precepts induced by church and religion. There are other criteria influencing their choice. Instead, in the case of our sample, we see the gap between men and women's intentions. If we assume the hypothesis launched above, according to which the church influence on the individuals' decisions has decreased, then the only explanation for the differences between the two genders is related to the social traditions, deeply rooted in the collective mind.

Therefore, H1 is confirmed and H2 is rejected.

4.2 Desire to achieve a certain social status and prestige

According to our study, 61.2% of the respondents consider the desire for recognition and social positioning as a psychological motivation for starting a business. What is more intriguing is that the desire can be found more often among the Orthodox (62.2%) than among the Catholics (47.2%). A chi-square test indicated that the association between religion and the presence or absence of this motivation is significant ($p=0.047$).

Therefore, we have to reject the two initial hypotheses (H3 and H4). The rigor of Orthodoxy, the fact that the concern for material wealth is seen as a threat to the salvation of the soul, should determine the Orthodox to be less inclined to get recognition through businesses and money. One possible explanation lies in the power distance, generated by the secularization phenomena of the Orthodox Church.

4.3 Need for achievement and entrepreneurial intentions

In our study, we were curious to find out what is the relationship between the religious affiliation, the need for achievement and the entrepreneurial intentions. We were surprised when we found that, in the total sample, there is a weak correlation between the need for achievement and the entrepreneurial intention, which shows that students do not yet have a clear idea of what a business means and the "shortcuts" offered as models by the Romanian society (business based on speculation with high yields, but also apparently high risks, substantial incomes obtained by non-profit activities) change the perception of business as a source of personal achievement. Bivariate correlation analyses, based on the Pearson coefficient, indicated that the students' entrepreneurial intentions are positively and significantly correlated with their personality traits.

The results presented in Table 1 show a medium strength correlation between the entrepreneurial intentions on one hand and the respondents' willingness to take risks and their creativity on the other hand (r=0.344 and r=0.356, respectively). There is also weak correlation in the case of the need for achievement (r=0.109), which allows us to consider H5 partially confirmed.

However, we have tried to see if there are some differences among the young Orthodox and Catholics. By analyzing the two religious groups separately, it can be noted that these correlations are stronger in the case the Catholics than in that of the Orthodox (Table 1). The most remarkable difference is in the case of the need for achievement. Catholics' entrepreneurial intentions are more pronounced as their need for achievement is higher (r=0.321), while for the Orthodox, such a relationship is not very obvious (r=0.089).

Table 1: Pearson correlation coefficients and *p* values for the relationship between entrepreneurial intentions and personality traits

Personality traits	**Total sample**		**Catholics**		**Orthodox**	
	r	p	r	p	r	p
Propensity to take risks	0.344	0	0.448	0.001	0.331	0
Innovativeness	0.356	0	0.440	0.001	0.357	0
Need for achievement	0.109	0.004	0.321	0.017	0.089	0.026

The obtained results are somewhat different than those we obtained when testing the personal motivations for developing a business. If there we have observed a higher result for Orthodox students, which we have explained through a shorter distance to power, given by the majority status of the Orthodoxy, this time what we have obtained support for one of the basic assumptions that Orthodoxy is less favorable to entrepreneurship. As we can see, the young Catholics possess a psychological background more suitable for business. Since there are no other possible differences between young people from our sample, it is legitimate to conclude that the influence of the norms and religious precepts on the environment where they were educated led to the acquisition of certain personality traits, which are favorable for entrepreneurial activity. H6 is therefore confirmed.

4.4 Other analysis

Several independent-samples t-tests were conducted in order to compare the entrepreneurial intentions of the various groups or respondents for each of the two religious categories considered. The aim was to identify further potential

differences between Catholics and Orthodox in terms of probability of starting a business. The results of these tests, presented in Table 2, were similar for both for religious groups.

Table 2: Results of independent-samples *t-tests* using "probability to start a business" as the test variable

Grouping variable	**Groups**	**Catholics**		**Orthodox**	
		Mean probability of starting a business (%)	**p**	**Mean probability of starting a business (%)**	**p**
Entrepreneurial education in university	Yes	41.25	0.014	46.28	0
	No	19.81		35.30	
Currently employed	Yes	41.81	0.214	42.19	0.481
	No	27.95		40.16	
Entrepreneurial model – parent	Yes	32.63	0.758	52.27	0
	No	29.72		34.45	
Entrepreneurial model – sibling	Yes	39.54	0.324	57.01	0
	No	28.52		38.88	
Entrepreneurial model – friend	Yes	40.55	0.030	46.23	0
	No	21.25		34.72	
Gender	Female	25.43	0.006	37.88	0
	Male	57.77		50.00	
Residence environment	Rural	20.20	0.026	39.87	0.663
	Urban	38.87		41.14	

Respondents who have had some form of entrepreneurial education during their graduate studies indicate a higher probability to start a business. The same is true for those who have had an entrepreneurial model in their lives, either a close relative or a close friend.

Other results show that respondents who are currently employed as well as those who reside in the urban areas are also more likely to become entrepreneurs. However, the differences are significant only in the case of the Catholics' residence environment (p=0.026).

Overall, male respondents indicated a higher average probability of starting their own business (M=50.43%) than women (M=36.78%), p=0.

This is also true within the two religious groups investigated. Catholic men's average probability was 57.77% and that of Catholic women was 25.43%,

with a p value of 0.006. For the Orthodox respondents the results were M=50% for males and M=37.88% for females, p=0. As it can be noted, the gender discrepancy in entrepreneurial intention is higher in the case of the Catholics than in the case of the Orthodox.

CONCLUSIONS

Our study started from the basic assumption that the religious factor, as an important dimension of social capital, plays a significant role in the development of entrepreneurial intentions among young people. Moreover, starting from Weberian approaches, we assume that there are differences between the influences of different religions, in our case the Orthodox and the Catholic. Evaluating the two Christian religions in terms of doctrine and relying on a series of previous studies, we anticipated that Orthodoxy had a significant negative influence on the development of entrepreneurship among young people. Processing the data from our survey, we surprisingly found out that young Orthodox persons are more optimistic regarding their future ability to develop businesses. Unfortunately, this optimism has not been proven by the assessment of their personality traits, which are very important when it comes to the success in business. We found that there are differences, some of them quite large, between the young Orthodox people and Catholics when it comes to the relationship between their entrepreneurial intentions and their risk-taking capacity, need for achievement and innovation capacity. As we expected, the influence of the Orthodox religious on the familial and cultural environment in which these young people have been raised had an impact on the ability to develop businesses. As we have seen, the Orthodox Church is more severe when it comes to the principles of capitalism, strongly denying the selfishness, the material prosperity, the capital accumulation. Instead, Catholicism, wanting to face the consequences of the Reform, became more tolerant and adapted to the socio-economic evolutions generated by the spread of global capitalism. Therefore, it is possible that the critical attitude towards the economic opportunism, towards businesses and gains, in general, still influences the behavior of the young people.

However, according to our results, the influence of the religious culture was not perceived as strongly as we have expected. A good example for this would be to analyze the sex differences in religious context. Initially, we assumed that the Orthodox rigor has perpetuated the traditional values regarding the role of women and men in the society. It was expected that the difference between entrepreneurial intentions of the Orthodox men and women to be higher than among Catholics. We

found out that it is not so. On the contrary, our results are similar in the case of the Orthodox persons, fact that we could only explain through the exogenous influences and the diminishing religious footprint at the societal level. In other words, if the attitude toward capitalism remained fairly conservative, there is a certain change in the view regarding the social norms. This produced a favorable mutation for young Christians, especially for the Orthodox, encouraging them to improve their perspectives related to the entrepreneurship.

Our research has some *limitations*, generated mainly by the fact that there was not a controlled sample. Therefore, the number of the Catholic respondents was quite low, below 10%, which means that it may have influenced the results, up to a certain level. Another limitation refers to the territorial dispersion of our sample, the respondents being students from only one university.

In future research, we might expand the sample in order to analyze the differences in entrepreneurial intentions for all the major religions in Romania. We want to find out to what extent the Weberian hypothesis can be tested on Romanian Catholics and Protestants and to determine the distance to the entrepreneurial intentions of the young Orthodox persons. Meanwhile, we intend to conduct these analyses on a sample controlled in terms of gender and religion.

REFERENCES

1. Allen, I.E., Elam, N., Langowitz, N. & Dean, M. (2008). Global Entrepreneurship Monitor 2007 Report on Women and Entrepreneurship, Wellesley: Babson College and London Business School.
2. Apospori, E., Papalexandris, N. & Galanaki, E. (2005). Entrepreneurial and professional CEOs: Differences in motive and responsibility profile, *Leadership & Organization Development Journal*, vol. 26, no. 2, pp. 141-162, doi:10.1108/01437730510582572.
3. Arruñada, B. (2010). Protestants and Catholics: Similar Work Ethic, Different Social Ethic*, *Economic Journal*, vol. 120, pp. 890-918, doi:10.1111/j.1468-0297.2009.02325.x.
4. Audretsch, D.B., Boente, W. & Tamvada, J.P. (2007). Religion and entrepreneurship, *Jena Economic Research Paper No. 2007-075*.
5. BarNir, A., Watson, W.E. & Hutchins, H.M. (2011). Mediation and Moderated Mediation in the Relationship among Role Models, Self-Efficacy, Entrepreneurial Career Intention, and Gender, *Journal of Applied Social Psychology*, vol. 41, no. 2, pp. 270-297, doi:10.1111/j.1559-1816.2010.00713.x.
6. Barro, R.J. & McCleary, R. (2003). Religion and economic growth, National Bureau of Economic Research.
7. Becker, S.O. & Woessmann, L. (2009). Was Weber Wrong? A Human Capital Theory of Protestant Economic History, *The Quarterly Journal of Economics*, vol. 124, no. 2, pp. 531-596, doi:10.1162/qjec.2009.124.2.531.
8. Bénabou, R. & Tirole, J. (2006). Belief in a Just World and Redistributive Politics, *The Quarterly Journal of Economics*, vol. 121, no. 2, pp. 699-746, doi:10.1162/–qjec.2006.121.2.699.
9. Blum, U. & Dudley, L. (2001). Religion and economic growth: was Weber right?, *Journal of Evolutionary Economics*, vol. 11, no. 2, pp. 207-230.
10. Bowen, D.D. & Hisrich, R.D. (1986). The Female Entrepreneur: A Career Development Perspective, *Academy of management review*, vol. 11, no. 2, pp. 393-407.
11. Carter, N.M., Gartner, W.B., Shaver, K.G. & Gatewood, E.J. (2003). The career reasons of nascent entrepreneurs, *Journal of Business Venturing*, vol. 18, no. 1, pp. 13-39.
12. Chaves, M. & Cann, D.E. (1992). Regulation, Pluralism, and Religious Market Structure: Explaining Religion's Vitality, *Rationality and society*, vol. 4, no. 3, pp. 272-290, doi:10.1177/1043463192004003003.
13. Chen, C.C., Greene, P.G. & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers?, *Journal of Business Venturing*, vol. 13, no. 4, pp. 295-316, doi:http://dx.doi.org/10.1016/S0883-9026(97)00029-3.
14. Cromie, S. (1987). Motivations of aspiring male and female entrepreneurs, *Journal of Occupational Behaviour*, vol. 8, no. 3, pp. 251-261, doi:10.1002/job.4030080306.
15. Entrialgo, M., Fernández, E. & Vázquez, C.J. (2000). Characteristics of Managers as Determinants of Entrepreneurial Orientation: Some Spanish Evidence. *Enterprise and Innovation Management Studies*, vol. 1, no. 2, pp. 187-205, doi:10.1080/–14632440050119596.
16. Fanfani, A. (2003). Catholicism, Protestantism, and Capitalism, Norfolk: IHS Press.

17. Fish, M.S. (2002). Islam and Authoritarianism, *World Politics*, vol. 55, pp. 4-37, doi:doi:10.1353/wp.2003.0004.
18. Fry, L.W. (2003). Towards a theory of spiritual leadership, *The Leadership Quarterly*, vol. 14, pp. 693-727.
19. Georgellis, Y. & Wall, H.J. (2005). Gender differences in self-employment, *International Review of Applied Economics*, vol. 19, no. 3, pp. 321-342, doi:10.1080/02692170500119854.
20. Gotsis, G. & Kortezi, Z. (2009). The impact of Greek Orthodoxy on entrepreneurship: a theoretical frameworknull, *Journal of Enterprising Communities: People and Places in the Global Economy*, vol. 3, no. 2, pp. 152-175, doi:10.1108/17506200910960851.
21. Gruber, J. & Hungerman, D.M. (2008). The Church Versus the Mall: What Happens When Religion Faces Increased Secular Competition?, *The Quarterly Journal of Economics*, vol. 123, no. 2, pp. 831-862, doi:10.1162/qjec.2008.123.2.831.
22. Guiso, L., Sapienza, P. & Zingales, L. (2003). People's opium? Religion and economic attitudes, *Journal of Monetary Economics*, vol. 50, no. 1, pp. 225-282, doi:http://dx.doi.org/10.1016/S0304-3932(02)00202-7.
23. Guiso, L., Sapienza, P. & Zingales, L. (2006). Does Culture Affect Economic Outcomes?, *Journal of Economic Perspectives*, vol. 20, pp. 23-48, doi: 10.1257/jep.20.2.23.
24. Gwinn, J.D., Judd, C.M. & Park, B. (2013). Less power = less human? Effects of power differentials on dehumanization, *Journal of Experimental Social Psychology*, vol. 49, no. 3, pp. 464-470, doi:http://dx.doi.org/10.1016/j.jesp.2013.01.005.
25. Hollenshead, C. & Wilt, J. (2000). Women and the MBA: Gateway to Opportunity, Michigan: Catalyst.
26. Hout, M. & Rosen, H. (2000). Self-Employment, Family Background, and Race, *Journal of Human Resources*, vol. 35, no. 4, pp. 670-692, doi:10.2307/146367.
27. Huntington, S.P. (1996). The Clash of Civilisations and the Remaking of World Order, New York: Simon & Schuster.
28. Iacob, L., Matei, D. & Boza, M. (2006). Similitudini şi diferenţe în reprezentarea socială a puterii. Perspectiva comparativă femei – bărbaţi, *Revista de Psihologie Socială*, vol. 17, pp. 15-42.
29. Iacob, L.M., Neculau, A. (2013). Paradoxical aspects of the social representation of power in the Romanian context, *Revista de Psihologie Socială*, vol. 32, pp. 105-123.
30. Iannaccone, L.R. (1988). A Formal Model of Church and Sect. *American Journal of Sociology*, vol. 94, pp. S241-S268.
31. Iannaccone, L.R. (1991). The Consequences of Religious Market Structure: Adam Smith and the Economics of Religion, *Rationality and society*, vol. 3, no. 2, pp. 156-177, doi:10.1177/1043463191003002002.
32. Ibrahim, N.A. & Angelidis, J.P. (2005). The Long-Term Performance of Small Businesses: Are there Differences Between "Christian-Based" Companies and their Secular Counterparts?, *Journal of Business Ethics*, vol. 58, no. 1/3, pp. 187-193, doi:10.1007/s10551-005-1413-8.
33. Inglehart, R. & Baker, W.E. (2000). Modernization, Cultural Change, and the Persistence of Traditional Values, *American Sociological Review*, vol. 65, pp. 19-51.
34. Kelley, D.J., Singer, S. & Herrington, M.D. (2012). The Global Entrepreneurship Monitor: 2011 Global Report, Wellesley: Babson College.

35. Koh, H.C. (1996). Testing hypotheses of entrepreneurial characteristics: A study of Hong Kong MBA students, *Journal of Managerial Psychology*, vol. 11, no. 3, pp. 12-25, doi:10.1108/02683949610113566.
36. Kumar, A., Page, J.K. & Spalt, O.G. (2011). Religious beliefs, gambling attitudes, and financial market outcomes, *Journal of Financial Economics*, vol. 102, no. 3, pp. 671-708, doi:http://dx.doi.org/10.1016/j.jfineco.2011.07.001.
37. Landes, D.S. (1999). The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor, New York: W. W. Norton & Company.
38. Langowitz, N. & Minniti, M. (2007). The entrepreneurial propensity of women, *Entrepreneurship theory and practice*, vol. 31, no. 3, pp. 341-364.
39. Lehrer, E.L. (2004). Religion as a Determinant of Economic and Demographic Behavior in the United States, *Population and Development Review*, vol. 30, no. 4, pp. 707-726, doi:10.1111/j.1728-4457.2004.00038.x.
40. Liao, T.F. & Stevens, G. (1994). Spouses, Homophily, and Social Networks, *Social Forces*, vol. 73, pp. 693-707.
41. Loon, M. & Casimir, G. (2008). Job-demand for learning and job-related learning: The moderating effect of need for achievement, *Journal of Managerial Psychology*, vol. 23, no. 1, pp. 89-102, doi:10.1108/02683940810849684.
42. Maes, J., Leroy, H. & Sels, L. (2014). Gender differences in entrepreneurial intentions: A TPB multi-group analysis at factor and indicator level, *European Management Journal*, vol. 32, no. 5, pp. 784-794, doi:http://dx.doi.org/10.1016/j.emj.2014.01.001.
43. Marlino, D. & Wilson, F. (2002). Teen Girls on Business: Are They Being Empowered?, Boston and Chicago: Simmons School of Management and The Committee of 200.
44. Marsden, P.V. (1987). Core Discussion Networks of Americans, *American Sociological Review*, vol. 52, pp. 122-131.
45. McCleary, R.M. & Barro, R.J. (2006). Religion and Political Economy in an International Panel, *Journal for the Scientific Study of Religion*, vol. 45, no. 2, pp. 149-175, doi:10.1111/j.1468-5906.2006.00299.x
46. McClelland, D.C. (1961). The Achieving Society, Van Nostrand: Princeton.
47. McClelland, D.C. (1965). Toward a theory of motive acquisition, *American Psychologist*, vol. 20, no. 5, pp. 321-333, doi:10.1037/h0022225.
48. McClelland, D.C. (1985). How motives, skills, and values determine what people do, *American Psychologist*, vol. 40, no. 7, pp. 812-825, doi:10.1037/0003-066X.40.7.812.
49. McPherson, J.M. & Smith-Lovin, L. (1986). Sex Segregation in Voluntary Associations, *American Sociological Review*, vol. 51, pp. 61-79.
50. Minniti, M. & Nardone, C. (2007). Being in Someone Else's Shoes: the Role of Gender in Nascent Entrepreneurship, *Small Business Economics*, vol. 28, no. 2-3, pp. 223-238, doi:10.1007/s11187-006-9017-y.
51. Minns, C. & Rizov, M. (2005). The spirit of capitalism? Ethnicity, religion, and self-employment in early 20th century Canada, *Explorations in Economic History*, vol. 42, pp. 259-281, doi:http://dx.doi.org/10.1016/j.eeh.2004.07.002.
52. Moore, G. (1990). Structural Determinants of Men's and Women's Personal Networks, *American Sociological Review*, vol. 55, pp. 726-735.
53. Nietzsche, F. (2010). Voința de putere, București: Antet.
54. Nunziata, L. & Rocco, L. (2011). The implications of cultural background on labour market choices: The case of religion and entrepreneurship, *Discussion Paper series*,

Forschungsinstitut zur Zukunft der Arbeit, No. 6114, http://nbn-resolving.de/–urn:nbn:de:101:1-201111303467 (accessed on August 2014).
55. Popielarz, P.A. (1999). Voluntary Association: A Multilevel Analysis of Gender Segregation in Voluntary Organizations, *Gender & Society*, vol. 13, no. 2, pp. 234-250.
56. Putnam, R.D. (1993). The Prosperous Community: Social Capital and Public Life. *The American Prospect*, vol. 13, no. 4, pp. 35-42.
57. Ratcliff, N.J. & Vescio, T.K. (2013). Benevolently bowing out: the influence of self-construals and leadership performance on the willful relinquishing of power, *Journal of Experimental Social Psychology*, vol. 49, no. 6, pp. 978-983, doi:http://dx.doi.org/–10.1016/j.jesp.2013.06.003.
58. Rice, G. (2003). The challenge of creativity and culture: a framework for analysis with application to Arabian Gulf firms, *International Business Review*, vol. 12, no. 4, pp. 461-477, doi:http://dx.doi.org/10.1016/S0969-5931(03)00039-8.
59. Schaltegger, C.A. & Torgler, B. (2010). Work ethic, Protestantism, and human capital, *Economics Letters*, vol. 107, no. 2, pp. 99-101, doi:http://dx.doi.org/10.1016/–j.econlet.2009.12.037
60. Scott, M.G. & Twomey, D.F. (1988). The Long-Term Supply of Entrepreneurs: Students' Career Aspirations in Relation to Entrepreneurship, *Journal of Small Business Management*, vol. 26, no. 4, pp. 5-13.
61. Smith, A. (1904). An Inquiry into the Nature and Causes of the Wealth of Nations, 5th ed., London: Methuen and Co., Ltd.
62. Sombart, W. (1911). Die Juden und das Wirtschaftsleben, Leipzig: Duncker & Humblot.
63. Stark, R. & Bainbridge, W.S. (1987). A Theory of Religion, New York: Peter Lang.
64. Stăniloae, D. (1981). Teologia morală ortodoxă pentru institutele teologice, vol. III, Bucureşti: Editura Insititutului Biblic şi de Misiune al Bisercii Ortodoxe Române.
65. Steffy, K. (2013). Religious Orthodoxy and the American Worker, *Sociology of Religion*, vol. 74, no. 1, pp. 1-29, doi:10.1093/socrel/srs074.
66. Stewart, W.H., Jr., Watson, W.E., Carland, J.C. & Carland, J.W. (1999). A proclivity for entrepreneurship: A comparison of entrepreneurs, small business owners, and corporate managers, *Journal of business venturing*, vol. 14, no. 2, pp. 189-214, doi:http://dx.doi.org/10.1016/S0883-9026(97)00070-0.
67. Stulz, R.M. & Williamson, R. (2003). Culture, openness, and finance, *Journal of Financial Economics*, vol. 70, no. 3, pp. 313-349, doi:http://dx.doi.org/10.1016/S0304-405X(03)00173-9.
68. Tracey, P. (2012). Religion and Organization. A Critical Review of Current Trends and Future Directions, *The Academy of Management Annals*, vol. 6, no. 1, pp. 87-134, doi:10.1080/19416520.2012.660761.
69. Turan, M. & Kara, A. (2007). An exploratory study of characteristics and attributes of Turkish entrepreneurs: A cross-country comparison to Irish entrepreneurs, *Journal of International Entrepreneurship*, vol. 5, no. 1-2, pp. 25-46, doi:10.1007/s10843-007-0014-2.
70. Wang, W., Lu, W. & Kent, M.J. (2011). Determinants of Entrepreneurial Intention among College Students in China and USA, *Journal of Global Entrepreneurship Research*, vol. 1, no. 1, pp. 35-44.
71. Weber, M. (1930). The Protestant Ethic and the Spirit of Capitalism, London: George Allen & Unwin Ltd.

72. Wilson, F., Kickul, J. & Marlino, D. (2007). Gender, Entrepreneurial Self-Efficacy, and Entrepreneurial Career Intentions: Implications for Entrepreneurship Education, *Entrepreneurship theory and practice*, vol. 31, no. 3, pp. 387-406, doi:10.1111/j.1540-6520.2007.00179.x.
73. Worden, S. (2005). Religion in Strategic Leadership: A Positivistic, Normative/ Theological, and Strategic Analysis, *Journal of Business Ethics*, vol. 57, no. 3, pp. 221-239, doi:10.1007/s10551-004-6943-y.
74. Yousef, D.A. (2000). Organizational Commitment as a Mediator of the Relationship between Islamic Work Ethic and Attitudes toward Organizational Change, *Human Relations*, vol. 53, no. 4, pp. 513-537, doi:10.1177/0018726700534003.

CASE STUDY

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FROM THE HANDICAP PRINCIPLE TO BRAND STRATEGY – ARE GENDER EQUALITY PRACTICES AND CSR RELATED?

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Abstract: *There is increasing interest in determining the impact that employment of women in management positions may have on corporate social responsibility (CSR) initiatives. Various authors suggest that gender equality practices should be factored into the broader framework of CSR. Public policy could adopt an ethic that strengthens the moral commitment to social involvement of men and women alike, and expresses public responsibility for women's experiences in both the public and private spheres. Following this logic, the research question for the present article is: What marketing strategy factors can be utilized by women to influence their attainment of senior managerial positions?*

This article deals with the qualitative stage of a mixed method study that will answer the research question. The aim of the qualitative research design is to examine attitudes toward motivational factors and the environment that affect the strategic marketing of women to management positions. The research tool is a semi-structured in-depth interview, followed by a content analysis of data from transcripts. The research population includes ten women of different ages presently employed in managerial positions in Israel's Ministry of Education. Future research directions and managerial implications are derived from this qualitative study.

Keywords: *personal marketing; gender equality; management; behavioral economics; handicap principle*

1. INTRODUCTION

The qualitative research presented in this article focuses on the self-marketing steps that women have taken in order to obtain a managerial position and uses Zahavi's handicap principle in discussing personal strategies. The article

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begins with a discussion about the concepts of behavioral marketing, and goes on to describe relevant theories in personal marketing. Gender inequality in the labor market will be discussed in general, and in relation to Israel and its education system in particular. The literature review section will examine the situation in Israel's Ministry of Education with respect to the number of women in managerial positions. Larrieta-Rubín de Celiset, et al. (2015) used information collected in Spain from signatories to the Women's Empowerment Principles, and found that the presence of women in managerial positions has a positive impact on CSR activities. Despite the significance of a slightly increased presence of women in senior management positions, very little research has been done to explain how strategic marketing can effectively promote women to positions within the higher managerial ranks of Israel's Ministry of Education.

Studies indicate that male and female managers have different management styles, which is also reflected in the way they are promoted within the organization. Men tend to advance in a more upward direction, whereas women's advancement is more horizontal and less upward. Different managerial abilities have been attributed to women and men: men tend to be more assertive; women are more likely to involve other employees in the decision making process. These distinctions of management styles also play a part in their advancement within the organization. Since men earn more because they work more, they are perceived by employers as being better because of the difference in salary, a discrepancy, which rather than diminishing, continues to be maintained (Barbera et al., 2000; Eagly & Johannesen-Schmidt, 2001; Eagly et al., 2003)

Not only is inequality in regard to the promotion of men and women to management positions preserved, but studies show that there are solid explanations for its perpetuation. Society ascribes different roles to men and women, and these attributions greatly reduce the possibilities of advancement, while at the same time contributing to the preservation of the problem and the glass ceiling for women who wish to advance. (Instituto de la Mujer, 2008; ISOTES, 2012; Lyness & Heilman, 2006; Thornton, 2012)

In view of the problem of achieving equality between women and men regarding their ability to attain managerial positions, and taking into account the objective difficulties they face in today's society when attempting to balance between work and home, various solutions have been suggested on three levels: governmental, organizational, and individual. Some of the proposals made on the governmental level include: allowing people to work part-time from home, making childrearing expenses part of a salary package, and providing wage increases for

those who are also caring for their elderly parents. On the organizational level, suggestions included: developing a supportive organizational culture for families, providing an assistant for the director when needed, and more. On the individual, family level, a proposal was made proposed to rethink the tasks that need to be performed in the household, when they are performed, and who is responsible for performing them.

These proposals have not yet solved the problem and creative thinking is required in order to continue to explore and try to promote equal opportunities for women to progress to managerial positions.

2. LITERATURE REVIEW

Behavioral theorists have suggested that human decision making is not necessarily based on concrete or rational thinking. Individuals often follow certain traditions, and attempt to avoid risks and difficulties. Prospect theory is associated with behavioral theory, and its advocates argue that human behavior may be dictated by a desire to avoid loss rather than the desire to generate profits (Guzavicius et al. 2015). From an educational and psychological perspective, this theory strengthens the claim that even in the twenty-first century, women are hesitant to break the tradition, and prefer to remain at home without any career goals rather than working outside the home and working toward achieving those goals. One can see that today, when referring to working mothers, the expectation is still that of women integrated into the labor market finding a way to work while preserving their roles within the family (Ferrante, 2018[10]; O'Neal et al., 2008)

Gender roles, issues associated with work-life balance, and problems related to gendered organizations are the main factors delaying the achievement of gender equality. Working women do not get enough support from either the organization, the government, or their family to allow them to have a family life without feeling that they are giving up career advancement (Southworth, E., 2014). The GLOBE project defines "gender egalitarianism" as "societies' beliefs about whether members' biological sex should determine the roles that they play in their homes, business organizations, and communities" (House, Hanges, Javidan, Dorfman&Gupta, 2004: 347). When comparing female managers with their male counterparts in boundary management, a control position closer to a socially stereotyped masculine role, the results show that women have slightly higher

[10]https://www.forbes.com/sites/marybethferrante/2018/08/27/the-pressure-is-real-for-working-mothers/#26ef7d352b8f

access to boundary management as well as a significantly lower promotion time than male colleagues (Araújo-Pinzón, P, et al 2017). Women are also less "visible" than men in the labor market (Cassidy 2016).

Personal marketing designs strategies for a very special "product" – the human being (women, in our case). The decision to select a woman for a managerial position can be analyzed using the same general consumer behavior theory. According to Kotler and Armstrong (1994), purchasing decisions are made on the basis of four features – cultural, social, personal, and psychological. In most cases they cannot be controlled by marketers but must be taken into account in the marketing process. Cultural factors have the greatest influence on consumer behavior (Kotler and Armstrong, 1994). Culture is a basic system of values, perceptions, desires and behavior that are learned by members of society from their families and other important institutions. This study does not address the cultural factor because all the managers/principals under discussion are members of the same secular Jewish society.

Consumer behavior is also affected by social factors such as family, attitudes, and social roles. People are influenced by the groups to which they belong, those to which they aspire to belong, and the disengaged groups to which they do not want to belong. Family exerts the greatest influence on product acquisition. Understanding the dynamics of family decision-making is likely to help marketers build a branded marketing strategy. For example, people sometimes choose a brand to flaunt their status to society.

Purchasers' decisions are affected by personal, extrinsic factors such as age, economic status, personality, and self-perception. Personality refers to an individual's unique psychological traits that may lead to inconsistent reactions. Characteristic qualities are, for example, ambition, capability, adaptability, ability to connect, aggression, decisiveness, independence, self-confidence, and more.

Psychological factors also affect purchasing decisions. There are four key psychological factors: motivation, learning perception, beliefs, and opinions. In the context of our research, which seeks to find a suitable strategy for marketing women for management jobs on the basis of qualitative research findings, we have also turned to the natural world. Specifically, it may be useful to devise a branded marketing strategy based on the handicap principle. The handicap principle was formulated by the Israeli zoologist Amotz Zahavi to explain communication in the animal world. According to this principle, for a message to be believed, it has to match its source; hence, it is not worthwhile to send a false message. For example, the purpose of a message is often to demonstrate the health or fitness of a certain

individual and a signal (the strutting of a male peacock, for instance) is expressed in various forms of handicap (as in sports).

Gap in Knowledge

Millions of women are employed in the labor market today, and there has been a significant improvement in the employment data related to them. Studies have shown that working women in general, and in management positions in particular, contribute to the economy on both the national and personal levels (Ziman, 2013).

Despite the many existing plans to promote gender equality in the labor market, there is still a discrepancy between the number of men and women occupying managerial positions in the world in general, and for the purposes of this study, in Israel's Ministry of Education as well. In 2011, out of a total of 1,863 school principals, 42% were men and 58% were women. Although women constitute a majority, 64%, of principals in elementary schools, in secondary education only 44% are women. Education is considered a female profession; therefore, the number of women directors in the Ministry of Education is greater than their share in the labor market (Givoly, S. Heiman, F. Efraim Y,2012)

Shuv–ami (2011) states that "from the marketing point of view, it is good to plan actions that will get the marketing message across." The marketing mix is a combination of factors, which consists of the following seven Ps'– controlled variables: product, price, place, promotion, people, processes, and physical evidence. If we consider women as "products" in the employment market who need to be selected for managerial positions, then a comprehensive marketing strategy can be advanced to improvethe promotion of women.

Qualitative Study Approach and Results

The aim of the qualitative aspect of the study is to examine attitudes regarding motivational factors and the environment that affect the strategic marketing of women for employment in senior management positions.

The qualitative research was planned and conducted according to the seven stages delineated by Shkedi (2007). During the first stage, ten women were interviewed. Interviews were prearranged by telephone. Interviewees were given a brief description of the research aims and their agreement to participate in the study was obtained. At the start of each interview, they signed a consent form. Interview times ranged from 15 to 55 minutes. All interviews were conducted in a pleasant atmosphere, and the interviewees cooperated and answered all the interview questions.

A systematic content analysis has been used to produce 101 units of meaning (themes). Content analysis is a method of data analysis, which makes use of written content to identify themes that emerge from that content and classify it according to specific categories. Guba and Lincoln define the method as "any research technique that produces deductions, which systematically and objectively identify the characteristics of messages in given written materials." In content analysis, the collection of the materials and the analysis are not dependent on the researcher's presence contact with people in the field. As a result, a large number of studies are done using a deductive method, i.e., the researcher posits a theory which is the basis for confirming/refuting – by means of the empirical data – a given model.

The interview consisted of seven questions. The first was a broad, general question: "Tell me about your work and your role, as well as your background." The aim was to allow interviewees to talk openly and freely about their role and experiences, without being led by the interviewer. The research approach is a combined ethnographic study dealing with the human experience.

The research tool selected was that of an in-depth, semi-structured interview aimed at studying exactly how managers accomplished their jobs. The advantage of an in-depth, semi-structured interview is that it allows the researcher to add questions while conducting interviews in order to obtain a more comprehensive picture (Shkedi, 2010). The interview questions were open-ended in order to obtain the entire range of opinions and feelings without interference on the part of the researcher.

The study population consisted of managers in the Israeli's Ministry of Education. The sample, which is a convenience sample, was increased by means of the snowball method. (Tzabar Ben-Yehoshua, 2017).

Interview responses were categorized using the content analysis method. Every response was separated into units of meaning (from one word to a number of sentences) in which a single idea was identified. From these answers, themes were identified that were gathered and analyzed on the basis of Kotler's (1994) consumer behavior model. To understand what is important to consumers – in this case the women in the sample, who sought to advance to management positions – the four factors that influence buying decisions – cultural, social, personal, and psychological – were used. The thinking underlying the choice of this method of analysis was based on marketing theory, which argues that a relationship of trust must be developed between a consumer and a brand. Thus, it is not enough for "manager" to be a brand; consumers must also understand its value.

Most of the themes describing marketing factors related to achieving a management position fell under the category "social marketing factor" (52%).

About two-thirds of the social themes (68%) referred to "roles and status," one-quarter (24.5%) referred to "reference groups," and 7.5% referred to "family."

As an example, here are some quotes and the way in which they were assigned to influence factors:

Quote 1: "I am more influential than the CEO, the surgeon, or the Minister of Education.

(Indicates the use of status icons and associations.)

Quote 2: "I was in youth organization."

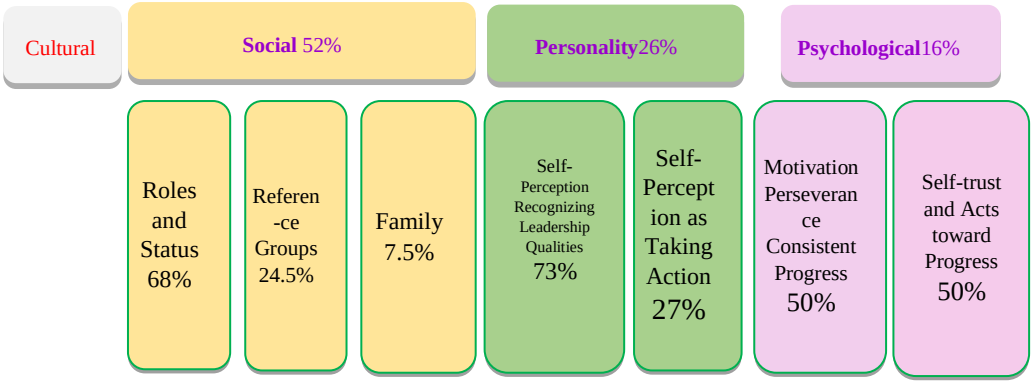
(Indicates the use of reference group.)

Quote 3: "The family never presented an obstacle."

(Indicates the use of family support [parents, husband].)

The main factors influencing the marketing of women to managerial positions, as resulted from the interviews, are presented in figure 1.

Figure 1: Findings – Main influence factors



We can see that the most influential perceived factors are those from the social category – 52%, followed at a distance by personality (26%) and psychological (16%).

CONCLUSIONS

This study examines, at an exploratory stage, the factors affecting the marketing of women for management positions. The results of the qualitative analysis are in line with Kotler's theoretical model regarding factors influencing buying decisions.

No marketing factors were found in the category "cultural marketing factor – cultural background." The cultural factor, which is considered the most influential of the four factors affecting the consumer according to Kotler's product consumption model, was not examined in the study. Instead, the results indicate that the social factor was most significant (52% of the 101 themes that emerged). Next in line was the personal factor, and finally, the psychological factor emerged as the least influential.

In order to advance the research, the findings related to the other two categories of Kotler's model, which are also presented in Figure 1 – the psychological category and the personal category – require further analysis. Such an analysis, together with the findings of the second stage, the quantitative stage, will enable us to understand the factors affecting the marketing of women for management positions; and in keeping with the conclusions reached, it will be possible to propose a marketing strategy for women interested in advancing to management positions in Israel's Ministry of Education. A follow-up study may even allow us to expand the conclusions of this research, and apply them to women working in other organizations.

REFERENCES

1. Araújo-Pinzón, P., Álvarez-Dardet, C., Ramón-Jerónimo, J. M., &Flórez-López, R. (2017). Women and inter-organizational boundary spanning: A way into upper management? European Research on Management and Business Economics, 23(2), 70-81.
2. Barbera, E., Sarrió, M., & Ramos, A. (2000). Mujeres y estilos de dirección. El valor de la diversidad. IntervenciónPsicosocial, 9(1), 49–62
3. Cassidy, H., DeVaro, J., &Kauhanen, A. (2016). Promotion signaling, gender, and turnover: new theory and evidence. Journal of Economic Behavior & Organization, 126, 140-166.
4. Eagly, A. H., Johannesen-Schmidt, M. C., & Van Engen, M. (2003). Transformational, transactional, and laissez-fair leadership styles: A meta-analysis comparing women and men. Psychological Bulletin, 129, 569–591.
5. Ferrante, M.B. (2018). The Pressure is Real for Working Mothers. Forbes Media: https://www.forbes.com/sites/marybethferrante/2018/08/27/the-pressure-is-real-for-working-mothers/#26ef7d352b8f
6. Givoly, S., Heiman, F., Efraim Y., .(2012)School Principals as Reflected in Statistics, the Current Situation, and Future Trends Avney Rosha ISRAEL
7. Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, *2*(163-194), 105
8. Guzavicius A., Giziene V., Zalgiryte L. (2015). Education as public good: Behavioral economics approach, *Procedia – Social and Behavioral Sciences*, Vol. 191, June 2015, pp. 884 – 889.
9. House, R. J., Hanges, P. J., Javidan, M., Dorfman, P. W., & Gupta, V. (2004). Leadershipculture, and organizations: The GLOBE study of 62 societies. Thousand Oaks, CA: Sage.
10. http://edu.gov.il/owlHeb/AboutUs/Pages/about.aspx
11. http://edu.gov.il/owlHeb/AboutUs/FreedomOfInformation/Pages/officemanagement.aspx#2
12. Instituto de la Mujer. (2007). La discriminaciónlaboral de la mujer: Una décadaaexamen. Madrid: Ministerio de Igualdad.
13. ISOTES. (2012). La mujerdirectivaenEspa˜na. Women as leaders. PriceWaterhouseCooper
14. Kotler, P., Armstrong, G., Brown, L., and Adam, S. (2006) *Marketing*, 7th Ed. Pearson Education Australia/Prentice Hall.
15. Larrieta-Rubín de Celis, I., Velasco-Balmaseda, E., Fernández de Bobadilla, S., Alonso-Almeida, M. D. M., &Intxaurburu-Clemente, G. (2015). Does having

women managers lead to increased gender equality practices in corporate social responsibility? Business Ethics: A European Review, 24(1), 91-110.

16. Eagly, A. H., & Johannesen-Schmidt, M. C. (2001). The leadership styles of women and men. Journal of Social Issues, 57, 781–797.
17. O'Neal, D., Hopkins, M.M., Bilimoria, D. (2008). Women's Careers at the Start of the 21st Century. Journal of business *Ethics*, 80: 727 – 743 Available at: https://www.researchgate.net/publication/5149246_Women's_Careers_at_the_Start_of_the_21st_Century_Patterns_and_Paradoxes.
18. Shkedi, A. (2003). "*Words that Try to Touch: Qualitative Research – Theory and Application*". Tel Aviv University: Ramot Publishing
19. Shuv-Ami, A. (2011). *Contemporary Marketing Strategies*. Hod Hasharon, Agam Publications (In Hebrew).
20. Southworth, E. M. (2014). Shedding gender stigmas: Work-life balance equity in the 21st century. Business Horizons, 57(1), 97-106.
21. Thornton, G. (2012). Women in senior management: Still not enough. Grant Thornton International Business Report.
22. Lyness, K. S., & Heilman, M. E. (2006). When fit is fundamental: Performance evaluations and promotions of upper-level female and male managers. Journal of Applied Psychology, 91, 777–785.
23. Tzabar Ben-Yehoshua, N. (2017). *Qualitative Research in Teaching and Learning*. Tel Aviv: Moet Institute.
24. *Weber, M. (2009). The theory of social and economic organization*. Simon and Schuster.
25. Ziman, R. (2013). *Women in the workforce: An In-Depth Analysis of Gender Roles and Compensation Inequity in the Modern Workplace*, University of New Hampshire Peter T. Paul College of Business and Economics fall U.S.A

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POTENTIAL IMPACT OF VIRTUAL TOUCHING ON ENDOWMENT AND FEELINGS OF OWNERSHIP. A LITERATURE REVIEW OF CONCEPTS AND SCALES

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Abstract: *Online sales increase at incredible paces, all over the world, and so are corresponding marketing efforts. One of the main deterrents of online selling is related to the impossibility of trying or touching products before taking the decision to buy. Previous studies on offline environments have proved that touching products makes people develop a feeling of ownership, a psychological sense of property that has positive consequences on their intention and decision to buy those products. Similar effects, adapted for the online environments, were less investigated, but the very few existent studies suggest that virtually touching a product through tactile interfaces (smartphone, iPad, tablet etc.) could be as important for consumer decisions as the content of the site and product information. Virtual touching could serve as emotional triggers, leading to feelings of ownership and endowment effects in online marketing. However, defining the concept of "virtual touching" is difficult – even the simple association of "touch" and "virtual" seems oximoronic.*

The purpose of the present study – a literature review type – is to investigate the tactile based creative online marketing, in order to conceptualize and operationalize the variable „virtual touching", thus being able to further suggest a research design which would enable us to measure the impact of online „touching" on consumer behaviour. The main analysed constructs related to virtual touching are: endowment effect, psychological ownership, haptic advertising, sensory online marketing, haptic imagery, haptic technology, reverse electrovibration.

Keywords: *sensory marketing, touch marketing, e-commerce, haptic marketing, sense of ownership, endowment effect*

JEL Classification*: M31, M37, L81, L11*

INTRODUCTION

Sensory marketing – not only through classical visual and audio stimuli, but also through smell and touch – proves to be very efficient in attracting customers

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and positively influencing their decision to buy (Linstrom, 2005; Peck & Childers, 2008; Krishna, 2012). In physical environments, all senses can be – and most of the time are – successfully used in marketing strategies. However, traditional shopping continues to be seriously challenged by online commerce, steadily growing – in 2018, retail e-commerce sales grew 23.3% over 2017, and are expected to account for 13.7% of global retail sales in 2019, not to mention the fact that it also influences up to 56% the in-store purchases (STATISTA). The top online purchasing category in 2018 was fashion, with 61% (NIELSEN), a sector in which we expect all senses to be challenged. Consequently, several questions arise – how can we use sensorial marketing for online transactions? Is it possible and efficient to use online some of the senses that we associate with face to face, physical experiences? What would virtual senses look like? These questions were at the basis of our present study, a literature review type, through which we investigated one particular sense – the tactile sensation – in order to conceptualize and operationalize the variable „virtual touching"; following this analysis we would be able to further suggest a research design which would enable us to measure the impact of online „touching" on consumer behaviour. We first conducted a key word search using all the words from the "touch" family (touch, tactile, haptic etc.), associated with key concepts from marketing (sale, advertising, online marketing etc.) followed by a selection of expressions or categories related to both online or virtual and touch or haptic. For example, touching a product in offline environments is associated with developing a sense of possession, important in subsequent buying decisions; using a mirroring procedure offline-oline, we investigated existent studies that tranferred this psychological mechanism from real touch to virtual touch situations. The main analysed constructs related to virtual touching, selected in the present study, are: endowment effect, psychological ownership, haptic advertising, sensory online marketing, haptic imagery, haptic technology, reverse electrovibration. After identifying and conceptualizing the main concepts, we identified operationalization possibilities – scales previously used to measure these concepts. The results of our investigation follow, into the next sections of the paper.

ENDOWMENT EFFECT, PSYCHOLOGICAL OWNERSHIP AND TOUCH

The endowment effect is defined as the people's tendency to overestimate the value of objects they own or they perceive as being their own. This overestimation leads to a gap between how much a person is willing to pay (WTP) for the product and how much is willing to accept (WTA) in order to sell it. The endowment effect

has been investigated in various areas due to its implications for rational decision-making. The researches showed that the endowment effect can appear in a variety of situations, not only for adults involved in economic activities or transactions, but even on children or monkeys (Harbaugh et al., 2001; Kanngiesser et al., 2011; Lakshminaryanan et al., 2008). In the investigated literature we came across two fundamental approaches on how the endowment effect is triggered. The first approach is that endowment effect is a manifestation of loss aversion (Carmon and Ariely 2000, Johnson et al., 2007, Kurt & Inman, 2013, Peters et al., 2003). According to this perspective, the sale of an object is perceived as a loss compared to the seller's reference point, while the purchase is perceived as a gain, compared to the buyer's reference point. Because individuals have an aversion to loss, they tend to value more the items they own than the items they can buy.

The second approach suggests that the ownership determines the endowment effect (Maddux et al., 2010; Morewedge et al., 2009; Peck & Shu, 2009; Carmon & Ariely, 2000. Ownership is sufficient to increase the perceived value of a good (Morewedge et al., 2009). The endowment effect is triggered by both psychological and legal ownership. The impact that property and psychological ownership have on the favourable assessment of a good is explained by the fact that people have positive attitudes towards themselves, and these attitudes are transferred to the objects they possess. The product is embedded in the owner's self-concept, becoming part of his identity and it is enriched with attributes related to his own concept. It is important to note that not only legal ownership, but also psychological ownership or the feeling that something "is mine" can lead to an endowment effect. Pierce et al., define psychological ownership as “the state in which individuals feel as though the target of ownership or a piece of that target is ‘theirs’” (Pierce et al., 2003, p. 86). The object of psychological ownership can consist of physical products, but could also include persons or intangible goods, like ideas.

Pierce, Kostova & Dirks (2003) discuss the three factors that determine the emergence of psychological ownership: controlling the ownership target, coming to intimately know the target, and investing the self into the target. Kirk, Swain and Gaskin (2015) identify three motivations that explain the psychological ownership: efficacy and effectance, enhancing self-identity, and having a place to dwell. In Kirk, Swain and Gaskin model, efficacy and effectance correspond to controlling the ownership target. According to them, the psychological ownership emerges when a person can control the object that the person owns.

Enhancing self-identity is defined as an investment of time or psychic energy into an object. So, individuals spend time in analysing, evaluating or using the

object. Studies also showed that psychological ownership can appear even in the lack of physical possession. Karhanna, Xu & Zhang, (2015) argue that individuals can feel owners even over virtual, digital content. For example, on e-commerce sites individuals spend time and energy searching for products, reading descriptions, searching for reviews, adding the product in the shopping cart and finalize the order – all these activities develop a sense of ownership.

Coming to intimately know the target refers to the emotional implications that can appear during the process of using an object. Familiarity, for example, can lead to emotional connections between the owner and the object. These emotional connections represent a strong antecedent for psychological ownership.

Fuchs, Prandelli, and Schreier (2010) studied how empowering customers to select the product range of a company influences demand (measured as purchase intentions and willingness to pay) and psychological ownership. The results showed that empowering consumers to select a product range will result in higher demand due the psychological ownership that appears for selected products.

Reb and Connolly (2007) explored the role of factual and subjective feelings of ownership by manipulating what the participants were told about the presence or lack of ownership and the physical possession of an object. The results showed that the monetary valuation of an object was rather influenced by the possession than by the factual ownership. Participants' feelings of ownership and the physical possession mediated the endowment effect. Pierce, Kostova and Dirks (2003) also suggest that psychological ownership is even more important than factual ownership in triggering endowment effect.

Boven and Dunning (2000) found out that the owners and potential buyers of an object tend to underestimate the magnitude of the endowment effect because they overestimate the similarity between the own evaluation of a product and others' valuation. The explanation is that people overestimate the similarity between feelings they have in the current situation (for example, as seller) and how they would feel in another role (for example, as buyer).

Carmon, Wertenbroch and Zeelenberg (2003) showed that when consumers have to choose between two similar options, they experience a feeling of discomfort as soon as they have made a decision in favour of one of the options. The authors argue that in such situations people are confronted with an anticipated sense of ownership, and when they decide for one option, they experience a sense of loss because they can no longer be seen as potential owners of the object they have not chosen. Carmon, Wertenbroch and Zeelenberg (2003) argue that the simple physical exposure to purchasing alternatives, the prior ownership of one of

the alternatives, and the anticipation of future consumer experiences incite attachment to available choices. This attachment can be enhanced when consumers are asked to imagine, simulate or anticipate consumption experiences during the deliberation process.

Researchers also showed that when individuals have the opportunity to touch an object, they report a higher ownership over the object (Peck & Shu, 2009; Shu & Peck, 2011; Brenner et al., 2007; Peck & Terry, 2003a). Some studies found that the experience of touching a pleasant object may influence purchasing decisions even if there are no other product information provided (Peck and Wiggins, 2006, Peck and Shu, 2009). Simply touching a product, touching a product's picture or even imagining possessing a product leads to a positive assessment. Grohmann and Spangenberg (2007) studied how consumers react in two different contexts where touching the product is not possible. In the first scenario, the object is physically present, but the participants are not allowed to touch it, while in the second scenario, the product is physically absent, but is presented on an internet page. The results of this experiment show that products are evaluated more positively when they are physically present, despite the fact that they cannot be touched compared to products that are available only on the internet.

Peck and Shu (2009) studied whether merely touching a product can lead to higher perceptions of ownership. During four experiments, they found that the possibility of touching an object increases the perceived ownership, and the object valuation is more positive when the touch experience provides neutral or positive feedback. The results also revealed that touch influences customer decisions even when there is no relevant information about the product attributes provided by touch.

Brasel and Gips (2013) explored how touch screen interfaces can enhance psychological ownership and endowment effect. The results show that tactile devices such as tablets can lead to higher product valuation compared to laptops or traditional computers. Their study showed that psychological ownership and endowment effect are higher for objects for which touch is normally a primary criterion for evaluation.

Vries et al. (2018) also investigated how using a touch screen can influence endowment effect and psychological ownership during grocery online shopping. The results showed that on food items there are no differences between touch interfaces and non-touch interfaces. In this case touching products through a touch screen does not increase psychological ownership and endowment effect. One of the explanations for these results is that "food items can be considered 'low involvement' purchases" (Vries et. al., 2018, p. 71).

NEED FOR TOUCH AND WTA-WTP GAP

Peck and Childers (2006) argue that there are individual differences in the consumers' "need for touch" value. It has been found that people experience varying degrees and different motivations in terms of need for touch before purchasing products. Peck and Childers (2006) categorize individuals in high need for touch and low need for touch people. The authors sustain that individuals with high need for touch buy more impulsively than individuals with low need for touch.

Regarding the motivation of touching the products, it was concluded that the need for touch can be split in two dimensions: the instrumental dimension and the autotelic dimension (Peck and Childers 2003b). The instrumental dimension refers to people's necessity to obtain useful information regarding product attributes (texture, weight) that will help them make a purchase decision – an objective or somehow cognitive motivation. The autotelic dimension refers to the pleasant sensory experience obtained by touching products – a subjective or somehow emotional motivation. Peck and Childers, (2003a) argue that people with a high need for touch are more confident and less frustrated when they touch products, while consumers with a low level of need for touch trust their evaluations, independent of the possibility of touching the products.

Citrin et al. (2003) also argue that the need for touch plays an important role in making buying decisions. Consumers with high need for touch are more sceptical about buying products on the Internet, especially those whose evaluation requires tactile cues. They also found that women show a greater need for touch when evaluating products, compared to men.

LEVELS OF TOUCH, VIRTUAL TOUCH AND HAPTIC TECHNOLOGY

Peck (2010) argues that, in marketing, touching a product can be achieved in four different situations (three pre-purchase behaviours and one hedonic behaviour). Firstly, consumers can touch a product in order to buy it, but without intentionally collecting product information by touching it – touch is not perceived as a necessary, objective source of information. Secondly, consumers can touch a product to gain information by visual inspection or by smell – in this case touching is just a vehicle for the other two senses (visual and olfactive). Thirdly, consumers can touch a product to gain additional information through tactile sense (for example, texture) – this would be an instrumental touch. Finally, consumers can only touch a product for the sensory experience – for the pleasure of the touch.

In order to understand how tactile information are received, processed and reflected in human behaviour, we can talk about "touch" on three levels: physiological, psychological and phenomenological.

The physiology of touch

Touching is defined as the sensation obtained by placing non-painful stimuli on the body surface (Horst, 2005). The body's perception of touch is a complex process involving neurological, chemical, and mechanical elements (Paterson, 2009). The tactile sense is a very complex system with many receptors located in the joints, muscles and skin, each having its own characteristics and responding to different stimuli. There are several touch sensors in the skin, associated with a specific type of receiver incorporated at different levels: some are sensitive to light touch, others respond to pressure, thermoreceptors react to temperature, and nociceptors transmit pain when injury occurs. The tactile sensation is the result of a chain of events that begins when a stimulus, such as heat, pressure or vibration, is applied to the body (Stenslie, 2010). This stimulus triggers a response from specialized receptors, depending on the type, magnitude and part of the skin where it is applied (Stenslie, 2010). The receptors convert mechanical or thermal stimuli into electrical signals which are transmitted through nerves to the brain. This process is called sensory transduction (Stenslie, 2010). Therefore, physiologically, touch comes from a wide range of mechanoreceptors and nerves. They transmit signals to the brain, where perceptions are formed.

The psychology of touch

The psychology of touch explains what happens when the signals and sensations (pressure, pain, heat) of the somato-sensory systems have reached the brain (Stenslie, 2010). In the literature we find suggestions about a necessary distinction between active and passive touch, depending on who is moving – the receptor part touching or the object touched. This distinction might be or not important depending on the size of the touched object, or the task accomplished through the touching process. Vega-Bermudez et al. (1991) state that there is no difference between active (the participant moves his finger on stimulus) and passive touch (the stimulus moves under the participant's finger) in terms of shape recognition, when the stimulation pattern is smaller than the fingertip. Vertillo et. al. (1999) compared how is perceived the roughness of an object by both active touch and passive touch, without finding differences between the two modes of

touch in the perception of hardness. Differences could arise not for the objective tasks, but rather at emotional level. Paterson (2009) argues that touch is closely related to affectivity and emotions, and in this case the distinction could be important. No matter if the touch is passive or active, the hedonic dimension of touching is important at psychological level, and specific technologies are created and tested in order to simulate these types of emotional reactions. Thus, the field of artificial emotional intelligence has been developed, which aims to create devices and applications that can recognize, interpret and simulate human feelings and human affection, including through touch.

Phenomenology of touch

Ratcliffe (2008) argues that the phenomenology of touch does not discriminate between the physical feeling and the global experience. He suggests that touching is not just a matter of "touching", but also of a "non-touching" – the lack of touch is often part of the touching experience. We could think about the „touch of the wind" or that of the heat, although we don't really touch anything. Ratcliffe talks about the fact that there may never be a complete absence of touch and that the feeling of warmth and cold can be considered part of the touch. This could be an important finding for the virtual touch field, since warmth and cold sensations can be transmitted through other senses, especially the visual one (colors and objects).

The concept of touch is not limited to the direct contact between an object and the skin, as main receptor. Indirect touch refers to the situation when a surface is "felt" through an instrument. Similar to kinaesthesia or proprioception, information that can be gathered through an instrument can be perceived as being part of the body. Studies have shown that indirect touch can provide an individual with sufficient information about an object's texture, for example. This information is transmitted through the axis of the instrument by vibration to specialized sensors, which translate them back into information about the texture.

Stenslie (2010) considers that virtual touch refers to how physical touch is perceived in the context of virtual media. Therefore, the experience of touching in these environments is a combination of real and measurable physical stimulation, and its mental perception or representation.

In the literature the concept of virtual touch is often identified with reverse electro vibration. Reverse electro vibration is an augmented reality technology that facilitates the electronic transmission of tactile stimuli, which allows haptic devices users to perceive the texture or the contour of objects displayed on touch interfaces devices. The term "haptic" is used in association with the tactile sense or areas like

tools engineering that allow tactile stimulation (Lindeman et. Al, 2004). Most often the term "haptic" is used to study the sensation of touch that appears when interacting with applications in the digital environment (Paterson, 2009, p. 12). Haptics involves an active interaction with virtual environments that allows the user to experience sensations similar to the interaction with real environments. Peterson (2009) defines haptics as a new mechanical channel to reproduce touch.

Through haptic technology "users are able to sense three dimensional virtual objects and manipulate them with respect to such features like shape, weight, surface textures, and temperature" (Sreelakshmi and Subash, 2017, p. 4182). Haptic technology allows the interaction between a user and different objects presented in a virtual environment "by applying forces, vibrations, or motions to the user" (Sreelakshmi and Subash, 2017, p. 4182). In recent decades haptic technology has led to the emergence of numerous devices capable of facilitating interactions with virtual objects very similar with the real ones. Specialists in haptic technology talk about two types of haptic stimulation: local stimulation and global stimulation. Local stimulation is performed at a single point of the finger and is specific to applications and devices developed for blind people. The global simulation is performed at the whole finger and is mainly used to improve the touch screens for smart phones, tablets or laptops (Messaoud, 2016).

In the mobile devices industry, haptic technology takes the form of vibrations that respond to the input provided by the user through touch screens. Smartphone manufacturers have already started using haptic technology: Apple offers its consumers the 3D Touch screen as well as a series of haptic effects games; Google Play also offers users a special games section called "Games you can feel".

SENSORY MARKETING, HAPTIC ADVERTISING AND HAPTIC IMAGERY

Sensory marketing is a powerful technique used mostly by traditional commerce for enhancing customer experiences by improving the look and atmosphere of the stores (Spence et al., 2014). Haptic advertising aims to trigger consumer emotions and enhance brand-consumer connections. This type of advertising is becoming more and more popular among brands. Peck and Wiggins (2006) studied the persuasive influence of touch in advertising. The authors investigated whether an advertising message that incorporates a tactile element, without providing information about the product attributes, will be more convincing for people who have a high level of autotelic need for touch compared to a message without a tactile element. The results showed that for persons with high autotelic dimension, a communication that incorporates tactile elements leads

to a high affective response and an increased persuasion, especially if the touch provides neutral or positive sensory feedback.

Despite the fact that the online environment is not as permissive as traditional stores, there are technologies used to stimulate smell, taste or touch. Yoganathan et. al. (2018) investigated the extent to which visual, auditory and tactile stimulation can influence consumers' willingness to pay for ethical brands in online environment. Participants were guided to an online store and asked to imagine three scenarios where the product description was completed by: an image, a song or the statement: "I feel the comforting touch of this teddy bear". The results showed that visual, auditory and tactile cues were effective and had a positive effect on consumers' desire to buy ethical brands.

Mulcahy and Riedel (2018) investigated whether haptic technology embedded in mobile phones can enhance the effectiveness of advertisements. The results showed that haptic touch enhances the user experience with advertisements and this leads to stronger purchase intentions. Another study was performed in 2017 by IPG Media Lab. They also studied the impact of advertising through mobile devices when using haptic technology. They found that the introduction of the touch element in advertisements increases the engagement and the connection between users and brands. Also, it was showed that haptic technology leads to a strong emotional response, especially increasing the level of perceived happiness and emotion. Involvement of the tactile sense in the advertising messages leads to a 62% increase in the feelings of connection with the advertised brand (Lab Team, 2017).

An alternative used to evoke touch sensations in the absence of haptic technology or physical touch is haptic imagery. Imagining touching an object can have the same effect on triggering psychological ownership as physical touch. This effect appears "due to a difference in the perception of control. Imagining touching an object results in greater feelings of physical control compared to not imagining touching it" (Iseki and Kitagami, 2017, p.59).

Mental imagery involves visualizing an object in order to bring sensory information stored in long-term memory, such as hearing, touch, taste, smell, and sight, into short-term memory. This way individuals may experience sensory stimuli even in their absence as imagery is based on sensory representations of perceptual information stored in memory. Peck et. al. (2013, p. 189) define haptic imagery as "the mental visualization of touch".

Klatzy, Lederman and Matula (1991) investigated the role of imagery in exploring an object. They asked the participants to evaluate some objects' attributes such as roughness, hardness, weight, size and shape. The objects were

not physically present, and respondents were asked to make a mental representation of the objects before describing the properties required by the researchers. The results showed that 94% of the respondents visualized the product before evaluating it. Also, most respondents stated that in order to evaluate the object's attributes they imagined how they would touch it.

Peck et al. (2013) studied how haptic imagery can have the same effect as physical touch on triggering psychological ownership. First, the respondents were asked to evaluate a blanket for a minute, without touching it, in order to purchase it. In the second phase, the respondents were asked to close their eyes and imagine that they were touching the blanket for a minute. The results showed that individuals who imagined touching an object when their eyes are closed experienced a sense of ownership similar to those who actually touched the object. Interesting to notice, this effect is not observed when a person imagines touching an object with open eyes.

In summary, we investigated til now the main concepts associated with touch, in the real and virtual, online environment, and the effects of touching a product on the sense of ownership and the intention to buy, concluding that touch is an important sense that could be testes in online marketing strategies, through it's adapted or modified „virtual touching". So, after this conceptualization part we moved forward and looked for possible instruments for measuring the associated constructs – need for touch, endowment effect and psychological ownership – the operationalization part.

SCALES USED IN LITERATURE TO MEASURE TOUCH, ENDOWMENT EFFECT AND PSYCHOLOGICAL OWNERSHIP

Need for touch

There are two commonly used scales for measuring the differences between individuals regarding the need to touch objects: the Need for Touch (NFT) scale and the Need for Tactile Input (NTI) scale.

The NFT is a scale which measures the „preference for the extraction and utilization of information obtained through the haptic system" (Peck and Childers, 2003, p. 431). As we have previously seen the need for touch has two components: the instrumental factor and the autotelic factor. The instrumental factor refers to all the objects features that are important to haptic utilization: texture, hardness, temperature, weight. Through touch individuals can appreciate the quality of the object so these characteristics are evaluated in order to make the best buying

decision. The autotelic factor refers to “touch as an end in and of itself” (Peck and Childers, 2003, p. 431). In this situation individuals touch an object „for fun, arousal, sensory stimulation and enjoyment” (Grebosz and Wronska, 2012, p. 70). People with high autotelic scores need to touch objects in order to satisfy hedonic needs. Peck and Childers (2003) developed a need for touch (NFT) scale that contains 12-items, 6 items representative for the instrumental factor and 6 items for the autotelic factor.

The NTI scale was developed by Citrin et. al. (2003) and contains six items that measure the need for tactile stimuli in order to evaluate a product or brand. When they developed this scale, the authors assumed that people generaly need to touch a product in order to asses it correctly. Items on this scale include: "I need to touch a product to evaluate its quality", "I need to touch a product to evaluate how much I will like the product", "I feel it is necessary to touch a product to achieve it","I feel it is necessary to touch a product to evaluate its quality "," I need to touch a product to evaluate its physical characteristics "," I need to touch a product to create an overall assessment on this."

Endowment effect

The endowment effect is also defined as the difference between the willingness to pay for a product (WTP) and the willingness to accept selling that product (WTA). In order to measure this difference, the participants are asked which is the maximum amount they are willing to pay for an object, respectively the minimum amount of money they are willing to receive in order to sell that object. The gap between willingness to pay and willingness to accept can be measured in a variety of ways:

- questionnaires with open questions (Reb and Connolly, 2007) – "what is the minimum amount you are willing to accept to sell the product?"
- questionnaires with closed questions – "are you willing to sell the item in exchange for x?"
- multiple choice questions (eg: choosing between multiple pricing options)
- Becker-DeGroot Marschack procedure (Horovitz and McConnel (2002), Kahneman, Knetsch şi Thaler, (1990)): buyers and sellers choose pairing options between different amounts of money and keeping/receiving the object (for example, "At X price *I will sell / I will not* sell the product.").

Psychological ownership

Most researchers interested in consumer psychology used a set of 3 to 4 questions to measure the extent to which an object is perceived as "mine" (Vries et. Al., 2018; Brasel and Gips, 2014; Peck and Shu, 2009; Peck et al., 2013). These questions are derived from scales developed by authors who have studied this concept at organizational level (van Dyne and Pierce, 2004; Pierce et. Al., 2001).

CONCLUSIONS

Previous studies on offline environments have proved that touching products makes people develop a feeling of ownership, a psychological sense of property that has positive consequences on their intention and decision to buy those products. Our analysis of the extant literature showed that similar effects, adapted for the online environments, although less investigated, are present; we have reasons to hypothesize that virtually touching a product through various tactile interfaces (smartphone, iPad, tablet etc.) could be as important for consumer decisions as the content of the site and product information in e-commerce. Virtual touching could serve as an important emotional trigger, leading to feelings of ownership and endowment effects in online marketing. We would conceptualize virtual touch as the perception of physical touch in the context of online marketing, measuring it as a combination of real and measurable physical stimulation, and its mental perception or representation.

Based on the literature review, we find the following scales as the most appropriate to be used in order to investigate the impact of virtual touch on endowment effect and psychological ownership:

- Need for touch – NFT scale developed by Peck and Childers (2003). We consider that individuals touch products not only for evaluating them, but also for fun. Using this scale we can have a clear picture regarding the degree and the motivation behind the need for touch.
- Endowment effect – Becker-DeGroot Marschack procedure. Using open-ended questions, unlike the other measurement variants, opens the possibility of receiving extreme values that could affect future analyses. Therefore, it’s better to guide the participants in choosing amounts already set by the researchers.

- Psychological ownership – scale used by Vries et. al. (2018) and Brasel and Gips (2014). Responses will be scored on a 7-point Likert scale (7 – total agreement; 1- total disagreement).

A future research design will be experimental, virtual touch being the independent variable, the endowment effect and the psychological ownership dependent variables, and need for touch a potential mediator or moderator variable. Virtual touch will be manipulated at physical level (type of interface) and emotional level (haptic imagery). Results would help us better understand how senses could be used in creative online marketing strategies.

REFERENCES

1. Boven, L., and Dunning, D. (2000), *Egocentric empathy gaps between owners and buyers: Misperceptions of the endowment effect*, Journal of Personality and Social Psychology, Vol. 79, pp. 66-76.
2. Brasel, S.A, Gips, J. (2014), *Tablets, touchscreens, and touchpads: How varying touch interfaces trigger psychological ownership and endowment*, Journal of Consumer Psychology, 24 (2), 226-233.
3. Brenner, L., Rottenstreich, Y., Sood, S., Bilgin, B. (2007), *On the psychology of loss aversion: Possession, valence, and reversals of the endowment effect*, Journal of Consumer Research, 34, pp. 369−376.
4. Carmon, Z. and Ariely, D. (2000), *Focusing on the forgone: how value can appear so different to buyers and sellers*, Journal of Consumer Research, 27, pp. 360–370.
5. Carmon, Z., Wertenbroch, K., Zeelenberg, M. (2003), *Option attachment: when deliberating makes choosing feel like losing*, Journal of Consumer Research, 30, pp. 15–29.
6. Citrin, A.V., Stem, D.E., Spangenberg, E.R., Clark, M. J. (2003), *Consumer need for tactile input. An internet retailing challenge*, Journal of Business Research, 56, pp. 915–922.
7. Fuchs, C., Prandelli, E. & Schreier, M. (2010), *The Psychological Effects of Empowerment Strategies on Consumers' Product Demand*, Journal of Marketing, 74(1), pp.65–79.
8. Grebosz, M., Wronska, B. (2012), *Sensory Impact on Customer Behaviour*, Politechnika Łódzka, 2, pp. 67-77.
9. Grohmann, B., Spangenberg, E. R., Sprott D. E. (2007), *The influence of tactile input on the evaluation of retail product offerings*, Journal of Retailing, 83(2), pp. 237-245.
10. Harbaugh, A. W., Krause, K., Vesterlund, L. (2001), *Are adults better behaved than children? Age, experience, and the endowment effect*, Economics Letters, 70, pp. 175–181.
11. Horowitz, K., J., McConnell, K. E. (2002), *A Review of WTA / WTP Studies, Journal of Environmental Economics and Management*, 44, pp. 426 – 447.
12. Hosrt, S. (2005), *Phenomenology and psychophysics*, Phenomenology and the Cognitive Sciences 4(1), pp.1-21.
13. Iseki, S., Kitagami, S. (2017), *Effects of haptic imagery and haptic importance on psychological ownership*, Journal of Human Environmental Studies, pp. 59-64.
14. Johnson, E. J., Häubl, G., & Keinan, A. (2007), *Aspects of endowment: A Query Theory of value construction*, Journal of Experimental Psychology. Learning, Memory, and Cognition, 33(3), pp. 461−474.
15. Kahneman, D., Knetsch, J., L., Thaler, H., R. (1990), *Experimental tests of the endowment effect and the Coase theorem*, The Journal of Political Economy, 98, pp. 1325–1348.
16. Kanngiesser, P.; Santos, L. R.; Hood, Bruce M.; Call, J. (2011), *The limits of endowment effects in great apes (Pan paniscus, Pan troglodytes, Gorilla gorilla, Pongo pygmaeus)*, Journal of Comparative Psychology. 125 (4), pp. 436–445.
17. Karhanna, E., Xu, S. & Zhang, N. (2015), *Psychological Ownership Motivation and the Use of Social Media*, Journal of Marketing Theory and Practice, 23(2), pp.185–207.

18. Kirk, C. P., Swain, S. D., Gaskin, J. E. (2015), *I'm proud of it: consumer technology appropriation and psychological ownership*, Journal of Marketing Theory and Practice, 23(2), pp.166-184.
19. Klatzky, R. L., Lederman, S. J., Matula, D. E. (1991), *Imagined haptic exploration in judgments of object properties*, Journal of Experimental Psychology: Learning, Memory, and Cognition, 17(2), pp. 314–322.
20. Krishna, A. (2012), An integrative review of sensory marketing: engaging the senses to affect perception, judgment and behavior, *Journal of Consumer Psychology* 22, pp. 332–351.
21. Kurt, D. and Inman, J.J. (2013), *Mispredicting others' valuations: selfother difference in the context of endowment*, The Journal of Consumer Research, 40, pp. 78–89.
22. Lab Team, (2017), *Ads You Can Feel: Immersion, Magna, & IPG Media Lab Conduct In-Depth Analysis Of Haptic Tech In Video Ads*, https://www.ipglab.com/–2017/01/24/ads-you-can-feel-immersion-magna-ipg-media-lab-conduct-in-depth-analysis-of-haptic-tech-in-video-ads/
23. Lakshminaryanan, V., Chen, M., Santos, L. (2008), *Endowment effect in capuchin monkeys (Cebus apella)*, Philosophical transactions of the Royal Society of London, 363, pp. 3837- 3844.
24. Lindeman, R.W., Page, R., Yanagida, Y., Sibert, J.L. (2004). *Towards Full- Body Haptic Feedback: The Design and Deployment of a Spatialized Vibrotactile Feedback System*, Proc. of ACM Virtual Reality Software and Technology (VRST), pp. 146-149.
25. Lindström, M. (2005). *Brand sense: How to build powerful brands through touch, taste, smell, sight & sound*. London: Kogan Page Publishers.
26. Maddux, W., Haiyang Y., Carl F., Hajo A., Wendi A., Yumi E., Ziv C., and Steven J. (2010), *For Whom Is Parting with Possessions More Painful? Cultural Differences in the Endowment Effect*, Psychological Science, 21 (12), pp. 1910–1917.
27. Messaoud, W., (2016), *Design and Control of a Tactile Stimulator for Real Texture Simulation: Application to Textile Fabrics, Automatic*, Université Lille 1: Sciences et Technologies. English, https://tel.archives-ouvertes.fr/tel-01360590/document.
28. Morewedge, K. C., Lisa L. S., Daniel T. G., and Timothy D. W. (2009), *Bad Riddance or Good Rubbish? Ownership and Not Loss Aversion Causes the Endowment Effect*, Journal of Experimental Social Psychology, 45 (4), pp. 947–51.
29. Mulcahy F., R., Riedel, A. (2018), *'Touch it, swipe it, shake it': Does the emergence of haptic touch in mobile retailing advertising improve its effectiveness?*, Journal of Retailing and Consumer Services, https://doi.org/10.1016/j.jretconser.2018.05.011.
30. Paterson, M. (2009), *Introduction: re-mediating touch*, The Senses & Society. 4:2, pp. 129-140, DOI: 10.2752/174589309X425094
31. Peck, J., (2010), *Does touch matter? Insights from haptic research in marketing*, https://www.researchgate.net/publication/303518016_Does_Touch_Matter_Insights_from_Haptic_Research_in_Marketing.
32. Peck, J., Barger, V., Webb, A. (2013), *In search of a surrogate for touch: The effect of haptic imagery on perceived ownership*, Journal of Consumer Psychology, 23, pp. 189-196.
33. Peck, J., & Childers, T. L. (2008). If it tastes, smells, sounds, and feels like a duck, then it must be a duck: Effects of sensory factors on consumer behaviors. In C. P. Haugtvedt, P. M. Herr, & F. R. Kardes (Eds.), *Handbook of consumer psychology* (pp. 193–219). Florence, KY: Psychology Press.

34. Peck, J., Childers, T. L. (2003), *Individual differences in haptic information processing: The "Need for Touch" scale*. Journal of Consumer Research, 30, pp. 430–442.
35. Peck, J., Childers, T. L. (2003a), *To have and to hold: The influence of haptic information on product judgments.* Journal of Marketing, 67(2), pp. 35–48.
36. Peck, J., Childers, T. L. (2003b), *Individual differences in haptic information processing: The "Need for Touch" scale*. Journal of Consumer Research, 30, pp. 430–442.
37. Peck, J., Childers, T.L. (2006), *If I touch it I have to have it: Individual and environmental influences on impulse purchasing*, Journal of Business Research, Vol. 59(6), pp. 757 -769.
38. Peck, J., Shu, S. B. (2009), *The Effect of Mere Touch on Perceived Ownership*, Journal of Consumer Research, 36, pp. 434–447.
39. Peck, J., Terry L. C. (2003a), *To Have and to Hold: The Influence of Haptic Information on Product Judgments*, Journal of Marketing, 67 (April), pp. 35–48.
40. Peck J, Wiggins J., (2006), *It just feels good: customers' affective response to touch and its influence on persuasion*, Journal of Marketing, 70, pp. 56-69.
41. Peters, E., Slovic, P., Gregory, R. (2003), *The role of affect in the WTA/WTP disparity. Journal of Behavioral Decision Making*, 16, pp. 309–330.
42. Ratcliffe, M. (2008), *The phenomenology of touch*, DOI: 10.1093/med/9780199206469.003.0003;
43. Reb, J., Connolly, T. (2007), *Possession, feelings of ownership and the endowment effect. Judgment and Decision Making*, 2(2), pp. 107-114.
44. Pierce, J.L., Kostova, T., Dirks, K.T. (2001), *Toward a theory of psychological ownership in organizations*, Academy of Management Review, Vol. 26, No. 2, pp. 298–310.
45. Pierce, J. L., Kostova, T., & Dirks, K. T. (2003), *The state of psychological ownership: Integrating and extending a century of research*, Review of General Psychology, 7, pp. 84–107.
46. Shu, S., Peck, J (2011), *Psychological ownership and affective reaction: Emotional attachment process variables and the endowment effect*, Journal of Consumer Psychology 21, pp. 439–452.
47. Spence, C., Puccinelli, N. M., Grewal, D., Roggeveen, A. L. (2014), *Store atmospherics: A multisensory perspective*, Psychology and Marketing, 31(7), pp. 472–488.
48. Sreelakshmi, M., Subash, D., (2017), *Haptic Technology: A comprehensive review on its applications and future prospects*, Materials Today: Proceedings, 4, pp. 4182-4187.
49. Stenslie, S. (2010), *Virtual Touch- A study of the use and experience of touch in artistic, multimodal and computer-based environments*, https://www.researchgate–.net/publication/236344603_Virtual_Touch.
50. Van Dyne, L., Pierce, J.L., (2004), *Psychological ownership and feelings of possession: three field studies predicting employee attitudes and organizational citizenship behavior*, Journal of Organizational Behavior, Vol. 25, No. 4, pp. 439–459;

51. Vega-Bermudez, F., Johnson, KO., Hsiao, SS. (1991), *Human tactile pattern recognition: active versus passive touch, velocity effects, and patterns of confusion'*, Journal of Neurophysiology, 65(3), pp. 531-546.
52. Verrillo, R. T., Bolanowski, S. J., McGlone, F. P., (1999), *Subjective magnitude of tactile roughness*, Somatosensory & Motor Research, vol. 16, no. 4, pp. 352-360.
53. Vries, R., Jager, G., Tijssen, I., & Zandstra, E. H. (2018), *Shopping for products in a virtual world: Why haptics and visuals are equally important in shaping consumer perceptions and attitudes*, Food Quality and Preference, 66, pp. 64-75.
54. Yoganathan V., Osburgb, V., Akhtarb, P. (2018), *Sensory stimulation for sensible consumption: Multisensory marketing for etailing of ethical brands*, Journal of Business Research, https://doi.org/10.1016/j.jbusres.2018.06.005.
55. *** STATISTA report, https://www.statista.com/statistics/251666/number-of-digital-buyers-worldwide/
56. *** NIELSON report, https://www.nielsen.com/wp-content/uploads/sites/3/2019/04/–connected-commerce-report-1.pdf

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DEFINITION OF MICRO, SMALL AND MEDIUM ENTERPRISE UNDER THE GUIDELINES OF THE EUROPEAN UNION

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Abstract: *Research problem: It should be remembered that projects co-financed from European Union funds are a special type of projects to which additional guidelines apply. Awareness of the regulation may help enterprises avoid erroneous categorization or loss of SME status resulting in non-awarding or reimbursement of subsidies with tax interest. The problem is still valid, because EU projects are and will be implemented and must preserve the so-called durability. The validity of the topic can be confirmed by the fact that definitional problems appear all the time, which are even dealt with in court.*

Thesis: The definition of micro, small and medium enterprises under the European Union guidelines requires special attention when applying for EU funding.

The aim of the article is to present the issues related to the qualification of an entity to the category of micro, small and medium-sized enterprises in the context of using EU funds.

The research methods were applied in the article: in the theoretical part – literature studies, comparative analysis, in the empirical part – case study, causal and effect analysis, descriptive analysis.

Keywords: *SMEs, Definition, UE*

JEL Classification*: M13*

1. INTRODUCTION

The European Commission (EC) is currently preparing an evaluation and possible revision of some aspects of the EU micro, small and medium-sized enterprises (SME) definition (Recommendation 2003/361/EC of 6 May 2003). In that process are involving for example European Savings and Retail Banking Group or European Centre of Employers and Enterprises providing Public Services

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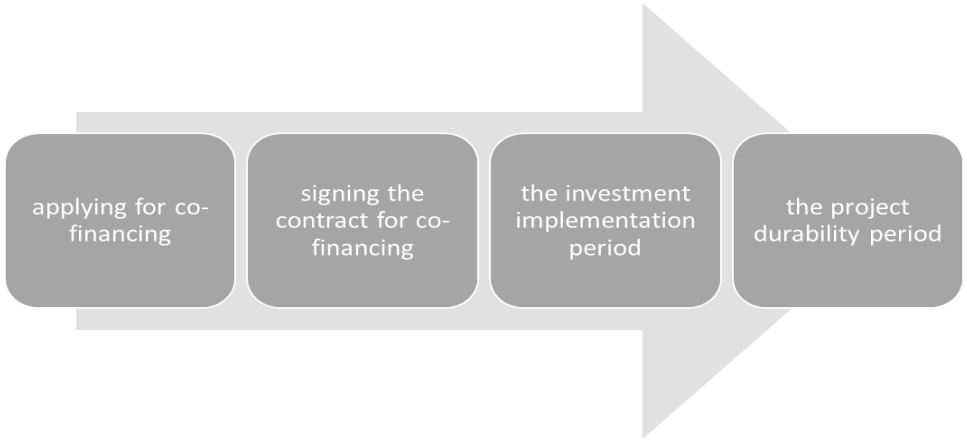
(CEEP). It is high time that the scientific community is also involved in the discussion on the definition of SMEs.

The status is determined at the moment of applying for co-financing, signing the contract for co-financing, during the investment implementation period, as well as during the project durability period (figure-1).

Figure-1: Moments of determining the status of enterprise

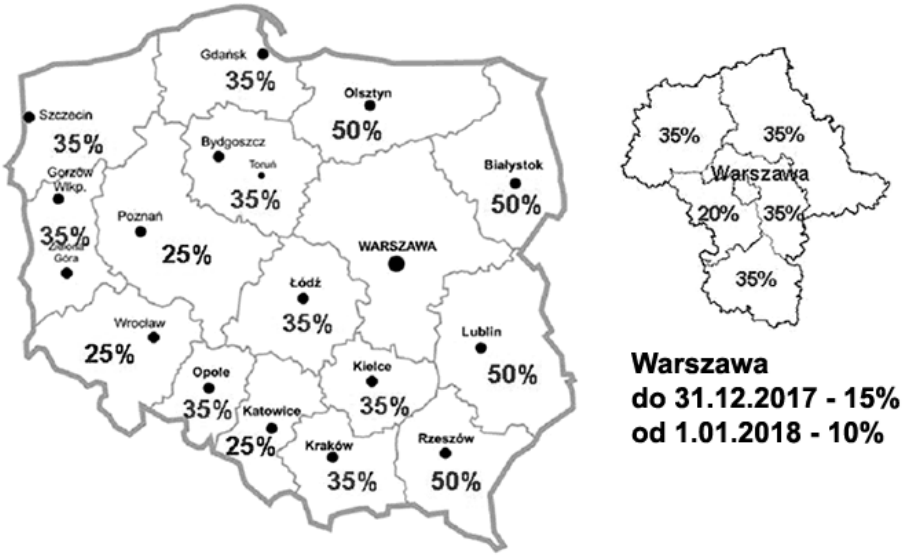


Source: Own study

The process can cause errors that may have negative consequences for enterprises (European Savings and Retail Banking Group, 2018: 1). Enterprises and their projects can be controlled by various institutions (Managing Authority (MA), Intermediate Body (IB), Implementing Authority (IA), Monitoring Committee (MC), Supreme Audit Office (or NIK (previously used English translation of the name of the institution was the Supreme Chamber of Control)), National Revenue Administration (NRA), European Court of Auditors (ECA) etc.). This is to re-check the correctness of project implementation, including eligibility and proper incurring of expenses, maintenance of the declared indicators by the beneficiary (Zarząd Województwa Śląskiego, 2019), proper qualification or loss of SME status during the durability period.

It should be remembered that supporting through public funds, especially EU funds, is aimed at supporting the activities of not all but specific enterprises, those which really need help. It is important to determine the status of the applicant at the very beginning the procedure for applying for the support (Cieślak, 2007: 21). Co-financing is granted depending on (figure-2) the localization of the project and the scale of its business operations (Marquuardt, 2007: 146).

Figure-2: The map of Poland with indicated level of co-financing dependent on the localization of the project and the scale of business operations



Micro, small enterprises: + 20%
Medium-sized enterprises: + 10%
Source: European Commission: 2015; Polish Investment and Trade Agency S.A.: 2007.

2. JUSTIFICATION OF THE VALIDITY AND TIMELINESS OF THE PROBLEM

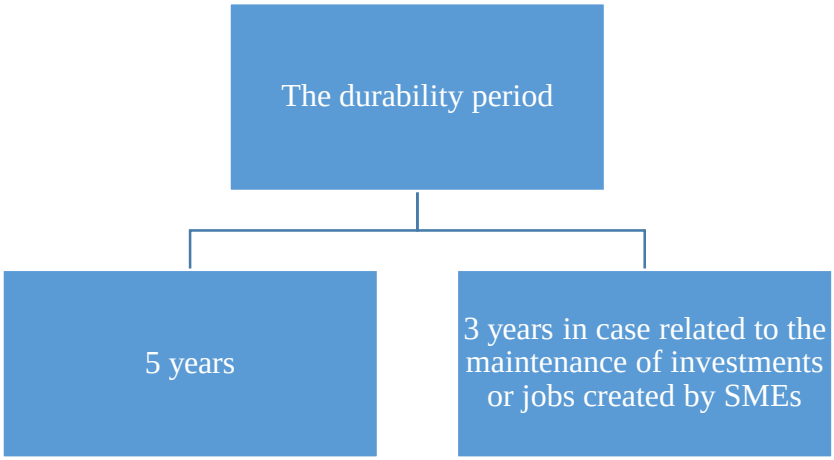
Proper qualification for the SME category may facilitate the spending of EU funds by beneficiaries. In accordance with the n+3 rule referring to the European Union programming period, designating an additional period for the implementation and settlement of projects and programs co-financed from European funds, support granted under the 2014-2020 financial perspective can actually be used until 2023. If by that time the national Member State will not be able to use the entire funding allocated to the current financial perspective, it will have to return the unused surplus to the EU budget.

It should be remembered that the enterprise implementing the project from EU funds is obliged to archive and make all project documentation available for inspection, including during the durability period. The co-financing agreement in the financial perspective 2014-2020 (Zarząd Województwa Śląskiego, 2019), as in the financial perspective 2007-2013, obliges the beneficiary to have and store documents (including electronic versions) related to the implementation of the project in accordance with article 140 of the Regulation (EU) No 1303/2013 of the

European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006, OJ L 347, 20.12.2013, p. 320–469 (the so-called "general regulation") and for at least 10 years from the date of approval by the intermediate institution of the application for final payment. However, this deadline may be changed before the original deadline expires. Article 140 of Regulation No 1303/2013 stipulates that the Managing Authority shall make available to the Commission and the ECA all supporting documents regarding expenditure supported by cohesion policy funds under operations, with total eligible expenditure of less than 1 000,000 EUR and makes them available on demand for a period of three years (for projects below 1,000,000 EUR up to two years, if the Managing Authority does not extend up to three years) from 31 December following submission of the statement of expenditure to the Managing Authority in which the expenditure is included regarding a given operation. However, the indicated period shall be discontinued if legal proceedings have been initiated or a duly reasoned request of the Commission. The Managing Authority is obliged to inform the beneficiaries about the date of commencement of the above period. Special care should be taken to ensure that the project documentation is not lost or damaged in the above period.

After completing the investment, the beneficiary has to maintain the durability of the project on the terms resulting from article 71 of Regulation 1303/2013 (so-called "general"). It should immediately inform the Managing / Intermediate Body about any circumstances that may cause non-durability. Each case of possible violation of the durability of the project is assessed individually. The durability period is counted from the final payment in the project, for example the transfer to the Beneficiary's bank account as part of the settlement of the application for final payment. If there is no amount to be paid from the final application payment for the date, the deadline is counted from the approval of the application for the final payment by the intermediary institution (Zarząd Województwa Śląskiego, 2019).

Figure-3: The durability period in investment projects co-financed by the European Regional Development Fund (ERDF)



Source: Own study based on article 71 of Regulation 1303/2013 (the so-called "general").

According to article 71 of Regulation 1303/2013 (the so-called "general") violation of durability (figure-3) occurs if within 5 years (3 years – in cases related to the maintenance of investments or jobs created by SMEs) any of the following circumstances occurs:

1. ceasing production activity or moving it outside the program area,
2. change in ownership of an infrastructure element that gives an undertaking or public entity undue benefits,
3. a significant change affecting the nature of the project, its objectives or implementation conditions, which may lead to a violation of its original objectives.

Lack of durability is tantamount to violation of article 207 of the Act of 27 August 2009 on public finance and means the necessity of reimbursement by the beneficiary (excluding state budgetary units) of funds received for the implementation of the project, with interest calculated as for tax arrears, in proportion to the period of non-durability – in the mode specified in to the above-mentioned Act, unless the provisions governing the granting of state aid provide otherwise. In the case of violation of the principle of durability, a financial correction is calculated in accordance with the Annex to the Agreement (Zarząd Województwa Śląskiego, 2019) and so-called "Tariff" indicated in the Regulation

of the Minister of Development regarding the conditions for reducing the value of financial corrections and expenses incorrectly connected with the awarding of contracts 22.02.2017 (Journal of Laws of 2017, item 615) amending the Regulation of the Minister of Development of January 29, 2016 regarding the conditions for reducing the value of financial corrections and expenses incurred incorrectly related to the award of contracts (Journal of Laws of 2016, item 200). According to article 71 paragraph 2 in the case of an operation involving investments in infrastructure or productive investment, the EU contribution shall be reimbursed if, within 10 years of the final payment to the beneficiary, the productive activity is transferred outside the Union, except where the beneficiary is an SME. If the EU contribution constitutes state aid, the 10-year period will be replaced by the date applicable under the provisions on aid (Urząd Marszałkowski Województwa Śląskiego, 2014: 125-126).

At this point, the difference between projects co-financed by the European Regional Development Fund (ERDF) and the European Social Fund (ESF) should be noted. The obligation to maintain the durability defined above applies to projects co-financed from the ERDF, which include investments in infrastructure or production investments, i.e. the majority of projects co-financed from the ERDF. In projects financed from the ESF, a different type of durability may apply. If the application for co-financing foresees the durability of the project or results, the beneficiary is obliged to submit data and supporting documents specified by the Managing / Intermediate Body.

Until the project's lifetime has expired, the beneficiary may lose its SME status as a result of changes in the ownership and management structure of the beneficiary enterprise, in particular taking over the beneficiary enterprise or obtaining a direct or indirect dominant influence over the beneficiary company by another company without SME status. In the above-mentioned situations, the beneficiary loses the status of an SME on the day of taking over of his enterprise or obtaining a dominant influence on this enterprise by an enterprise without the status of an SME (Zarząd Województwa Śląskiego, 2019).

Until the end of the project's lifetime, the beneficiary is obliged not to change the legal form of the Beneficiary's enterprise or to transfer his company in whole or in part to a third party, except for such changes, which are made in accordance with the Title IV of the Code of Commercial Companies and resulting in the entity's entry acting in a changed legal form (transformed company) or a third entity (the acquiring company or a newly formed company) in the general rights and obligations of the Beneficiary by operation of law. The Beneficiary is

obliged to inform the Intermediate Body of any planned changes to the legal form before they are carried out (Zarząd Województwa Śląskiego, 2019).

3. THE CONCEPT OF MICRO, SMALL AND MEDIUM ENTREPRENEUR – DEFINITION PROBLEMS

One of the criteria for the division of enterprises is their scale (size). According to this criterion, different classes of enterprises are distinguished. The scale of the enterprise is a quantitative category, however, due to the fact that changes in the scale lead to qualitative changes, the quality criteria are also used to measure the size of enterprises. Quantitative criteria are company scale assessments that may concern expenditures (employment, capital (Skowronek-Mielczarek, 2005: 1), assets) or effects (turnover, value added, market share). The quality criteria concern economic and legal abilities of the enterprise owner (Skowronek-Mielczarek, 2005: 1), e.g.: independence, ownership form, organizational and/or management structure.

In theory and practice, multi criteria definitions are often used, such as employment, turnover, and independence. Taking into account the purpose of measuring enterprises (scientific, statistical, public support etc.), various criteria and different thresholds for measuring the scale of enterprises are used. The selection of criteria and measures is of an institutional nature and is historically different in individual countries. It results from the international diversification of the socio-economic level and the scale of the market. However, it is a hindrance in comparative analyses (Woźniak, 2006: 11) and in conducting coordinated economic policy. For many years, work has been carried out under the OECD's leadership on the unification of definitions regarding the criteria for assessing the scale of enterprises.

The definition of SME is binding only in certain areas, such as state aid, implementation of structural funds or Community programs, in particular the framework program for research and technological development. However, the European Commission has called on the Member States, the European Investment Bank and the European Investment Fund to use it as a reference level. As a result, actions taken to support SMEs could become more consistent and effective. At Community and national level, the new definition applies from 1 January 2005.

To achieve EU founds for investment projects it should be used the definition of SME from the Commission Recommendation 2003/361/EC of 6 May 2003 (Official Gazette L 124 of 20.05.2003). The definition was detailed in the User Guide for information and clarifications regarding the new definition of

SMEs, which entered into force on January 1, 2005 in and updated guidelines, and next in the Annex 1 to the Commission Regulation (EC) No 800/2008 of 6 August 2008, declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General block exemption Regulation) (Text with EEA relevance), and then in the Annex 1 to the Commission Regulation (EU) No 651/2014 of 17 June 2014, declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty. It should be emphasized that the EU guidelines on definitions of SMEs in the 2007-2013 and 2014-2020 programming periods are almost identical (Kowalski, 2016: 319, Kulawik-Dutkowska, 2014: 75). In the 2014-2020 financial perspective, the general regulation indicates that "SMEs" means a micro, small or medium enterprise within the meaning of Commission Recommendation 2003/361/EC (Kulawik-Dutkowska, 2014: 75). This may be the result of an independent evaluation study carried out in 2012, which showed that there is no need to seriously change the definition of an SME. The final report recommends clarifying the application of some principles by providing guidance or updating the 2005 Guide. This was done in the User Guide to the SME Definitions Ref. Ares (2016) 956541 – 24/02/2016. In the course of the 2014-2020 programming period, the study on the definition of SMEs in 2017 also indicated that there is no need to change it. However, it recommended more stringent verification of compliance by national institutions. In connection with the new financial perspective 2021-2027, as well as the evaluation of the 2014-2020 programming period, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) in the European Commission, from February 6, 2018 – May 6, 2018. conducted a survey among enterprises in order to further work on changing the definition of SMEs (European Commission, 2019b). A special questionnaire was prepared for this purpose, addressed to micro, small and medium enterprises, especially those that had the opportunity to verify their SME status as part of their activities (European Commission, 2018). The results of the undertaken research may be helpful in the evaluation studies of programming periods 2007-2013 (ex-post) and 2014-2020 (mid-term) and the construction of guidelines under the next programming period 2021-2027 (ex-ante) (Zysińska, 2007: 225, 229). All the more so it is worth discussing existing solutions and proposing changes adjusted to the current situation of enterprises.

In order to correctly classify enterprises, it is necessary to establish data according to three criteria, the so-called quantitative criteria (Woźniak, 2006: 11, Daszkiewicz, Wach, 2013: 13), which are summarized in table 1:

- the annual work units (AWU),
- yearly turnover,
- balance sheet total (European Commission, 2006).

Table–1: Quantitative criteria for SMEs definition established by the\ European Commission

Enterprise category	Headcount: the annual work units (AWU)		Turnover		Balance sheet total
Micro	<10	and	≤ €2 million	or	≤ €2 million
Small	<50	and	≤ €10 million	or	≤ €10 million
Medium-sized	<250	and	≤ €50 million	or	≤ €43 million

Source: Own study based on: Act of 6 March 2018 – Entrepreneurs' Law (Journal of Laws of 2018, item 646) repealing the Act on the freedom of economic activity of July 2, 2004 (Journal of Laws No. 173, item 1807); European Commission, The User Guide to the SME Definitions Ref. Ares (2016) 956541 – 24/02/2016, p. 11; Commission Regulation (EU) No 651/2014 of 17.6.2014, declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty; Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (Text with EEA relevance) (notified under document number C(2003) 1422).

Most of the analogous tables for the SME categories do not indicate annual work units (AWU), but only the number of employees. However, these are two different categories.

The enterprise (Dumitru, Neluta, 2017: 562):

- medium-sized employs fewer than 250 employees, has an annual turnover not exceeding EUR 50 million or a total annual balance not exceeding EUR 43 million,
- small employs less than 50 employees, has an annual turnover or a total annual balance not exceeding EUR 10 million.
- micro is characterized by employment of less than 10 employees, annual turnover or total annual balance not exceeding EUR 2 million.

Many publications, instructions, including even public institutions, end the presentation of SME definitions to the abovementioned table. In the author's opinion, this is the basis for mistakes made by the beneficiaries in determining the size of the enterprise. Indication of the data source under the table with no information that detailed explanations are found in a specific regulation or guide and it is necessary to familiarize them with the purpose to properly determine the

status is irresponsible. Such practices should be identified and corrected. It is worth adding that European Parliament "calls on the Member States and the Commission to provide guidance to enterprises on the procedures used to determine SME status and information about any changes concerning the SME definition or procedures, in a timely and optimal manner" (European Parliament, 2018).

Exceeding the employment threshold or the financial ceiling during the year, which is taken into account, does not affect the status. Admittedly, the Act on the freedom of economic activity of July 2, 2004 (Journal of Laws No. 173, item 1807) in article 104, and then the Act of 6 March 2018 – Entrepreneurs' Rights (Journal of Laws of 2018, item 646) in article 7 par. 1, indicated that the entrepreneur is considered to be a micro-entrepreneur, who in at least one of the last two financial years has reached the values indicated in table 1 (Pabiś, 2016: 161). However, according to Annex I to the Commission Regulations (EC) No 800/2008 and (EU) No 651/2014, the change of status takes place only if in the next two years the phenomenon repeats (Czekański, Gajek, 2015: 37).

It should be noted that the retention of the employment threshold is obligatory, while in the case of the annual turnover ceiling or the total annual balance, one can be chosen. Therefore, an enterprise does not have to meet both financial conditions and may exceed one of the ceilings without losing its status. The new definition gives this choice, as entities operating in the trade and distribution sectors usually have higher turnover rates than production units. By allowing a choice between the turnover criterion and the criterion of the total annual balance sheet reflecting the overall financial situation, fair treatment of SMEs conducting various types of economic activities was ensured (Kubera, 2010: 103). Exceeding the employment threshold or the financial ceiling during the year, which is taken into account, does not affect the status. The change of status takes place only if the phenomenon is repeated within the next two years (Czekański, Gajek, 2015: 37).

Data used in determining the number of staff and financial amounts refer to closed fiscal periods and are calculated on an annual basis. They are taken into account from the date of closing the accounting books. The amount selected for trading is calculated without taking VAT into account. In the case of newly established enterprises that do not have closed accounts, the size of individual indicators is calculated according to the data obtained up to the moment of calculation during the financial year. Therefore, declarations, plans of an entity that intends and therefore become a SME should not be accepted.

The Act on the freedom of economic activity of July 2, 2004 (Journal of Laws No. 173, item 1807) in article 104, and then the Act of 6 March 2018 – Entrepreneurs' Rights (Journal of Laws of 2018, item 646) in Article. 7 par. 3, indicated that the average annual employment is defined in full-time equivalents, but that employees who are on maternity leave, leave on maternity leave, paternity leave, parental leave and parental leave employed for the purpose of vocational training are not included. Annex 1 to the Commission Regulation (EC) No 800/2008, and then Annex 1 to the Commission Regulation (EU) No 651/2014 more precisely set out the method of determining the value of the employment rate.

The annual work units (AWU) are used to determine the number of employees, i.e. the number of people working full-time in the enterprise or on its behalf during the settlement year, also referred to as AWU, i.e. the number of employees corresponds to the number of annual work units. The above indicator includes:

a) employees,
b) people working for and being subordinated to (subject to) the enterprise and deemed (considered) to be employees under national law,
c) owners – managers,
d) partners engaging in a regular activity in the enterprise and benefiting from financial advantages from the enterprise.

The work of persons who have not worked the full year, and the work of seasonal workers, the work of those who have worked part-time, regardless of duration are counted as fractions of AWU. It does not include apprentices or students engaged in vocational training with an apprenticeship or vocational training contract, maternity or parental leaves.

The number of employees in the reference period, i.e. one fiscal year, is presented as average annual employment. It is determined as the sum of average numbers of employees in individual months. In order to obtain an annual average, this sum should be divided by 12. In the case of the functioning of the enterprise for less than a full year, the sum obtained should be divided by the number of months in the year in which the activity was carried out.

The definition of an employee is according to the wording of Community law. The justification for this approach is due to the fact that both Articles 5 of Annex I to Commission Regulation (EC) No 800/2008 and article 5 of Annex No I to the Commission Regulation (EU) No 651/2014, the reference to national law appears only at the letter b). Therefore the Community legislator did not apply such a reference („persons working for the enterprise and its subordinates" under letter a), which means that the concept of employee must be considered under

Community law. Due to the fact that the Treaty on the Functioning of the European Union does not define the concept of an employee, the position of the EU Court of Justice has been adopted in the course of integration. This concept should have a very wide application, independent of the legal systems of the Member States.

The "independence" criterion was adopted as a qualitative criterion. A distinction is made between three categories of entrepreneurs according to their mutual relations with other enterprises in the field of capital ownership, voting rights or the right to exercise decisive influence (in terms of shares). To qualify for the right SME category also needs to take into account partner and linked entities.

4. Partnerships and Connections and Their Impact on the Status of Enterprises

The purpose of verifying the SME status of individual enterprises is to determine their actual economic position. The European Court of Justice has held that by applying Community competition rules: in cases where legally independent legal or natural persons constitute one economic unit, they should be treated as linked. Therefore, the entity examining the status of SMEs, and especially the EC, has the possibility to freely take into account and evaluate economically complex facts and circumstances. The above measures contribute to the fact that the funds for supporting SMEs are used by entities for which the difference in size is an obstacle to competition, lacking access to resources and support that their competitors of the same size have but a potential beyond the status SMEs. The effect of such an approach is the conclusion that in order to provide support only to entrepreneurs who have the actual status of SMEs, it is necessary to eliminate such legal entities that, having created economic groups, have a potential that significantly exceeds the real SME. Case law of the European Court of Justice is proof of the correctness of the interpretation that the definition of SMEs cannot be abused for purely formal reasons.

The justification for this position regarding the definition of SMEs is also confirmed by other rulings of the Tribunal relating to the expediency of the interpretation of SME definitions. They concern the purpose for which SMEs are covered by more favourable conditions for the granting of state aid. The aim is therefore to provide support only to those entities for which the size of the business is the cause of many difficulties in access to production factors, which also means weaker market position. Therefore, entities that meet the formal conditions for being considered as SMEs, operating simultaneously within a large capital group, have similar business conditions as in the case of large enterprises and can not

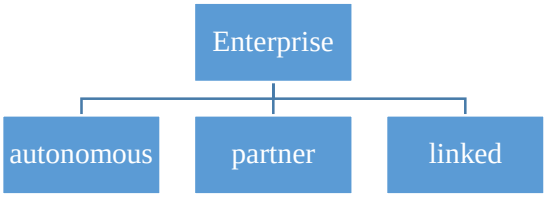
benefit from increased limits of admissible public aid (Cf. EU Tribunal ruling of April 28, 2004 in the C- 91 / 01- Italian Republic vs. the Commission of the European Communities).

The problem may be an interpretation of personal relations. The European Commission is of the opinion that it is necessary to look at factors such as persons in the management team, the degree of economic connections at the level of running a business, joint use of a logistics base, e.g. buildings, means of transport and office space. These exemplary criteria for assessing relationships between entities do not constitute a closed catalogue, which means that decisions regarding other criteria are acceptable. This applies to the verification of links between individuals with a formal and informal character leading to the formation of unions in individual areas or even economic activities.

Issues are considered whether companies belonging to the group operate at various stages of the production cycle in such a way that they combine and form a coherent production cycle. Attention is drawn to the functions of persons who sit in the governing bodies, but also to the relations between these persons. What's more, the analysis concerns the correlation of performed functions with the shares held in given units. The relationship between entities due to individuals, and especially to family members, may be an important premise to treat various enterprises as a joint venture carried out in the same market or related markets. The necessity to check family relations also entails an obligation to examine property relations in a marriage. The connection is not said when there is no property community, that is, when one of the spouses has so-called property separation, which is the premise to exclude a community of interests between spouses running a business.

The definition of SMEs in terms of EU guidelines divides enterprises into three categories (figure-4): autonomous, partner, linked.

Figure-4: Categories of enterprises



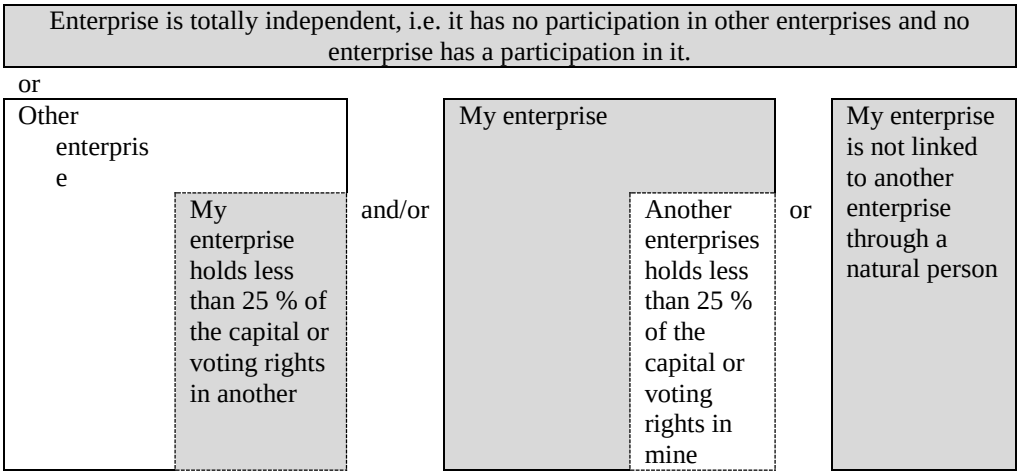
Source: Own study based on: Commission Recommendation of 6 May 2003; Commission Regulation (EU) No 651/2014.

The above-mentioned division is determined depending on the relationship with other entities in terms of percentage of capital, voting rights or the right to hold a dominant position.

Under the new definition of an SME, an enterprise cannot be considered as small or medium sized if 25% or more of its votes or capital is controlled directly or indirectly, individually or collectively, by one or several public authorities. The justification for this exemption is due to the fact that for state-owned entities certain benefits, especially financial ones, may give rise to advantages over other entities financed by private capital. In public entities it is often not possible to determine the number of persons employed and calculate financial data.

An autonomous enterprise (figure-5) is not a partner or linked entity within the meaning of article 3 par. 2 and 3 of Annex 1 to the Commission Regulation (EC) No 800/2008 and Article 3 par. 2 and 3 of Annex I to the Commission Regulation (EU) No 651/2014.

Figure-5: An autonomous enterprise



Source: Own study based on: Commission Recommendation of 6 May 2003; Commission Regulation (EU) No 651/2014; European Commission: 2016: 16.

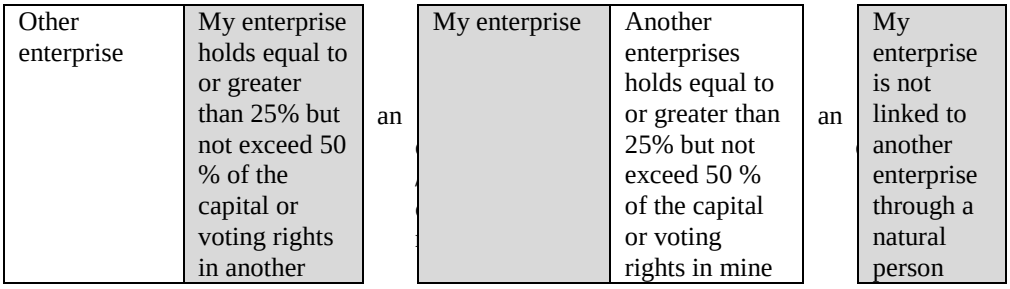
An enterprise may be ranked as autonomous, even if 25 % threshold is reached or exceeded by the following investors, provided that those investors are not linked (not exceeded 50 % threshold), either individually or jointly to the enterprise in question:

- universities or non-profit research centres;
- institutional investors, including regional development funds;

- public investment corporations, venture capital companies, individuals or groups of individuals with a regular venture capital investment activity who invest equity capital in unquoted businesses (business angels), provided the total investment of those business angels in the same enterprise is less than EUR 1 250 000;
- autonomous local authorities with an annual budget of less than EUR 10 million and less than 5 000 inhabitants.

Partner enterprises (figure-6) are all enterprises which are not classified as linked enterprises and between which there is the following relationship: an enterprise (upstream enterprise) holds, either solely or jointly with one or more linked enterprises, 25 % or more but not exceeded 50 % of the capital or voting rights of another enterprise (downstream enterprise).

Figure-6: Partner enterprises



Source: Own study based on: Commission Recommendation of 6 May 2003; Commission Regulation (EU) No 651/2014; European Commission: 2016: 18.

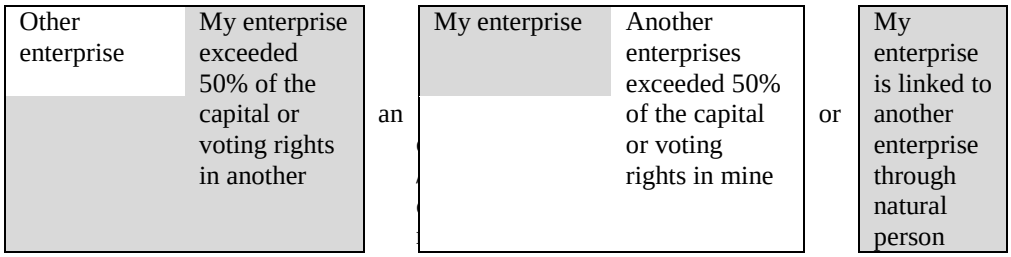
Data (employment, turnover and balance sheet total) of any partner enterprise of the enterprise in question situated immediately upstream or downstream from it are aggregated is proportional to the percentage interest in the capital or voting rights (whichever is greater). In the case of cross-holdings, the greater percentage applies.

Linked enterprises (figure-7) are enterprises which have any of the following relationships with each other:

- an enterprise has the right to appoint or remove a majority of the members of the administrative, management or supervisory body of another enterprise;
- an enterprise has a majority of the shareholders' or members' voting rights in another enterprise;

- an enterprise, which is a shareholder in or member of another enterprise, controls alone, pursuant to an agreement with other shareholders in or members of that enterprise, a majority of shareholders' or members' voting rights in that enterprise;
- an enterprise has the right to exercise a dominant influence over another enterprise pursuant to a contract entered into with that enterprise or to a provision in its memorandum or articles of association.

Figure-7: Linked enterprises



Source: Own study based on: Commission Recommendation of 6 May 2003; Commission Regulation (EU) No 651/2014; European Commission: 2016: 21.

Enterprises which have one or other of above mentioned relationships through a natural person or group of natural persons acting jointly are considered linked enterprises if they engage in their activity or in part of their activity in the same relevant market or in adjacent markets.

An “adjacent market” for a given service or product is considered to be a market that is directly downstream or upstream from the relevant market.

No dominant influence exists if the investors listed above are not involving themselves directly or indirectly in the management of the enterprise in question, without prejudice to their rights as shareholders.

The data are added 100% of the data of any enterprise, which is linked directly or indirectly to the enterprise in question, where the data were not already included through consolidation in the accounts.

5. THE EFFECTS OF INCORRECT COMPANY QUALIFICATION – A PRACTICAL APPROACH

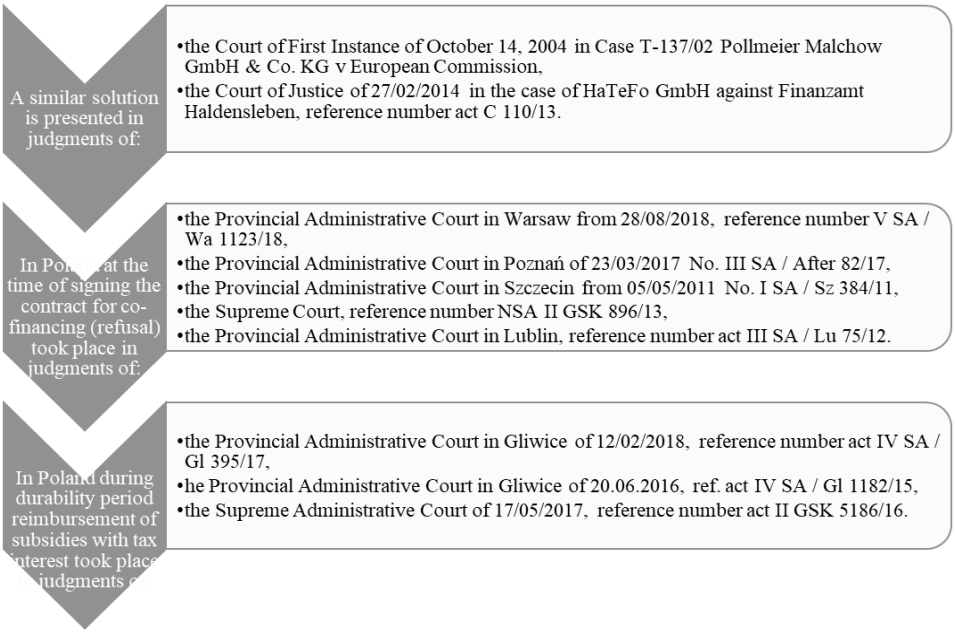
Projects co-financed from European Union funds are a special type of projects to which additional guidelines apply. Awareness of regulation and supremacy of EU law over national law can help enterprises avoid incorrect SME qualifications. Verification of the terms of admissibility of public aid, including in terms of size of enterprise on the day the aid is granted, lies with the entity granting the aid. Consequence of erroneous categorization or loss of SME status is non-awarding or the need to return state aid with tax interest, which is confirmed by the verdict of the Provincial Administrative Court in Lublin III SA/Lu 75/12.

The project submitted by the applicant (M. K.) positively passed all stages of the evaluation and was qualified by the Agency in L. for co-financing. By letter of 1 December 2011 No [...], the Agency informed M. K. about the refusal to sign the contract for co-financing the project, submitted in response to competition No [...], announced under Measure 1.1. Regional Operating Program (ROP) LV for the years 2007-2013. M. K. does not meet the requirement of an independent microenterprise, and therefore cannot obtain funding, as the competition concerned microenterprises operating on the market for up to 24 months. The court shared the assessment by the managing authority that the complainant did not meet the criteria for granting the aid.

The applicant for co-financing remains in the relationship of entities affiliated with [...] Sp. J. R. K., M. K., which results from the fact that the indicated economic entities have practically the same scope of activity, both entities operate in the same relevant market. The applicant concluded with AR a contract for the provision of services, consisting in the applicant conducting, inter alia, tire service, which is consistent with the scope of activity indicated in the project for co-financing. In addition, according to the application for co-financing, the services would be provided at [...] in L., where there are workshop rooms at the disposal of the AR company, and used by the applicant company on the basis of the agreement of 29/10/2010. The agency indicated also that the applicant concluded a loan agreement with his father RK (partner in the AR company) on terms more favourable than those applicable on the free market. The agency pointed out that AR already has several years of experience in the market, appropriate technical facilities and reputation, which gives it a privileged position on the local market. Thus, they form a group of entities, which makes it impossible to grant the subsidy requested, due also to the fact that the aid must be provided in a way that avoids unacceptable risks of distorting competition

According to article 26 par. 1 of the Act on the principles of conducting development policy, the tasks of the managing authority include, in particular, fulfilling the obligations under article 60 of Council Regulation (EC) No 1083/2006 of 11.07.2006 laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund, the selection, based on established project criteria, which will be co-financed under the operational program and concluding project financing agreements with the beneficiaries. The above-mentioned provision of article 60 of Council Regulation (EC) No 1083/2006 imposes on the managing authority an obligation to ensure that operations are selected for co-financing in accordance with the criteria applicable to the operational program and that they comply with Community and national rules for the period of their implementation. It would be a violation of the above rules to grant aid to an enterprise which, as a result of the links identified by the managing authority, referred to in article 3 of Annex I to Regulation (EC) No 800/2008, in fact has a position other than that resulting from the declaration by the applicant on the fulfilment of the criteria for granting the aid, specified in the regional operational program. There is no doubt that verification of the status of enterprises applying for co-financing is also possible at the stage immediately preceding the conclusion of the contract, because the beneficiary must fulfil the conditions for granting grant co-financing at the time the contract is concluded. Similar solution were in other judgments (figure-8).

Figure-8: Consequence of erroneous categorization or loss of SME status – effects of incorrect company qualification – practical approach



Source: Own study.

6. New Challenges for SME Definition

- research on connections and partnerships with foreign entities and internet entities (availability of data about beneficiaries and for institutions which verify the status and max financing depending on status and localization of the investment),
- changes in law,
- limited company in organisation, starts up,
- small business (monthly income up to 50% of the minimum wage, activities carried out personally by persons who have not run their business for the last 5 years) without an obligation to register, operating under simplifications for enterprises introduced by the Ministry of Enterprise and Technology; starts up,
- a company in succession acting in accordance with the Act of 5 July 2018 on the succession management of a private enterprise (Journal of Laws item 1629), family businesses.

The question arises here whether the limited company in the organization can be a beneficiary. In the 2007-2013 programming period, this was possible with some projects under Measure 8.1 of the OP IE. However, in the later period, the possibility of applying for co-financing by entities in the organization was waived. It should be recalled that, according to the first handbook, the condition of being classified as an SME is to have enterprise status. It is "any entity engaged in an economic activity regardless of its legal form". The above position and terminology are used by the Court of Justice in its case law. It is emphasized that the deciding factor is the fact of running a business, not a legal form. Translating into a practical approach, this means that an enterprise can be considered a self-employed person, a family enterprise and a company or any other entity engaged in a regular business activity. An economic activity is usually considered as "the sale of products or services at a given price in a given / direct market" (Urząd Publikacji Unii Europejskiej, 2015, s. 9). In the Detailed Description of Priority Axes of the ROP of the Śląskie Voivodeship for 2014-2020 (SZOOP RPO WSL 2014-2020) v 14.1 indicated that the beneficiary may be an enterprise entered in the Register of Entrepreneurs of the Central Register and Information on Economic Activity (CEIDG) or National Court Register (KRS), and the condition verification will take place at the moment of signing the contract for co-financing (Management of the Śląskie Voivodeship, 2018: 79, 84).

A similar problem applies to natural persons conducting small operations without the obligation to register. Article 5 of the Act of 6 March 2018 – Entrepreneurs' Rights (Journal of Laws of 2018, item 646) indicates that the business activity is performed by a natural person whose income from this activity does not exceed 50% in any month the amount of the minimum wage (defined in the Act of 10 October 2002 on the minimum remuneration for work (Journal of Laws of 2017 item 847 and of 2018 item 650), and did not run a business or the company was removed from the business register before April 30, 2017 (it does not apply to activities carried out under a civil law partnership). In a recent report, the European Committee of the Regions encourages the European Commission to try to clearly define start-ups. It has been argued that problems related to the definition of new enterprises may appear soon (El Madani, 2018: 113). In relation to the support from EU funds, in some calls additional points on the assessment are given to enterprises for the period of running a business or starting it. In relation to the support from EU funds, in some calls for grant applications, additional points are awarded to enterprises for the period of running a business or starting it. The problem for the subsidizing institution may be to determine the date from which

the business period should be calculated. A consequence for the beneficiary may be the failure to grant or return the funding.

The problem arises in the case of a company which operates in accordance with the Act of 5 July 2018 (Journal of Laws, item 1629). New regulations came into force on November 25, 2018, with the exception of article 30 of the Act, which entered into force on February 25, 2019. Succession management is a form of temporary management of the enterprise after the entrepreneur's death. Successor is responsible for running the business (contracts with employees, contacts with contractors, tax matters, The Polish Social Insurance Institution (ZUS)) until the inheritance formalities are settled. Succession management is a temporary solution. It may last 2 years after the entrepreneur's death (for important reasons, the court may extend this period to 5 years). It gives legal successors time to decide on the further fate of the company (continued self-employment, sale, closure) (Ministry of Enterprise and Technology, 2019a). EU guidelines do not provide solutions in this regard. The problem concerns many family businesses. Its recommended to regulate and give examples of replacing the beneficiary in the guide.

CONCLUSION

In the author opinion, as well as European Savings and Retail Banking Group opinion, the existing distinction between micro, small and medium-sized enterprises is appropriate and should be maintained as it offers the possibility for targeted and graduated funding. The definition of SME in terms of European Union guidelines requires special attention in the case of projects applying for EU funding. Awareness of the problem related to regulations and the superiority of EU law over domestic law may help enterprises avoid wrong qualification of SMEs, which means that they do not grant funding or need to return it with tax interest.

Recommendations:

- more and correct information about the SME definition, durability period, consequences of changing the SME status;
- publications, instructions, including even public institutions, end the presentation of SME definition should indicate the data source of definition and information that detailed explanations are found in a specific regulation or guide and it is necessary to familiarize them with the purpose to properly determine the status;
- in the guideline should be added new examples how to understand the definition, especially involving changes in law (ex. start-up, business

succession, family business), internationalization, informatization of companies;
- more examples in the guideline presented by tables, drawings, icons, charts;
- calls for proposals for all SMEs, and not just calls for micro-enterprises or only for small or medium-sized enterprises.

It is worth adding that European Parliament "calls on the Member States and the Commission to provide guidance to enterprises on the procedures used to determine SME status and information about any changes concerning the SME definition or procedures, in a timely and optimal manner" (European Parliament, 2018). Due to the subject of the article, it deals only with selected issues related to the SME definition. The topic requires discussion in a more dignified group of scientists than the author's person.

REFERENCES

1. Bednarczyk (2004), Małe i średnie przedsiębiorstwa w Polsce a integracja europejska, Kraków: Wydawnictwo Akademii Ekonomicznej w Krakowie.
2. Cieślak (2007), „Fundusze strukturalne w latach 2007-2013. Podstawowe informacje", (in: Cieślak, Kordasiewicz, *Fundusze Unijne 2007-2013 Poradnik przedsiębiorcy)*, Wrocław: Oficyna Wydawnicza Unimex.
3. Czekański, Gajek (2015), Pomoc publiczna na badania, rozwój i innowacje, Warszawa: Narodowe Centrum Badań i Rozwoju.
4. Daszkiewicz, Wach (2013), Małe i średnie przedsiębiorstwa na rynkach międzynarodowych, Kraków: Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie.
5. Definicja mikroprzedsiębiorstw oraz małych i średnich przedsiębiorstw, http://europa.eu/–legislation_summaries/enterprise/business_environment/n26026_pl.htm.
6. Dumitru, Neluta (2017), „The Access of SMEs from Romania to Financing through Financial Instruments. Impact and Results", *"Ovidius" University Annals, Economic Sciences Series*, Volume XVII, Issue 1, p. 562.
7. El Madani (2018), *SME Policy: Comparative Analysis of SME Definitions*, International Journal of Academic Research in Business and Social Sciences, 8(8).
8. European Commission (2015), *State aid: The Commission approves the regional aid map for 2014-2020 for Poland*, http://europa.eu/rapid/press-release_IP-14-180_en.htm [Accessed 18.03.2015],
9. European Commission (2016), *The User Guide to the SME Definitions Ref. Ares (2016) 956541 – 24/02/2016, https://publications.europa.eu/en/publication-detail/-/publication/79c0ce87-f4dc-11e6-8a35-01aa75ed71a1* [Accessed 5.04.2019].
10. European Parliament, *European Parliament resolution of 4 July 2018 on the definition of SMEs (2018/2545(RSP)).*
11. European Savings and Retail Banking Group (2018), *ESBG response to the European Commission consultation on the review of the SME definition, ESBG Transparency*, Register ID 8765978796-80, Doc 0274/2018, https://www.wsbi-esbg.org/SiteCollectionDocuments/0274_FINAL%20(002).pdf [Accessed 4.04.2019].
12. http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_pl.pdf.
13. Kaliszuk, Tarnawa (2003), Programy wsparcia dla Małych i Średnich Przedsiębiorstw, wyd. 1, Warszawa: Fundusz Współpracy.
14. Komisja Europejska (2014), *Rozporządzenie Komisji Europejskiej nr 651/2014 z dnia 17 czerwca 2014 r. uznającym niektóre rodzaje pomocy za zgodne z rynkiem wewnętrznym w zastosowaniu artykułów 107 i 108* (*COMMISSION REGULATION (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty (Text with EEA relevance*); https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.187.01.0001.01.ENG [Accessed 18.01.2019].
15. Komisja Europejska (2015), *Rozporządzeniu Delegowanym Komisji (UE) 2015/1076 z dnia 28 kwietnia 2015 r. ustanawiającym na mocy rozporządzenia Parlamentu Europejskiego i Rady (UE) nr 1303/2013 dodatkowe przepisy*

dotyczące zastąpienia beneficjenta i stosownych obowiązków oraz minimalne wymogi, które mają być zawarte w umowach partnerstwa publiczno-prywatnego finansowanych z europejskich funduszy strukturalnych i inwestycyjnych.

16. Komisja Europejska (2019), *Public consultation on the review of the SME definition*, https://ec.europa.eu/info/consultations/public-consultation-review-sme-definition_en [Accessed 17.01.2019].
17. Komisja Europejska (2019), *What is an SME?*, http://ec.europa.eu/growth/–smes/business-friendly-environment/sme-definition/ [17.01.2019].
18. Komisja Wspólnot Europejskich (1996), *Rekomendacją Komisji Europejskiej nr 96/280/WE z dnia 3 kwietnia 1996 r. w sprawie definicji małych i średnich przedsiębiorstw*, Dz. U. WE 107, 30.04.1996.
19. Komisja Wspólnot Europejskich (2003), *Rekomendacją Komisji Europejskiej nr 2003/361/–WE 2003 r. o definicji małych i średnich przedsiębiorstw*, Dz. U. WE 124/2003.
20. Komisja Wspólnot Europejskich (2003), *ZALECENIE KOMISJI z dnia 6 maja 2003 r. dotyczące definicji mikroprzedsiębiorstw oraz małych i średnich przedsiębiorstw (notyfikowane jako dokument nr C(2003) 1422) (Tekst mający znaczenie dla EOG) (2003/361/WE.), Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (Text with EEA relevance) (notified under document number C(2003) 1422) OJ L 124, 20.5.2003, p. 36–41*, https://eur-lex.europa.eu/legal-content/EN/TXT/–?uri=CELEX:32003H0361 [Accessed 15.01.2019].
21. Komisja Wspólnot Europejskich (2006), *Nowa definicja. MŚP Poradnik dla użytkowników i wzór oświadczenia*, http://ec.europa.eu/enterprise/policies–/sme/files/sme_definition/sme_user_guide_pl.pdf.
22. Komisja Wspólnot Europejskich (2008), *Rozporządzenie Komisji (WE) nr 800/2008 z dnia 6 sierpnia 2008 r. uznającego niektóre rodzaje pomocy za zgodne ze wspólnym rynkiem w zastosowaniu artykułów 87 i 88 Traktatu (ogólne rozporządzenie w sprawie wyłączeń blokowych), The Commission Regulation (EC) No 800/2008 of 6 August 2008, declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General block exemption Regulation) (Text with EEA relevance*) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008R0800 [Accessed 15.01.2019.
23. Kowalski (2016), „Definicja MŚP w przepisach UE a specyfika przedsiębiorstw polskich, Państwo i Społeczeństwo", *Dwumiesięcznik* – rocznik 61: 2016, nr 2 (367) marzec-kwiecień, Warszawa: Najwyższa Izba Kontroli, s. 319.
24. Kubera (2010), Pomoc inwestycyjna dla przedsiębiorców w Unii Europejskiej, Warszawa: CeDeWu.
25. Kulawik-Dutkowska (2014), „Prawidłowe określenie statusu MŚP w kontekście korzystania z pomocy publicznej przez przedsiębiorstwa", *Internetowy Kwartalnik Antymonopolowy i Regulacyjny*, nr 9(3), Warszawa s. 75, https://ikar.wz.uw.–edu.pl/numery/23/pdf/73.pdf [Accessed 18.01.2017].
26. Marquuardt (2007), Pomoc publiczna dla małych o średnich przedsiębiorstw, Warszawa: LexisNexis.
27. Ministerstwo Przedsiębiorczości i Technologii (2019a), *Sukcesja firmy – jak ułatwić następcom kontynuowanie działalności*, https://www.biznes.gov.pl–/pl/firma/zamykanie-firmy/chce-zakonczyc-dzialalnosc-jednoosobowa/zarzad-sukcesyjny-ulatwienie-w-przekazywaniu-firmy-nastepcom [Accessed 04.06.2019].

28. Ministerstwo Przedsiębiorczości i Technologii (2019b), https://www.biznes–.gov.pl/pl/ulatwienia-dla-biznesu/ulatwienia-dla-firm [Accessed 21.01.2019 r.].
29. Ministerstwo Rozwoju (2017), *Rozporządzenie Ministra Rozwoju w sprawie warunków obniżania wartości korekt finansowych oraz wydatków poniesionych nieprawidłowo związanych z udzielaniem zamówień z dn. 22.02.2017 r. (Dz. U. z 2017, poz. 615) zmieniające Rozporządzenie Ministra Rozwoju z dnia 29 stycznia 2016 r. w sprawie warunków obniżania wartości korekt finansowych oraz wydatków poniesionych nieprawidłowo związanych z udzielaniem zamówień (Dz. U. z 2016, poz. 200).*
30. Orzeczenie TS UE z 28 kwietnia 2004 roku w sprawie C-91/01- Italian Republic vs. Commission of the European Communities.
31. Pabiś (2016), „Wsparcie małych i średnich przedsiębiorstw na przykładzie miasta Częstochowa", *Zeszyty Naukowe Politechniki Częstochowskiej*, Zarządzanie Nr 23, t. 2, Częstochowa: Politechnika Częstochowska.
32. Piekarczyk, Zimniewicz (2010), Myślenie sieciowe w teorii i praktyce, Warszawa: Polskie Wydawnictwo Ekonomiczne.
33. Polish Investment and Trade Agency S.A. (2007), *Change of regional aid rules*, https://www.paih.gov.pl/nowosci/?id_news=1255 [Accessed 24.05.2019].
34. Polska Agencja Rozwoju Przedsiębiorczości (2007), *Raport o stanie małych i średnich przedsiębiorstw w Polsce w latach 2005-2006*, Warszawa.
35. Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 1303/2013 z dnia 17 grudnia 2013 r. ustanawiającego wspólne przepisy dotyczące Europejskiego Funduszu Rozwoju Regionalnego, Europejskiego Funduszu Społecznego, Funduszu Spójności, Europejskiego Funduszu Rolnego na rzecz Rozwoju Obszarów Wiejskich oraz Europejskiego Funduszu Morskiego i Rybackiego oraz ustanawiające przepisy ogólne dotyczące Europejskiego Funduszu Rozwoju Regionalnego, Europejskiego Funduszu Społecznego, Funduszu Spójności i Europejskiego Funduszu Morskiego i Rybackiego oraz uchylającego rozporządzenie Rady (WE) nr 1083/2006 (Dz. Urz. UE L 347 z 20.12.2013 r.) (Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006, OJ L 347, 20.12.2013, p. 320–469, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1303 [Accessed 08.01.2019]).
36. Skowronek-Mielczarek (2005), Małe i średnie przedsiębiorstwa. Źródła finansowania, Warszawa: Wydawnictwo CH Beck.
37. Szczęsna L., Beneficjenci powinni uważać na zmiany w swojej strukturze w czasie realizacji projektów. Narodowe Centrum Badań i Rozwoju, https://www.ncbr.gov.pl–/potrzebuje-wiedzy-firma/aktualnosci/szczegoly/news/beneficjenci-powinni-uwazac-na-zmiany-w-swojej-strukturze-w-czasie-realizacji-projektow-52443/ [Accessed 25.11.2018 r.].
38. Śląskie Centrum Przedsiębiorczości (2018), *Prace nad zmianą definicji MŚP. Weź udział, wypełnij kwestionariusz!*, http://www.scp-slask.pl/czytaj/prace_nad_–zmiana_definicji_msp__wez_udzial_wypelnij_kwestionariusz, Komisja

Europejska, https://ec.europa.eu/–eusurvey/runner/targeted_sme_definition [Accessed 08.01.2018].
39. The Judgment of the Court of First Instance of October 14, 2004 in Case T-137/02 Pollmeier Malchow GmbH & Co. KG v European Commission.
40. The Judgment of the Court of Justice of 27/02/2014 in the case of HaTeFo GmbH against Finanzamt Haldensleben, reference number act C 110/13.
41. Tkaczyński, Świstak, Sztorc (2011), Projekty europejskie. Praktyczne aspekty pozyskiwania i rozliczania dotacji unijnych, Warszawa: Wydawnictwo C. H. Beck.
42. Tkaczyński, Willa, Świstak (2009), Leksykon funduszy Unii Europejskiej, Warszawa: Wydawnictwo C. H. Beck.
43. Urząd Publikacji Unii Europejskiej (2015), *Poradnik dla użytkowników dotyczących definicji MŚP*. Ref. Ares (2016)956541 – 24.02.2016., Luksemburg.
44. Ustawa – Kodeks Pracy z 26 czerwca 1974 roku, Dz.U. PRL/RP z 1998 r., nr 21, póz. 94 z poźn. zm.
45. Ustawy z dnia 6 marca 2018 r. – Prawo przedsiębiorców (Dz.U. 2018 poz. 646).
46. Ustawa o swobodzie działalności gospodarczej z dnia 2.07.2004 r. (Dz. U nr 173, poz. 1807, s. 33), article 104-106.
47. Uwaga 48 Decyzji KE nr 904/2006 z 7 czerwca 2006 r. w sprawie pomocy państwa nr C 8/2005.
48. Woźniak (2006), Rozwój sektora małych i średnich przedsiębiorstw w Polsce a wzrost gospodarczy, Kraków: Wydawnictwo Akademii Ekonomicznej w Krakowie.
49. Wyrok WSA w Lublinie III SA/Lu 75/12, http://orzeczenia.nsa.gov.pl/–doc/B95C2B054F.
50. Zarząd Województwa Śląskiego (2018), *Uchwała zarządu nr 93/13/VI/2019 z dnia 23.01.2019 r. w sprawie aktualizacji Szczegółowego Opisu Osi Priorytetowych Regionalnego Programu Operacyjnego Województwa Śląskiego na lata 2014-2020. Szczegółowy Opis Osi Priorytetowych Regionalnego Programu Operacyjnego Województwa Śląskiego na lata 2014-2020 (SZOOP RPO WSL 2014-2020) v 14.1*, Katowice, s. 79 i 84 [na dzień 23.01.2019 r.].
51. Zarząd Województwa Śląskiego (2019), *Załącznik nr 3 do Regulaminu konkursu dla Działania 3.2 „Innowacje w MŚP" Umowa o dofinansowanie projektu współfinansowanego ze środków Europejskiego Funduszu Rozwoju Regionalnego w ramach Regionalnego Programu Operacyjnego Województwa Śląskiego na lata 2014-2020 stanowiący, załącznik nr 3 Uchwały zarządu nr 92/13/VI/2019 z dnia 23.01.2019 r.*

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ROMANIA'S RESEARCH AND INNOVATION AREA: THE BEGINNING OF A SWOT ANALYSIS

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Abstract: *The global, "soft-power" role of research, development and innovation (R&D) has increased drastically over the last decades and the expectations regarding the societal and economic benefits of R&D as a natural effect of investment are greater than ever. Although Romania has implemented some of the most up-to-date concepts and strategies in the R&D field, the results are still modest and far below expectations, the country ranging last places among international scoreboards.*

This study briefly surveys some of the most relevant indicators and statistics in the field and builds the fundamentals of a more complex SWOT analysis of the Romanian R&D area. It highlights key interconnected aspects like research national policies, public and private funding, human resources, key players in the field, R&D output and infrastructure.

Some of the strong points in the area are generated by a handful of poles of excellence – performing research entities based on highly qualified personnel and state-of-the-art infrastructure, stimulated by funding instruments under competitive conditions. The weaknesses belong to a complex of shortcomings and malfunctions related to the system's funding and overall structure. These raise serious questions regarding the participation of the national R&D system to the sustainable development of Romania.

Keywords: *R&D, Innovation, Research and Development Policy, Academic Research, Research Institute*

JEL Classification*: I23; O31, O32*

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1. INTRODUCTION

The core of the scientific, "soft" power of any nation is (or should be) the research, development and innovation system, and the way in which a state or a society approaches this area directly and precisely transmits the attitude that that state or that society has regarding its development towards to so-called "knowledge-based society".

Science, the general term for a multipolar research, development and innovation landscape, is indisputably acknowledged as a key feature of sustainable development, since it allows us to comprehend and tackle present and future societal, economic and technological issues and challenges.

This is why the investments in R&D will continue their growing trend this year (+3.6% as compared to 2018), with the United States and China being the "classic" leaders in this field, followed at great distance by Japan, Germany and South Korea (R&D Magazine 2019). More than two-thirds of these investments are coming from the private sector and roughly one fifth is estimated to be dedicated towards basic or fundamental research, thus showing an increasing preoccupation towards the opportunities and challenges of tomorrow.

As a consequence, there is no surprise that the above-mentioned countries are a constant presence as the leaders of international scoreboards of R&D quality (often measured by the so-called h-index, a citation metric which evaluates the impact and productivity of the scientific output of a R&D entity, e.g. scientist, institution or country (Jones, 2011) as indicated by Scimago Journal & Country Rank (2019).

The same ranking places Romania on the 45th position in the world (6th in Eastern Europe), following Iceland, Malaysia and Slovenia. The best performing Romanian scientific areas are (according to the worldwide h-index by scientific area as defined by Scimago): engineering, mathematics, chemistry and chemical engineering, medicine, physics and astronomy, computer science, materials science, biochemistry (their order ranges from year to year, but the list of the most performing areas has remained the same over the last few years).

According to in-depth analysis performed by the 2018 European Innovation Scoreboard (European Commission, 2019), which makes a comparative assessment of the EU R&D performance based on 27 indicators (2017 values), Romania accompanies its neighbor Bulgaria in the ranking's last category, Modest Innovators, since they display an aggregate index value below 50% of the EU average. As compared to the earlier versions of this yearly scoreboard, Romania falls behind Bulgaria in 2018 in its R&D performance and distances itself even more from the

European average, showing the largest decline in the EU since 2010 (-30% in the 2018 innovation index compared to 2010). This is mainly determined by some major decreases of the indicators dealing with the human resource size, public and private R&D investment, innovative small and medium enterprises (SMEs) a.o.

These modest and far below expectations results suggest a bitter image of the current Romanian R&D area and come in contradiction with the fact that Romania has implemented in the last two decades some of the most up-to-date concepts and strategies in the field. Various internal and external analyzes and assessments carried out in recent years (some of the most important ones being cited in this paper) have consistently highlighted the weaknesses in this area, with numerous and multifaceted causes which, similarly to other former socialist countries, cannot be completely dissociated from the history of the last half of century.

The above mentioned analyzes consist mostly of various comparisons and connections between a series of inputs (such as the system dimensions, human resource, infrastructure, investments) and various output parameters (quantitative and qualitative productivity, regional national and international impact), at various geographical scales, over different periods of time, and lead to the same main conclusion: the Romanian R&D system faces a complex of shortcomings and malfunctions and performs well below its real value. Moreover, they cannot be properly corrected by the (timid) attempts of institutional and financial revival undertaken since early 2000s.

The current state of affairs is closely linked to the R&D system's overall structure and its underachieving management, which are undeniably associated with the chronic, inefficient and unequal sub-financing of the system, and the small dimensions of its human resources. These major flaws raise serious questions regarding the participation of the national R&D system to the sustainable development of Romania.

Some of the strong points in the area are generated by a handful of poles of excellence – performing research entities based on highly qualified personnel and state-of-the-art infrastructure, stimulated by funding instruments under competitive conditions. The evolution of these research bodies is in many cases a natural consequence of solid traditions and significant human capital in certain areas of research. Their development was also supported by the activation of multidisciplinary research programs and consortia, stimulative actions for the entry level personnel, international mobility programs, awarding high quality research results (mainly ISI articles and patents). They have been added to the reestablishment of various ties with the ever-growing Romanian scientific diaspora

and with the international academic environment, and, to a less extent, to the development of some industrial parks or centers, which have to build bridges with the innovation and application-driven research area.

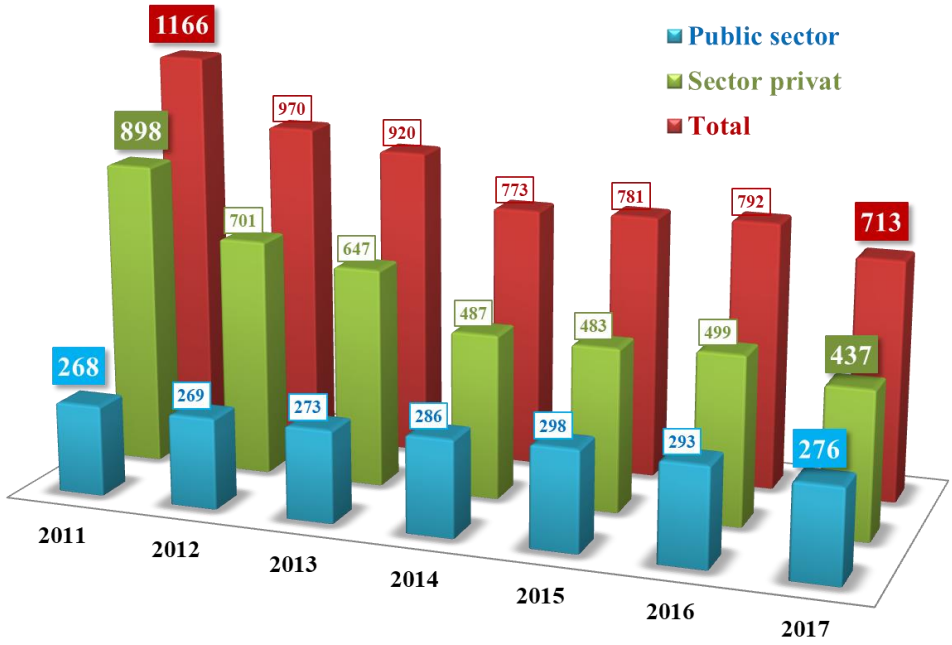
This study briefly surveys some of the most relevant indicators and statistics in the field and builds the fundamentals of a more complex SWOT analysis of the Romanian R&D area. It highlights key interconnected aspects like research national policies, public and private funding, human resources, key players in the field, R&D output and infrastructure.

2. R&D GOVERNANCE

Without any major reorganization after 1989, the Romanian R&D system is made of several heterogeneous, insufficiently connected pieces of various sizes: former industry-driven, sector-based institutes nowadays called national research and development institutes (divided between the public and the private sector), research institutions belonging to the Romanian Academy, universities, and (mostly) small-scale private R&D bodies. The former were seriously affected in the transition period by the low public investment and sparse, if any, demand for their services and expertise (Russu, 2014). The latter appeared in recent years as spin-offs, start-ups, NGOs or subsidiaries of multinational companies.

This particular organizational structure as compared to better performing countries in the field represents one major drawback of the system. For example, although Romanian higher education can be considered well developed, there are a relatively small number of universities which, on the basis of commonly accepted performance indicators, can be categorized as performing research entities. More specifically, there is currently no Romanian university that is in a top, decent position in the annual international rankings. Neither the national research and development institutes (often involved in struggles for survival) nor those belonging to the Romanian Academy (in both cases, with some precious exceptions) do not make a much better figure.

Figure 1: Evolution of the number of total, public and private R&D entities in Romania, 2011-2017 (Public: universities, national R&D institutes, institutes of the Romanian Academy; Private: business and NGOs)



Source: extension of Market Watch 2019, author with data from National Institute of Statistics (2017: last year with full centralized data)

Even if, at a first glance, they seem to build a diverse and flexible institutional model, one crucial weakness of these research bodies is the missing links in the connection with the national or European industry and the subsequent limited applicative potential of their research results. Placed in a larger volatile economic environment, this resulted in recent years in serious financial stability issues, almost half of the private R&D entities, most of them micro- and small-scale enterprises, disappearing from the market.

This unfavorable situation is doubled by a complex R&D governance system, with several institutions on multiple levels which are in charge of developing, implementing and evaluating the national strategy in the R&D field (renewed every four years) and need to aggregate and administer a heterogeneous and segregated system.

The strong points of the R&D governance are based on the experience capitalization of former national R&D plans, harmonization between national and

EU legislation and the implementation of various European governance models, including a Smart Specialization Strategy.

However, the national strategy fails to deliver a general system of evaluation of all research actors and programs and lacks the legislative, financial or structural tools and incentives to prompt R&D activities and their application in the economy. Meanwhile, the overall R&D management is not able to deliver the multi-annual funding competitions promised by the strategy and suffers from low transparency, excessive bureaucracy and overregulation. Moreover, it displays huge gaps in terms of predictability and stability, fueled by often changes in terms of secondary legislation and institutional framework.

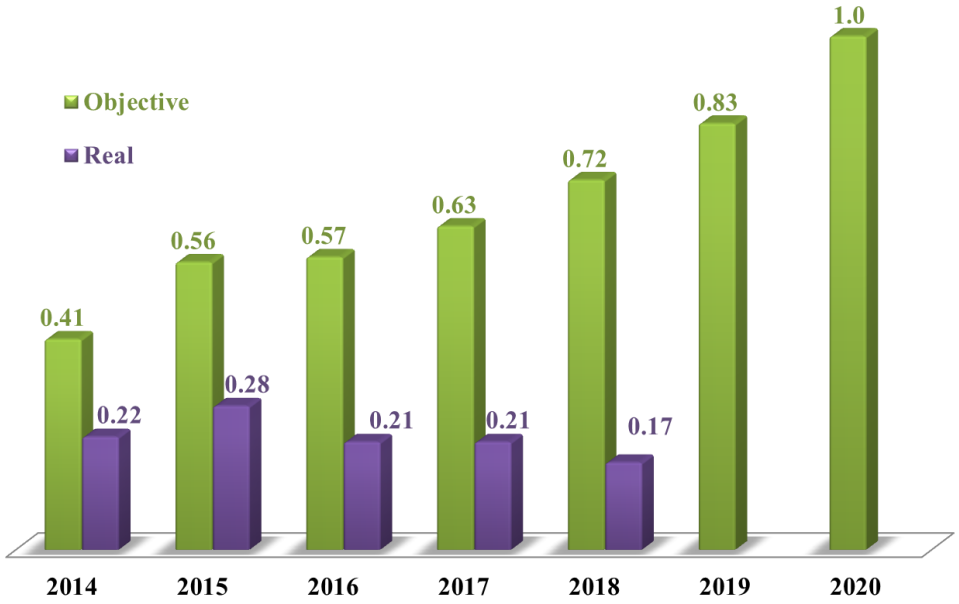
Nevertheless, the guilt must not be concentrated in one direction – the limited number of solid partnerships with the economic and social environment is also influenced by the insufficient involvement of the private sector in the financing of research and its reluctance towards technology intensive manufacturing.

As a consequence, there is a strong demand for a collaborative framework to ensure the proper environment for clustering and networking between public and private research, development and innovation.

3. R&D INVESTMENT

Most recent data available from the National Institute of Statistics (2019) show that the public GDP share allocated to R&D is the smallest in the last 10 years. This 0.17% GDP value, one of the smallest in the EU, follows a 4-years underfunding trend and is far behind the public R&D investment objective of 0.72%. The situation is all the more delicate since Romania has assumed a target of 2% in R&D investment (equally divided between the public and the private sector) when joining the general vision outlined in the Europe 2020 Strategy. The private sector doesn't perform better in this regard, being blocked in the 0.18-0.21% range in the last ten years. As a consequence, the research system can be considered chronically underfunded and the already limited financial resources are scattered across a wide, fragmented R&D system.

Figure 2: Public R&D investment objectives *vs* public R&D expenditure, \
as % of GDP, 2014-2020



Source: author with data from National R&D Strategy 2014-2020 (Objectives), National Institute of Statistics (2014-2017 R&D expenditure) and Ministry of Research and Innovation (2018: last year with full centralized data)

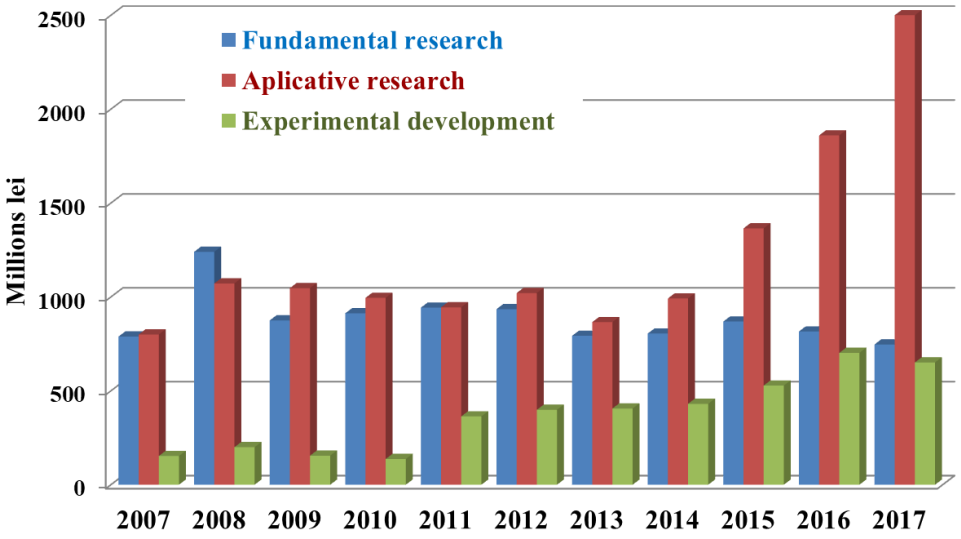
Even if the current European R&D Program (*Horizon 2020*) has not yet finished, partial data provided by the Ministry of Research and Innovation suggest an improvement of the dimensions of the funds attracted from the EU budget through various competitions. As a positive fact, it has to be emphasized that much of these resources have been redirected towards the development of infrastructure and human resources in the field, a necessary complement for to national programs.

Romania's R&D intensity makes it often difficult for the research system to function properly and efficiently. Significant annual fluctuations of the public investment, cumulated with the system's inadequate or delayed response, make it difficult to establish a programmatic, effective and predictable evolution of the R&D area.

As mentioned before, the private investment in the R&D area is also well below the national targets and most of these resources are immobilized in the business sector (Romanian Statistical Yearbook 2018; European Commission, 2019), indicating towards a scarce and inefficient collaboration between the private

and public sector and a low level of commercialization of applicative research results. These also point towards some missing links in the clustering and networking chain, since the R&D expenditure in the last 10 years show quite a large increase of the overall investment in applicative research and experimental development, which should be accompanied by some tangible results in terms of innovative products and technologies.

Figure 3: R&D expenditures by research categories, 2007-2017 (current prices)



Source: extension of Market Watch 2019, author with data from National Institute of Statistics (2017: last year with full centralized data)

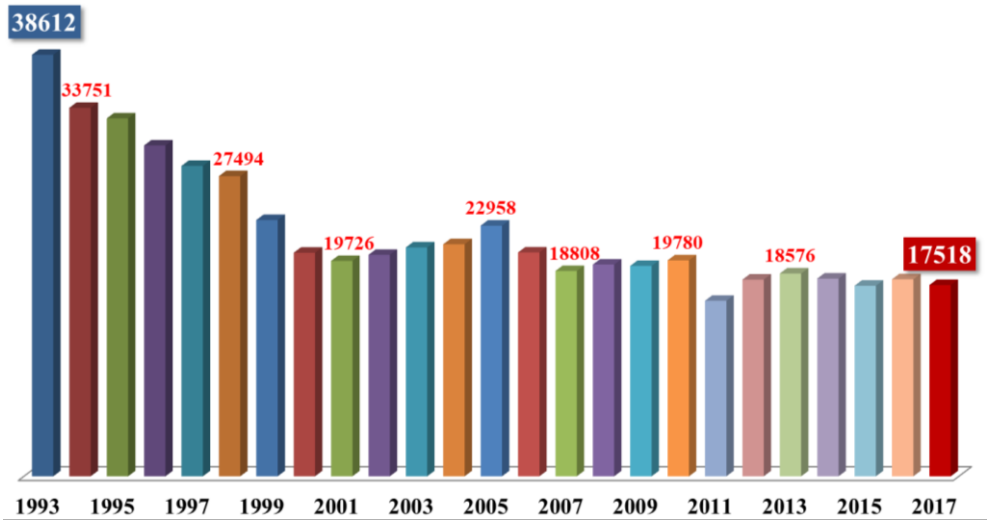
4. HUMAN CAPITAL

One of the most important negative effects of the R&D *status quo* in the last three decades is the sever contraction of human capital: according to the National Statistics Institute data, the number of Romanian researchers (in full time equivalents) has dropped by more than 53% in the last 25 years. The decreasing trend was very sharp in the 1990s, experienced a short revival in the middle 2000s, and continued its descent after 2010, reaching a value around 17.5 thousands researchers in 2017.

As part of an overall Romanian migration process taking part in consecutive waves in the last three decades, a significant number of researchers (especially young people) have departed public or private R&D bodies abroad (Dospinescu,

2018). It is worth noting that Romania is part of the group of countries that have the highest percentage of export of researchers, but it has an almost irrelevant percentage of invited researchers.

Figure 4: Evolution of the total number of researchers in Romania in the last 25 years (full time equivalents)



Source: extension of Market Watch 2019, author with data from National Institute of Statistics (2017: last year with full centralized data)

On one side, the migration of young students (PhDs, postdoctoral students) and Romanian researchers in countries with superior performing R&D systems (especially in Europe and the USA) comes as a bitter confirmation of the quality of human capital in this area. The biggest problem is related to stopping and, afterwards, reversing this undesirable trend – the return of (part of) this valuable asset, unlikely under the current conditions, despite the efforts made in recent years in this respect (concretized mostly in tax exemptions and some wage increases).

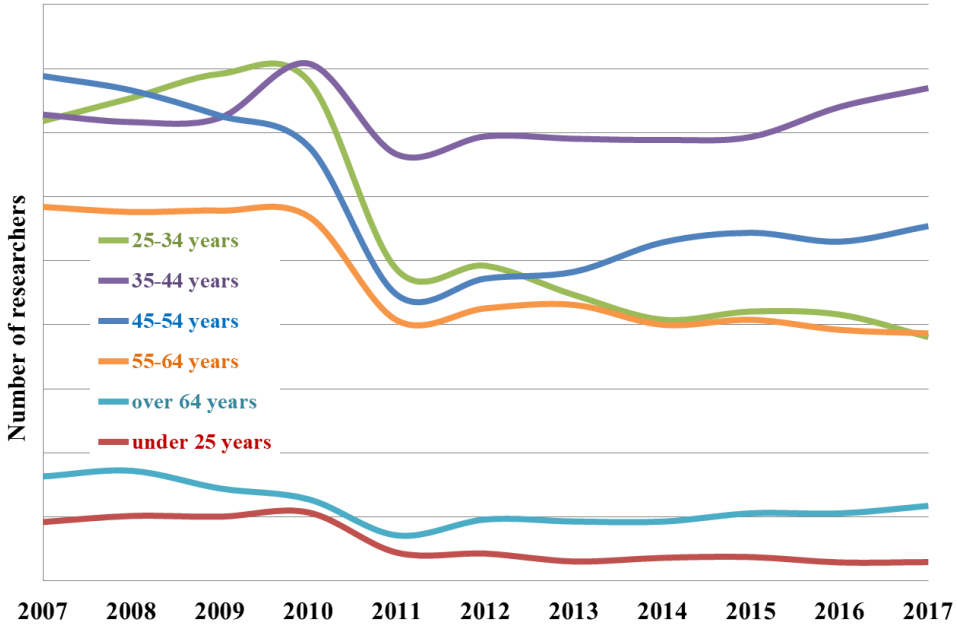
On the other side, this solid *brain drain* phenomenon determines negative effects on the medium and long term and affects the performance, predictability and efficiency of the R&D system and overall economy, which already lacks skilled human resources. As a result, the national R&D human resource (in terms of total number of researchers in full time equivalents) is constantly around 30% of the EU average in the field, with no reasonable hopes of increasing (Chioncel, 2018). When it comes to the R&D personnel as share among the active population, the situation is even worse. As a consequence, there is no surprise that the human

capital experiences an unbalanced distribution among research areas and regions. The Bucharest-Ilfov region seems to suffer the least in this regard, but only because it concentrates roughly 40% of the national R&D entities.

Moreover, this process is doubled by some negative mutations in the active age range – according to the same source, about 60% of active researchers are over 40 – which, linked to a lack of attractiveness of a research career for the early, young graduates, can easily lead to a phenomenon of senescence of the human resource in the field.

It can be observed that the number of so-called young researchers (under 25 or between 25 and 34 years old) has decreased with roughly 4 thousands persons in the last 10 years (with full centralized data), mostly due to the above-mentioned brain drain process. In addition, the 55-64 age group has also diminished in last years, due to the natural retirement of almost 2 thousands researchers in the last 10 years.

Figure 5: Number of researchers by age groups in Romania, thousands of persons, 2007-2017



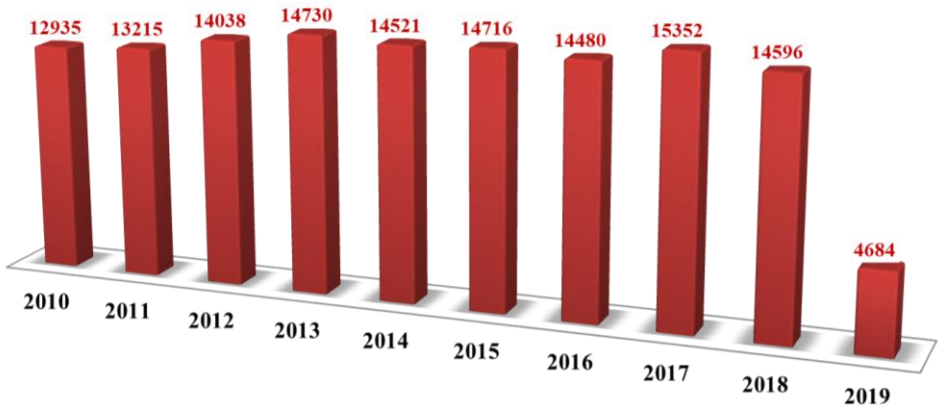
Source: extension of Market Watch 2019, author with data from National Institute of Statistics (2017: last year with full centralized data)

5. Scientific Output and Performance

The strengths and opportunities are more visible when it comes to the scientific output and performance, in terms of the quantity and quality of the results of the national R&D system. Although Romania's scientific and technological productivity is still reduced, or at least well below its potential, developments in the last 10 years show a growing trend above the European average.

A recent analysis of Scimago Journal & Country Rank data (a well-known online tool used to produce R&D productivity statistics worldwide, based on scientometric information provided by the Scopus database) shows Romania on the 43rd place in the world in 2018 regarding the generated number of scientific documents, behind Thailand, New Zeeland and Ireland. Although this is a decrease as compared to the last 5 years scoreboards (36th in 2013, 38th in 2014 and 2015, 39th in 2016, 42nd in 2017), the output is quite high as compared to the investment (other countries, e.g. Hungary and Slovakia are placed after Romania, even if their R&D financing (GDP%) is superior).

Figure 6: Number of scientific publications (articles, proceedings, reviews, published or in press) with Romanian affiliation (2019: partial data)



Source: author with data from Scopus (May 2019)

The 14.5 thousands scientific documents with Romanian affiliation from 2018 (quite close to the last 5 years average) represent 0.49% of the global scientific output and 6.17% of the region's productivity and places Romania 4th in Eastern Europe (after the Russian Federation, Poland and the Czech Republic). 36.72% of these documents were the result of international collaboration (the

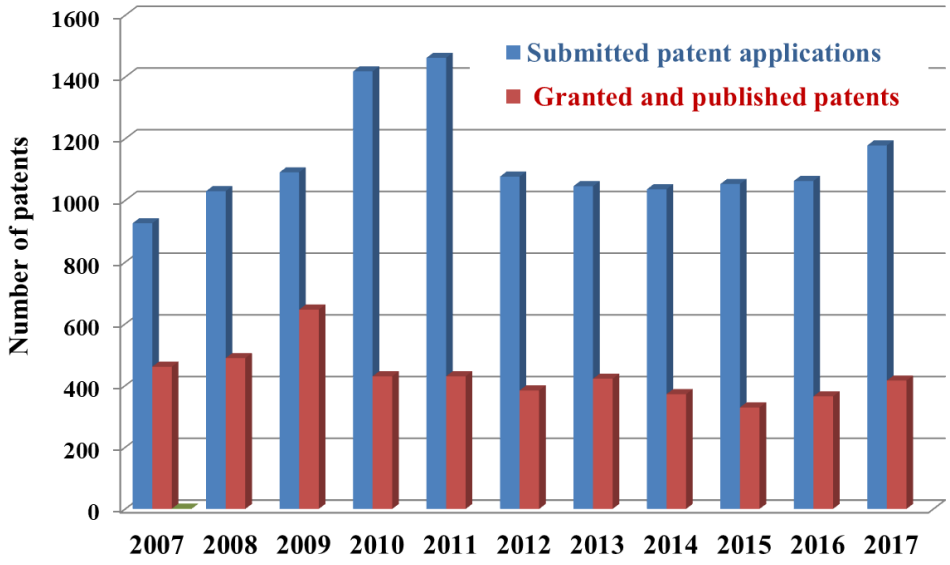
highest value since 2007) and 24.25% represent open access output, thus increasing the overall visibility and access to the system's results.

When it comes to the quality of these results, as measured by means of the h-index, the same source places Romania on the 45th position in the world and 6th in Eastern Europe, mostly due to some traditionally performing scientific areas like: engineering, mathematics, chemistry and chemical engineering a.o.

According to the Eurostat classification criteria, the quality and visibility of these results is towards the end of an EU scoreboard but has improved as compared to 2007. For example, the % of Romanian scientific publications within the 1% most cited scientific publications worldwide has increased from 0.28% in 2007 to 0.39% in 2014 (last assessed year), while the % of Romanian scientific publications within the 10% most cited scientific publications worldwide has increased from 4.1% in 2007 to 4.6% in 2015 (last assessed year) (Burkhardt, 2018).

There is a second indicator regarding the scientific output and performance of an R&D system, more close to the practical, innovation- and economical-linked productivity of research: the number of patents, in terms of patent applications and granted and published patents, their progress being presented in the figure below.

Figure 7: Number of national submitted patent applications and granted and published patents, 2007-2017

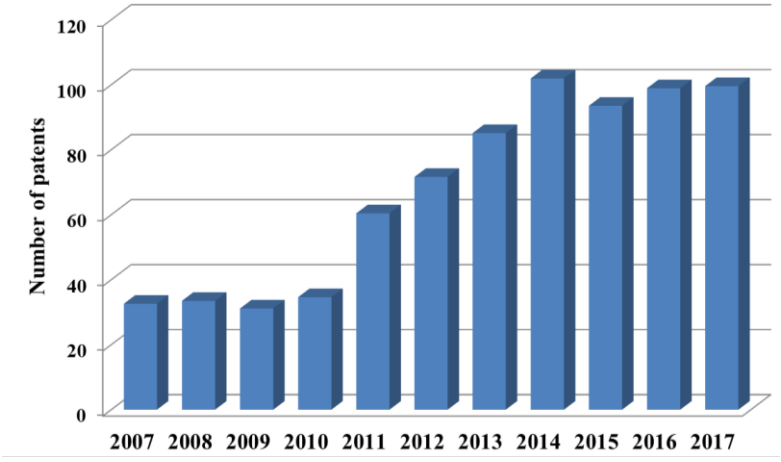


Source: author with data from the Romanian Statistical Yearbook, 2018 issue, National Institute of Statistics (2017: last year with full centralized data)

A 10 years analysis regarding the evolution of this indicator displays a sharp reduction after 2011 and a slow recovery in 2017 of the submitted applications, each of these temporal milestones also generating a spike in the evolution of the scientific documents. A similar pattern was also for the granted patents, but in this case the last-known value (2017) is almost the same with the number of granted and published patents in 2010. Since these values are roughly with a third smaller as compared to the 2007-2009 period, the economic crisis seems to be one major cause of this fluctuation, especially in the case of private-funded or private-partnerships driven research. In the same time, an undeveloped mechanism and infrastructure for knowledge and technology transfer, together with a poor communication and overall collaboration between R&D and industrial sector are to blame for these modest innovation-related results.

The European statistics (Eurostat, 2019) are quite different as compared to the national ones, Eurostat data showing a significant increase of the EPO patents (patent applications directed to the European Patent Office (EPO) or filed under the Patent Cooperation Treaty, regardless of whether they are granted or not) starting with 2011, perhaps a secondary explanation for the post-2011 decrease in the national ones. However, despite these positive results, the distance from the EU average is still large, a conclusion sustained by another EU indicator – public-private co-publications per million population, which decreased from 5.6 in 2008 to only 2.3 in 2015.

Figure 8: Number of patent applications to the European Patent Office (EPO), 2007-2017



Source: author with data from Eurostat (2017: last year with full centralized data, https://ec.europa.eu/eurostat/tgm/graph.do?pcode=tsc00009&language=en;)

The frail connections between academia and the business area fueled by the conservative attitude of part of the R&D system, by the lack of private investments towards the public sector and by the absence of proper stimulative tools for a both-ways dialogue and intellectual property rights absorptive capacity. There is also another important factor to blame for this situation: only 10.2% of the Romanian enterprises are considered to be innovative by national and European standards, 70% of these being small enterprises, and 21.9% medium ones.

6. CONCLUSIONS

Although Romania has made some improvements in the R&D field in the last years, the results are still modest and far below expectations, the country touching displeasing places among international scoreboards in terms of R&D investment, human capital and scientific output. The situation is based on a complex set of weaknesses and problems of the present R&D system and generates multifaceted challenges for its short and medium future and for the overall goal of placing innovation as the main driver of sustainable development and competitiveness.

A key challenge is represented by the heterogeneous and segregated organization of the research, development and innovation system governed by an overly bureaucratic and overregulated structure. This institutional framework has limited and unpredictable financial resources which are far from the targets assumed trough the national research strategy and way behind the EU R&D investment objectives.

Another important challenge refers to the insufficient dimensions and performance of the human resource, which is suffering from constant senescence and severe brain drain and is not able to fulfil its already established potential.

The third challenge is to eliminate the missing links of the networking chain between the research and business actors, to stimulate the involvement of the private sector in the financing of research and to boost the knowledge and technology transfer as to attain some tangible results in terms of innovative products and technologies.

REFERENCES

1. Iacob (Bara), Raluca (2018), "Brain Drain Phenomenon in Romania: What Comes in Line after Corruption? A Quantitative Analysis of the Determinant Causes of Romanian Skilled Migration", Romanian Journal of Communication and Public Relations, Vol. 20, No. 2 (44), pp.53-78.
2. Jones, Thomas, Sarah Huggett and JudithKamalski (2011), "Finding a Way Through the Scientific Literature: Indexes and Measures", World Neurosurgery, Vol. 76, No. 1–2, pp.36-38.
3. Russu, Corneliu (2014), "Romania's Creative and Innovation Potential", Economic Insights – Trends and Challenges, Vol. III (LXVI), No. 1, pp.53-61.
4. Burkhardt, Kathleen, Richard Deiss and Diana Senczyszyn (2018), "Scientific, Technological and Innovation Production" Science, Research and Innovation Performance of the EU 2018. Strengthening the foundations for Europe's future. Luxembourg: Publications Office of the European Union.
5. Chioncel, Mariana, and J.C. Del Rio (2018), "RIO Country Report 2017: Romania" Research and Innovation Observatory country report series. Luxembourg: Publications Office of the European Union.
6. Dospinescu, Andrei, and Giuseppe Russo (2018), "Romania. Systematic Country Diagnostic: background note – migration" From uneven growth to inclusive development: Romania's path to shared prosperity – systematic country diagnostic, Washington D.C.: World Bank.
7. Market Watch (2019), Cercetarea romaneasca: problemele prezentului si provocarile viitorului, http://www.marketwatch.ro/download_pdf.php?url=CERCETAREA_ROMANEASCA__PROBLEMELE_PREZENTULUI_SI_PROVOCARILE_VIITORULUI
8. R&D Magazine (2019), 2019 Global R&D Funding Forecast, https://digital.rdmag.com/researchanddevelopment/2018_global_r_d_funding_forecast?pg=2#pg2 [Accessed 01.05.2019]
9. Scimago Journal & Country Rank (2019), Country Rankings, https://www.scimagojr.com/countryrank.php?year=2018&order=h&ord=desc [Accessed 05.05.2019]
10. European Commission (2019), European Innovation Scoreboard 2018, https://ec.europa.eu/docsroom/documents/33147 [Accessed 07.05.2019]
11. European Commission (2019), Country Report Romania 2019. Including an In-Depth Review on the prevention and correction of macroeconomic imbalances, https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-romania_en.pdf [Accessed 10.05.2019].
12. Eurostat (2019), Science, technology and innovation, https://ec.europa.eu/–eurostat/web/science-technology-innovation/data/database [Accessed 01.05.2019].
13. National Institute of Statistics (2019), Research – development and innovation, http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table [Accessed 01.05.2019].
14. National Institute of Statistics (2019), 2018 Romanian Statistical Yearbook, http://www.insse.ro/cms/sites/default/files/field/publicatii/anuarul_statistic_al_romaniei_carte_ro_0.pdf [Accessed 01.05.2019].

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SEGMENTATION TECHNIQUES FOR INNOVATION SUPPORT SERVICES

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Abstract: *Segmentation of clients is a strategy widely used by companies and marketing units to sell their process. However, this concept is not so well established and widespread in public agencies supporting SME innovation. What are the benefits of designing advanced segmentation strategies for development agencies? Economic development practitioners agree that it's necessary to provide customised innovation services to companies to get a greater impact. This paper presents how nine development agencies from seven European countries carry out their segmentation strategies to provide tailored initiatives of SMEs' innovation support. The analysis also identifies common challenges RDA face, and how introducing Big Data Analysis can help them enhance innovation support in their regions.*

Keywords: *SMEs, Innovation programmes, Marketing, Regional Development, Good practice*

JEL Classification*: C81, M310, O38*

1. INTRODUCTION

Regional Development Agencies are public entities created to provide economic, legal and innovation support to Small and Medium Enterprises in a given region. To optimise these services, RDAs should apply objective standards to select a particular company or sector to promote and decide how and when to do so. Traditionally, development agencies have used other methods, like non-

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specialised spreadsheets or non-structured financial information, to support the decision process.

However, currently there are many tools available that can be easily implemented to enhance the support provided to SMEs and increase the success ratio of the policies deployed. Modern technology has allowed a new science to arise, Data Science, that relies on data mining and big data analysis to extract knowledge and insights from both structured and unstructured data. According to Iqbal (2018), *"Big Data describes the huge volumes of high velocity, complex and variable data that need sophisticated methods and technologies for data management and analytics"*.

Unfortunately, this big data analysis technology is not yet widespread within regional development practice. According to a study conducted by Kruszelnicki (2018), not many RDAs use modern tools to segment the companies of their region. When asked *Does the development agency apply any other segmentation methodologies e.g. according to size, age of enterprise, or number of employees, etc.?* only 55% of the RDAs answered positively, and barely 20% implement technologies to identify "gazelle SMEs" (highly growing and innovative SMEs).

Advanced innovation support agencies should use big data analysis to provide customised services to their local companies. To provide effective support, development agencies have no other choice but to send the right message and provide the right innovation support measure to the right company at the right time via the right channel. Leading development agencies are the ones that have already implemented customised marketing and support services approach to provide impact in the companies.

This clashes with current common practice. From a RDA's perspective, it's more efficient to provide the same innovation service to a group of enterprises, despite the fact that SMEs constitute a heterogeneous population and every single company has its own particular needs. The challenge for modern RDAs is therefore to identify, within this wide population, sample groups that are homogeneous regarding a given criterion. Kruszelnicki (2018) identifies ten different Key Performance Indicators (KPIs) that can reveal the degree of innovation of a particular company.

By applying a scientific approach to regional development practice, innovation support measures will always be in line with the results of these segmentation techniques, considering key indicators such as typology to measure innovation in SMEs. By doing so, development agencies go beyond a static offer of horizontal services (one size fits all) and provide the right support measures to targeted enterprises, allowing the services offered to produce a greater impact.

Following up on this idea, the H2020-supported project *OaSIS - Optimizing Support for Innovating SMEs* carried out a detailed analysis on how nine development agencies develop their own segmentation strategies in order to provide tailored innovation support in SMEs. Since there are a wide variety of innovation support measures throughout European regions, solutions will never be homogeneous. This high diversity gives a large number of conclusions and possibilities for segmentation strategies.

This paper discusses the presented issue from both a review of the existing theoretical literature and the practical experiences of the partner regions in four parts. First, it reviews the existing literature relevant to big data analysis. Then the research methodology is presented and data analysis techniques are discussed, analysing the application of the concept of segmentation to development agencies. Next, the findings are discussed and summarised. The paper concludes with a discussion of the results and policy recommendations, as it serves to inspire regional practitioners, to structure debates for the analysis of the reality of segmentation strategies of innovation support measures for SMEs in European regions.

2. THEORETICAL FRAMEWORK

2.1. The relevance of segmentation in development agencies

A development agency is an entity created by the government to support the economic growth in a territory. The initial experiences of these agencies started 1950's to promote economic restructuring and growth in countries with an institutional organisation that gives competences on economic growth to subnational level like municipalities, counties, provinces or regional governments. Development agencies were flexible dynamic public bodies, without bureaucratic barriers able to mobilise endogenous resources and align the principal actors to foster economic growth. These agencies were the principal instruments to implement development policies at the subnational level.

The model was consolidated with the development of the European Union's regional policy. The region is now considered a key actor for economic development and a need to establish efficient mechanisms for multi-level and multi-actor forms of governance arises. Most of the leading development agencies

were created in the seventies: ERVET from Emilia-Romagna (1974)[1], Scottish Development Agency (1975)[2], in The Netherland the ROMs Regionale Ontwikkelingsmaatschappijen like Oost NV and NOM were created between 1975 and 1982. The creation of agencies was consolidated in the following decades: SPRI from Basque Country (1981), Méditerranée Technologies in the region Provence-Alpes-Côte d'Azur (1988)[3], ARITT Centre Val de Loire (2001)[4].

Nowadays development agencies are more a connector than a driver. This reflects a transition from a more static and passive conception of economic development, where the territory was merely considered the place of asset production, to an idea of a dynamic space for the construction of relationships between economic agents and elements (visible or not). The territory is no longer considered one economic context given beforehand; it is now thought as the consequence of a creation process (constructed territory), the result of the collective relation process of different agents. Development agencies have a leading role on building relations as they are flexible and stable organisations with a detailed knowledge of the local economic actors (even the emerging start-ups). Agencies get advantages of their deployment in the territories, with close connections to companies and other stakeholders.

Innovation is a social, dynamically complex and non-linear process in which multiple actors take part with answers and behaviours not known in advance. The main entities that facilitate and enable innovation in a territory are those that make up the model of the "triple helix" proposed by Etzkowitz and Leydesdorff. This model is based on the interactions between universities engaging in basic research, industries producing commercial goods and governments regulating markets. As interactions increase within this framework, each component evolves to adopt some characteristics of the other institution, which then gives rise to hybrid institutions.

Development agencies must be able to mobilise all actors to fully exploit dynamic competitive advantages, based on innovation and learning at local or regional level. The main objective is to foster competitiveness and tackle inequality in the territory. Development agencies seek to identify and exploit opportunities for the growth of their territories by supporting companies. Most of the actions are

[1] ERVET merged with ASTER to create ART-ER in 2019

[2] Scottish Enterprise was created in 1991 to provide a full range of economic development support to lowland Scotland in start-up creation, companies' competitiveness, urban regeneration, FDI and workforce development. This agency is nowadays the biggest in Europe with over 1,000 employees

[3] Today is the development agency RisingSud created in 2014

[4] ARITT merged in 2017 with CENTRECO to create Dev'Up with 44 employees

directed to innovation and internationalisation scaleup support, since those actions provide a resilient industry fabric with long term sustainable economic growth.

Development agencies help companies increase their productivity (by organisational innovation or technological development), helping to build globally competitive sectors, attracting new investment and creating a world class business environment in their territories. In many countries, development agencies are autonomous public law entities linked to the regional ministries of industry or innovation or local governments. Agencies follow the guidelines of the industrial policy of the government, contribute to the improvement of business competitiveness mainly through the promotion of innovation, technology transfer from academia (universities)[5] and dissemination of technology, business development, start-up creation, attraction of productive business investments and FDI. The universe of targeted companies and possible actions is sizable.

Following the experience of development agencies, there are two fundamental reasons why development agencies are not able to apply horizontal innovation support measures: First, the high cost that would imply valuable high-quality actions; and secondly, because it would not achieve the desired result to provide a good impact.

For these two reasons, it is important to introduce the concept of segmentation, this is, to divide the universe of companies into groups whose members have certain characteristics that resemble one another and allow the development agency to design and implement appropriate policy mix for the whole group. Innovation support services will have the correct scale to be offered by the development agency with a lower cost and satisfactory results for the targeted companies compared to addressing the whole universe of local companies.

Effective innovation targeted measures implemented by development agencies are manifold. First, they aim to support globally competitive companies with growth and internationalisation opportunities, helping to improve innovation and commercialisation, and workforce development. They also build globally competitive sectors, utilising the existing endogenous capabilities in the territory and ensuring that local industries are recognised as a world leader in growing

[5] More than half (55%) of the total expenditure on research and development in the EU in 2015 was funded by business enterprises, almost one third (31%) by government, and a further 11% from abroad (EUROSTAT, 2018). However, in most of the European regions the knowledge is created in universities and public research laboratories. Their role is very important and the valuable knowledge that they gather should be transferred to the productive industry for economic development.

sectors. Finally, they establish a globally competitive business environment creating the right conditions for local companies to compete with other international locations.

2.2. Effective targeted communication for development agencies

ICT and data analytics have changed the way development agencies provide information to local companies. Technology has impacted the way agencies carry out marketing and communication. Traditional advertising and general information measures are not enough effective. For example, nowadays agencies do not prepare a common mailing to inform of an interesting conference to all the companies of an industrial sector based on just the geography or main data of the profile. Another example is the limited use of mass media (local newspapers, radio programmes or TV channels); agencies only use very specialised programmes for a target audience. Nowadays development agencies have effective marketing tools able to target almost individually the most interested companies and stakeholders in their action.

The next step will be to use the data of hundreds or thousands of companies to establish a model of behaviour of companies. Development agencies should use data analytics with big data companies knowing what are the products that they have developed, the technologies used, the main markets of the companies, their customers, etc. As it has been discussed in the previous section, the source of this data for the model could be data mining in internet, public official statistics or the own information that the development agency has of the companies.

With a behavioural model of companies, developed thanks to an optimal segmentation strategy, actions are better targeted. It's possible to inform companies and stakeholders interested in a certain opportunity (e.g. a programme to support the international opportunities of companies interested in a given technology). Furthermore, development agencies could monitor the effectiveness of public policies by measuring the scaleup and increases of productivity in specifically targeted companies.

For these models it's necessary to use publicly available information to discover patterns in large data sets connecting artificial intelligence, machine learning, statistics and database systems. The main goal of the data mining process is to apply data mining techniques to convert available information from companies into an understandable structure for further use.

Development agencies could use this data for market-based analysis, customer relations, analysis of the companies using the public support programmes, fraud detection with classification, managing relationship with stakeholders, etc. All of them are applicable to give a better impact on the companies chosen to be supported with public innovation support programmes.

2.3. Use of segmentation strategies for innovation support measures

Segmentation is the analysis of SMEs' characteristics, behaviour and evolution, aimed at solving a single and specific problem. Leading Development Agencies use this technique to provide better targeted innovate on support measures. Segmentation of clients in development agencies is usually focused on the optimization of marketing campaigns, often targeted to SMEs to promote their participation in events or in investment support programmes for regional economic development.

Segmentation within governments is commonly used to carry out the so-called public marketing, whose goal is to achieve closer relationships between the administration providing services and the citizens who are clients of those services. There is a good number of experiences in public marketing that should be taken into consideration to improve how development agencies could operate efficiently. The individualised innovation support service could be achieved with a personalised marketing implemented using advanced ICT technologies for retargeting flexible organisations able to supply the services requested on demand. But when we need to define a SMEs' customer strategy, total customisation does not work. A strategy for every single company entails too much complexity. Therefore, we assume that there are groups of companies similar to each other, and different from the others. This will allow development agencies to define differentiated strategies for each group of companies, with a singular set of services and a marketing plan. Segmentation aims to identify these homogeneous groups of SMEs and classify their clients.

SMEs' segmentation should not be mistaken with a sole description of sectors or regional industries. This usually describes a territory based on the type of companies that comprise it, but the individual SMEs are not identified, so it's not possible to use segmentation to establish a personalised relationship based on descriptive sectoral statistics. For example, a description of an industry would tell us that the segment of certain companies from one industry produce a type of product and invest a certain amount of resources in research and innovation. An

effective SME marketing segmentation would also tell us who those companies are and how to contact them.

Segmenting SMEs requires a database that collects, at least, the main key performance indicators (KPIs) of the companies (CEN, 2017). Typical KPIs are the turnover, the products manufactured, the number of employees in the company, the investments done, the main markets, trademarks, geography, volume, etc. But, in addition, a good database of companies for a development agency should collect other information about SMEs such as the expected evolution of the main economic figures of the company, the productivity, market trends, or the online relationship channel for the engagement of those companies[6]. In the case of SMEs segmentation for innovation support services it is particularlyint eresting information on their ongoing research and innovation projects, their intellectual property rights (IPRs), the staff education and characteristics of the CEOs and top executives of the companies. Segmentation develops all its potential with the use of multivariate statistical techniques or data mining for the analysis of data.

3. METHODOLOGY

In order to obtain and analyse all the necessary data to carry out this study, a three-step approach was followed. Preliminary contact with potential RDAs was done via online surveys and interviews; person-to-person interviews were then conducted; finally, a software was developed to structure and analyse the data obtained.

The first part of the study was a result of the contacts made with several RDAs in the framework of the OaSIS project. A public call for participation was initially published via the European Commission's Participant Portal with three different cut-off dates and disseminated through the different networks of the three project partners (Linknovate, the European Association of Development Agencies (EURADA) and Cracow University of Technology), especially relying on EURADA's list of members, as they mostly are regional development agencies. Several dozens of replies were taken into consideration, and online interviews were held with the RDAs. As a result of this first contact, twenty-one RDAs decided to become involved with the project in different degrees and filled an online survey via SurveyMonkey (see Table 3).

[6] An example of this database are business directories. See for example the business directory of the Development Agency of the Region of Murcia (INFO) with 22.000 companies in the following link http://www.institutofomentomurcia.es/web/portal/directorio-empresarial

Each applicant chose among four different levels of participation in the OaSIS project. At the Basic Level, the participants test the developed software and receive support to make use of the OaSIS project's outcomes. In addition, the Standard Level of participation comprises taking part in expert interviews and transnational benchmarking analyses about SME segmentation and innovation support. On top of that, the High Level participants agree to confidentially share data about their innovation support for SMEs. To participate at the Third Party Level it requires an agreement to confidentially share all relevant data for the OaSIS project's purposes and for the ultimate enhancement of the participants' own innovation support instruments, SME segmentation strategies, and impact assessment measures by using the project's results and software tools. Furthermore, those participants were integrated as official "Third Party" of the OaSIS project with a dedicated budget. These four categories were further simplified to only two; *basic* and *standard level* as RDAs not sharing data and *high* and *third party level* as RDAs sharing their data.

After the selection of participants, as a first step, expert interviews with the participants were carried out for a mapping of the segmentation techniques and the services to support innovating SMEs provided by regional development agencies. Finally, after the participating regional development agencies share their databases with the OaSIS project, Big Data analyses revealed which activities and measures of innovation support for SMEs lead to the highest impact. Based on these findings, a unique software tool has been developed from which the participants directly benefit first-hand.

Table-1: Questions asked to RDAs – Online Survey

1	Which techniques are used at the development agency to segment SMEs?
2	Please list the development agency's innovation support services, including the portfolio of innovation support measures used to improve SMEs' competitiveness.
3	Please provide an overview about the development agency's available data, which contain precise & historic information about cases of support provided to SMEs during the past 10 years.
4	Is the development agency experienced in collaborative data sharing?
5	Does the development agency manage a readily exportable database, or do you think you could easily export the relevant data about SMEs?
6	Please estimate the number of SMEs about which you documented your collaboration during the last 10 years?
7	About how many SMEs, with which you collaborate during one year, do you gather information?
8	Please insert the number of how many % of your collected data provides information about SME funding data and Advanced services data (e.g. coaching, funding support to apply to H2020, mentors, workshops
9	Has the development agency implemented methodologies to identify "gazelle SMEs", which are high growth SMEs?
10	Has the development agency implemented a system to identify SMEs with "high internationalization potential", e.g. via export data, product catalogue, EU grant?
11	Does the development agency profile the areas in which the supported SMEs are active, e.g. if they belong to specific clusters (biotech, aeronautics, robotics), or value chain (aerospace industry, construction industry), or smart specializations (RIS3)?
12	Does the development agency identify "high innovation potential SMEs", for instance those with more: patents, scientific publications, external funding or grants, employees in R&D, expenses in R&D?
13	Does the development agency apply any other segmentation methodologies, e.g. according to size, age of enterprise, or number of employees etc.?
14	What other areas would be interesting for the development agency to improve when it comes to supporting innovating SMEs?

The second part of the study included a series of interviews personally conducted by project manager Dr. Anna Irmisch in behalf of EURADA at the premises of 14 regional development agencies. Some of the Agencies initially involved dropped out from the project due to a lack of approval from the competent public authority. Public administrations of several regions were concerned about the data protection management due to the specific nature of the project.

An email was sent to the participating RDAs at least 2 weeks prior to propose a meeting of about 2h and asked who the interviewee will be, as well as the original signature of DLA if the RDA was willing to take part as High level or 3rd Party.

During the interviews, a non-disclosure agreement (and if needed a DLA) were shared with the RDA to sign them or send back via post. The following questions were asked to the interviewee:

Table-2: Questions asked to RDAs - Interviews

1	Do you apply segmentation techniques in the regional development agency?
2	Does the regional development agency apply any specific segmentation criteria, e.g. segmenting according to age of enterprise, location, NACE-Code, or number of employees etc.?
3	Please explain: Which methodologies and software tools are used at the regional development agency to segment SMEs?
4	Does the regional development agency have mechanisms in place to identify:
5	What other dimensions of segmentation would be interesting for the regional development agency to improve (If you do not segment, what could segmentation do for you) when it comes to supporting innovating SMEs, e.g. the SMEs' impact to the Sustainable Development Goals? What kind of software tools would you like to use for this?
6	Please estimate the current regional development agency's total yearly budget:
7	Please estimate the
8	% share of your total budget that goes to innovation support:
9	Please estimate the % share of your total budget that goes to innovation support for
10	SMEs: Among innovating SMEs you support, please state their 5 most common requests concerning what they say they need from the regional development agency:
11	Please provide examples of SME innovation support measures & their performance, and explain why they performed like this?
12	How do you measure the impact of the innovation support you provide to SMEs?
13	What are your success measures or success metrics for your innovation support to SMEs?
14	Please list the development agency's innovation support services, including the portfolio of innovation support measures used to improve SMEs' competitiveness.
15	Please list SME innovation support services you offer that could be linked to the following categories
16	What's your ideal support combo (= combination of different SME innovation support

	measures)? Please describe and explain (it can be either simultaneous or subsequent, also given that different innovation support measures are trajectory-based and not every SME is equally ready for all of them at all times)!
17	Do you perform periodical analyses of the data available in your database(s), especially concerning SMEs?
18	Are there any emerging demands among innovating SMEs that you would like to include in your offer of support services?
19	Which problems do you face when offering innovation support services to innovating SMEs?
20	What would you like to improve in terms of your SME innovation support instruments?

With all the data provided by the 9 regions that participated as third parties, the consortium (Linknovate, EURADA and Cracow University) chose Aragón (IAF) and Weser-Ems (Dieter Meyer) as pilot regions due to the higher quality of their data.

With this data, Linknovate developed an algorithm that was implemented in the OaSIS project to classify the different companies into their RIS3 categories by extracting data from their web page. This algorithm takes into consideration the number of keyword repetitions in the textual content of the sites and is specially designed for the industry and applied R&D. This web-keyword identification was then combined with data extracted from other sources to create a software tool capable of ranking the companies of a given region by revenue, revenue growth, employees, employee growth, and even RIS3 category and degree of innovation.

Regarding RIS3, a study of the RIS3 priorities of the two pilot regions was performed. According to the European Commission's Smart Specialisation Platform, companies were classified into the following sectors: Bioeconomy, Agri-food value chain, Development of more efficient vehicles, Energy, Healthy Ageing, Maritime Sector, Tourism and Leisure, Transport and Logistics, ICT, Management of Water Resources, Energy Storage and Efficiency, Resources Efficiency.

Classifying companies by innovation was much more complex, since there are no clear criteria to follow. Search engines like Google or Bing do not differentiate between different types of websites, they use the same relevance criteria for all of them regardless of the type of information. However, an innovation algorithm should be relevant to companies and researchers, so our users can find in seconds the same and more information that would take hours to find in a traditional search engine. Linknovate's algorithm uses machine learning and natural language processing to identify the organizations behind the document that matches the user's query and aggregates the results in a unique way (conferences,

publications, news, trademarks, grants, patents) to show which are the relevant players in an area or topic.

This information was introduced into an interactive software that allows the user to search for a particular keyword, company or sector. One important factor is the distance between the user's search keywords. If the user's search has 2 words and they appear together, this document will receive a higher score that other documents that contain the same words, but they appear in opposite places of the text. Once the score of each document is set and matches the user search, the scores of all documents retrieved for each organization behind them are aggregated and the final ranking is calculated.

Table-3: Regional Development Agencies

Regional Development Agency	**Country**	**Participation**
Agence pour l'Entreprise et l'Innovation	Belgium	Basic Level
Agentia pentru Dezvoltare Regionala Nord-Est	Romania	Survey
BEBKA Regional Development Agency	Turkey	Third Party
D2N2 Local Enterprise Partnership	United Kingdom	Survey
Dieter Meyer Consulting GmbH	Germany	Third Party
Grand E-nov	France	Survey
Instituto Aragonés de Fomento	Spain	Third Party
Instituto de Fomento de la Región de Murcia	Spain	Survey
Joensuu Regional Development Company JOSEK Ltd	Finland	Basic Level
MARKA	Turkey	Third Party
Middle Black Sea Development Agency	Turkey	Third Party
Municipality of Gabrovo	Bulgaria	Third Party
Northeast Anatolia Development Agency	Turkey	Survey
Regional Development Agency Centru	Romania	Basic Level
Regional development agency SI-MO-RA Ltd.	Croatia	Third Party
Regional Innovation Agency of South Great Plain region	Hungary	Basic Level
Sarajevo Economic Region Development Agency – SERDA	Bosnia & Herzegovina	Survey
SODERCAN – Cantabria Regional Development Agency	Spain	Basic Level
Struttura Valle D'Aosta	Italy	Third Party
The Investment and Business Development Agency CzechInvest	Czech Republic	Third Party
The National Centre for Research and Development	Poland	Survey

RESULTS AND EMPIRICAL FINDINGS

Interpretation of the interviews

The following section provides an overview of the main findings from data collection of several regional development agencies in Europe on SME segmentation. The 14 entities that were actively involved with the project were further divided in 9 who are officially onboarded as Third-Party participants of the OaSIS project and 5 who chose to have a standard/basic collaboration.

4.1.1 Segmentation strategies & innovation support

Segmentation means grouping SMEs according to certain criteria like the number of employees, age or industry affiliation with the purpose of allowing regional development agencies to use this information to serve the needs of SMEs in a more tailored and targeted way.

Regional Development Agencies have applied segmentation strategies since their inception to develop a strong support service to their SMEs. Virtually all of the agencies interviewed shared a similar approach to segmentation categories. Their databases included the number of employees of a SME, its location, its field or sector, its turnover or revenue and its size or type of company (start-up, SME, corporation). The study also showed how the NACE categorisation is still widespread in regional development practice. This Statistical Classification of Economic Activities in the European Community (NACE) has also been adapted to different countries such as Spain (CNAE), France (NAF) or Italy (ATECO).

Unfortunately, NACE categorisation has several drawbacks. First of all, NACE does not distinguish according to the kind of ownership of a production unit or its type of legal organisation since it's not related to the characteristics of the activity itself. Units engaged in the same kind of economic activity are classified in the same category of NACE, irrespective of whether they are (part of) incorporated enterprises, individual proprietors or government, whether or not the parent enterprise is a foreign entity and whether or not the unit consists of more than one establishment. Therefore, there is no link between NACE and the Classification of Institutional Units in the System of National Accounts (SNA) or in the European System of Accounts (ESA).

Also, the manufacturing activities are described independently of whether the work is performed by power‑driven machinery or directly by hand; in a factory

or in a household; modern or traditional; formal or informal production; or market and non‑market activities. Finally, NACE includes categories for the undifferentiated production of goods and services by households for their own use. These categories may refer, however, to only a portion of households' economic activities that don't fit in other NACE categories.

However, there are several categories that may have room for improvement. For example, only five agencies declared that they segment companies by their RIS3 priorities. This low number is probably due to the problem determining the precise services or products of a company and how this intertwines with the regional smart specialisation strategy. For this reason, a modern tool that can aid regional practitioners in this sense is necessary.

Regarding innovation support, all agencies studied shared a common approach on the services provided to innovative SMEs in their region. All of them fostered networking events, and most of them (at least 9) provided companies with loans, guarantees or subsidies, created one-stop shops to enhance innovation, aided SMEs with project proposal drafting, and helped them with their internationalisation strategies, human resources training or with coaching and mentoring.

However, very few (less than 4) took direct action on helping the SMEs in their region with obtaining patents or other intellectual property rights, provided them with certifications or gave access to venture capital or business angels in their region.

Most of the agencies agreed on the fact that they have very limited monitoring of the support given, as they usually lack feedback from entrepreneurs, their clients that should be the target of their segmentation strategy. When asking those entrepreneurs, SMEs believe they spend too much time with consultants, coaching or just applying, considering what they can receive in return. Another drawback from the private sector is that free or cheap services provided by the public administration are generally seen as low-quality and SMEs tend to not rely upon them for funding.

Another problem analysed with this study is the lack of foreign capital; most regions don't have an updated and attractive portfolio of the companies of their region that can be useful for foreign investors. Some regions even acknowledged that their companies don't want to innovate, as they are mainly traditional companies who perceive innovation comes from abroad.

Other common problems observed regarding innovation support are a lack of common measurements on how money is allocated; a poor technology transfer from university to the market; and a structural issue with the SMEs that received

funds not lasting in time. Some RDAs exclude for this reason any company in distress from their support.

With these results, is very clear that Regional Development Agencies need to better target the support they provide to the SMEs in their region and enhance the results of the policies they implement. For this reason, they lack an assessment tool that can allow them to understand precisely the state of not only the economy of their region, but also the state of the different sectors and even companies that coexist with different needs.

This tool should also allow them to compare their region with other territories and facilitate the creation of an online portfolio to access investors. The creation of such tool is the main goal of the OaSIS Project and described below.

4.2. OaSIS Portal - Sample cases

From the 9 development agencies considered as third parties, the OaSIS project consortium chose Weser-Ems region (Dieter Meyer Consulting) and Aragón region (Instituto Aragonés de Fomento) as pilot regions, due to their SME databases being more complete with all information required for the online platform http://portaloasis.com/ to work optimally. Their two databases were uploaded to the portal, producing a total of 239,968 entries in the online tool. In this section a brief profile of both agencies and regions is presented, followed by an analysis of the combined results displayed by the OaSIS Platform.

4.2.1. Dieter Meyer Consulting GmbH: services for technology transfer

This consultancy company provides innovation support services aligned with smart specialisation and ERDF as the development agencies. The main activity of Dieter Meyer consulting GmbH (MCON)[7] is to help SMEs to get innovation funding. Most of its clients and projects are carried out in Weser-Ems and Lower Saxony. MCON uses advanced segmentation techniques and uses structured databases from companies.

MCON provides advice and support to SMEs as consultants in many different areas. The portfolio of services includes: Innovation Management Consulting, Innovation audits (IMP^{3}rove Assessment), funding advice, funding research, funding acquisition, initiate cooperation between the companies and

[7] More information in www.mcon-consulting.de

universities, technology transfer, technology research, information sessions networks and cluster management. MCON either work on behalf of companies or on behalf of the public sector. For the districts of Diepholz and Osnabrück as well as the cities of Osnabrück, Delmenhorst and Oldenburg, the consultancy company has a general contract to support SMEs in the field of knowledge and technology transfer and innovation consulting. The overarching goal of MCON's activities is to strengthen the competitiveness of companies by improving their innovative capacity and innovation doing.

MCON main service is to write proposals for SME innovation support. It profits of their close relationships with companies, especially in Weser-Ems region (2.47 million of inhabitants). In the best scenario case, the company carries out an IMP^{3}rove assessment of their innovation management. It provides a good image of the status-quo of the company bringing the ideal framework for coaching, training and advisory service. Then ideally there will be some training provided to the company to structure ideas and innovation; followed by identifying new project ideas that can be implemented into new products/services. Afterwards MCON provides a fundraising scouting looking for the best funding alternatives, then helping the SME to write a proposal and get in touch with partners from academia (mainly universities and technology institutes).

4.2.2. Instituto Aragones de Fomento (IAF): segmentation to provide support in low populated areas

The development agency of Aragon (Spain) was established in 1990 by their regional government. The region has more than 1,3 million inhabitants with a GDP per capita of 27,403 EUR (2017), the fourth highest GDP per capita of a Spanish region after Madrid, Cataluña and the Basque Country. Aragon has an advanced economy with a 58% of the GDP service related. Despite the important role of rural areas and agriculture, industry is very important in the Aragonese economy. Aragon has an important industrial fabric with more than 18% of its GDP (the Spanish average is 11%) and 6,893 enterprises, the total number of enterprises in Aragon being 91,493[8].

[8] Regional Innovation Report (2016) Aragon
https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/sites/default/files/report/2016_–RIM%20Plus_Regional%20Innovation%20Report_Aragon.pdf

Aragón is a Moderate+ Innovator accordingly with the profile of the European Regional Innovation Scoreboard (2017). The relative strengths of Aragon a related higher education (115 above the EU average), the exports of medium, most-cited scientific publications (113 above EU average), and high-tech manufacturing (105 above EU average). This fact shows that Aragon has a strong public university and an extensive range of research institutes and centres specialised in water, logistics, nanoscience, food and agriculture, health and other aspects relevant for the Aragonese economy. The strategic sectors of Aragon's economy are the automobile industry, logistics and transport, renewable energies, corporate services, agroindustry and tourism. Therefore, according to the Annual Survey on Innovation (2016), there are 570 companies in Aragon that carried out innovation activities for 321'76 million of euros. The main priorities of their smart specialisation strategy are management of water resources, ICT, resources efficiency, transport and logistics, tourism and leisure, healthy ageing, development of more efficient vehicles, energy storage and efficiency and agri-food value chain.

IAF has a staff of 38 persons and an annual budget of over 30 million euros, mainly coming from the Government of Aragon. Most of this budget is given as public grants and financial instruments to companies and a diverse number of intermediaries. A relevant share of the agency's budget goes to support the industrialisation and economic activities in the province of Teruel and other less developed areas. The agency is divided in an area for support and four operational units: economic promotion, enterprises, entrepreneurship and infrastructures and innovation. With the programme "Aragon Empresa" (2004-2017), the agency has carried out activities with over 5,000 companies and it has performed 1,200 competitiveness assessments to companies.

The development agency has a segmentation strategy and use a specific software. Segmentation is used to provide a tailored support to the different companies accordingly to maturity, activity, year of creation, location, etc. For example, this segmentation is used to promote specific training to a certain group of companies that might be interested to participate accordingly with their characteristics. IAF constructs two databases at the same moment: one database for entrepreneurs and start-ups (with more than 4,000 entries) and another database for existing companies with 9,000. The agency has a software similar to apache CRM. The development agency IAF gathers and updated information directly with questionnaires and surveys that the agency sends to the companies. It is mainly sent to the companies that take place in events and training course. However, the questions go beyond a satisfaction survey and asks about

the type of entity (independent, SME, midcap, public company, etc.), services or products offered by the company, the structure of the company (departments and activities), number of employees, main products, etc.

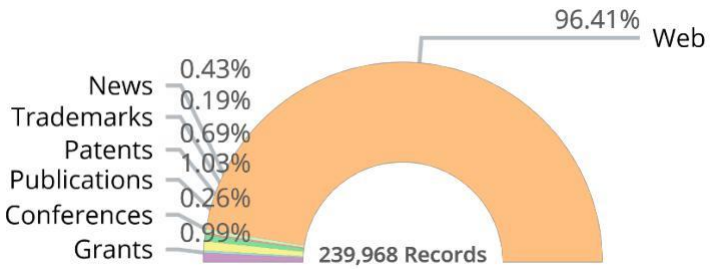
4.2.3. Analysis of the Records of Weser-Ems and Aragon combined

With all data collected from Weser-Ems (Germany) and Aragon (Spain) combined into a single platform, a total of 239,968 records were produced. This large amount of information allows a faithful analysis of the economy of both regions and sets the tone for future enlargements of the portal, with the inclusion of data from the other regions considered "third parties".

As shown in Figure 1, the vast majority (96.41%) of the data came from the information that the web crawler developed by Linknovate could extract from the websites of the SMEs both regions had in their databases. This is a great improvement compared with traditional classifications such as NACE, as it offers a dynamic approach to the economy of the region. Analysing each company's website looking for relevant keywords provides the precise services and products a company offers, and can be updated periodically, adapting the database to new scenarios.

Data from the websites was completed with data coming from different sources the consortium had access to, such as publications (1.03%) and appearances in relevant news (0.43%), patents (0.69%) and trademarks (0.19%) obtained by the SME, conferences the SME took part of (0.26%) and grants the company was awarded with (0.99%).

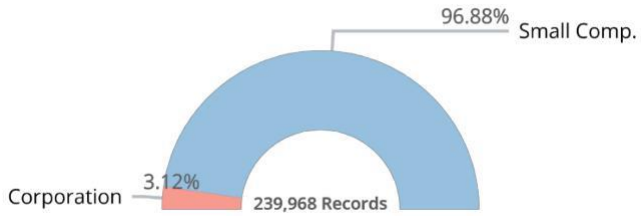
Figure-1: Data Source Distribution



The target of the project is to analyse the support regional development agencies provide to Small and Medium companies in their region. For this reason, 96.88% of the records available at OaSIS Portal are related to Small Companies

(Figure 2). The other 3.12% refers to bigger corporations, due to the different definitions of what constitutes an SME or diverse support programmes RDAs provide in their territories, some of which are targeted to larger companies.

Figure-2: Records per Organisation Distribution



One of the main gaps the tool is intended to fill is the previous lack of connection between RDAs databases and the RIS3 policy of the region. RIS3 to the productive focus of a region, on potentially competitive areas and generators of development within a global context. Therefore, an RIS3 agenda is a regional strategic plan for development that concentrates political support and regional investments on key priorities, challenges and needs for knowledge-based development and builds on the strengths of each region's competitive advantages and potential for excellence.

Connecting the keywords extracted from the websites of the companies with the RIS3 priorities of Weser-Ems (Maritime Sector, Bioeconomy and Energy) and Aragon (Management of water resources, ICT, Resources efficiency, Transport and logistics, Tourism and leisure, Healthy ageing, Development of more efficient vehicles, Energy storage and efficiency and Agri-food value chain) using the Eye@RIS3 Platform, the results are presented in Figure 3 and Figure 4.

Figure-3: RIS3 Distribution

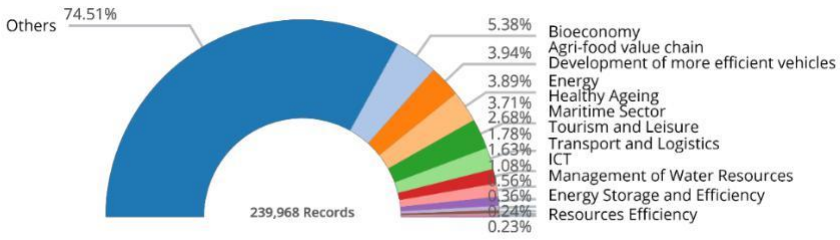
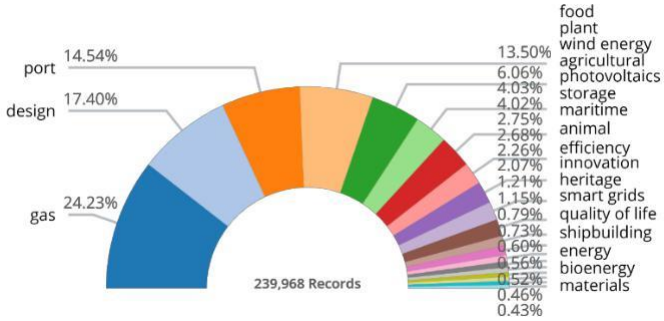


Figure-4: Sub-RIS3 Distribution



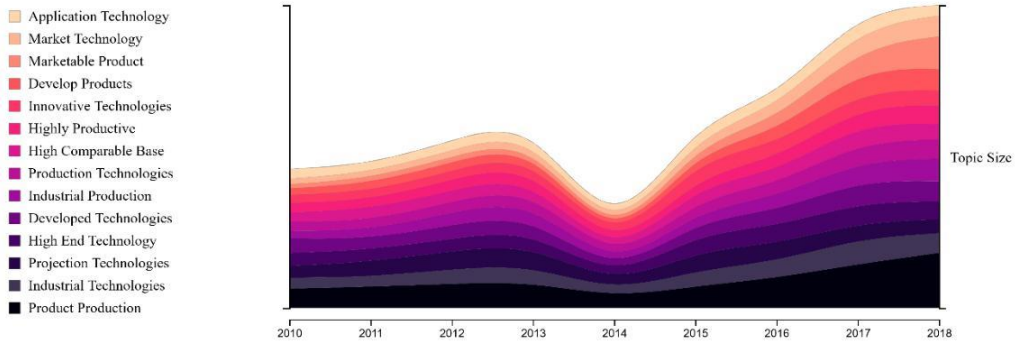
Another application the software developed can have to enhance the services provided by the regional governments to the SMEs in their region is to show the trending topics regarding their economy for that particular year and the evolution from previous years. As Figure 5 and Figure 6 show, due to the nature of the software data mining the most relevant keywords of each SME site, a list of useful keywords can be developed, helping the regional practitioners understand better their economy and knowing which sectors, technology etc. are rising (and which are decreasing in importance).

Figure-5: Relevant Keywords per Year

Relevant keywords per year Improve your search, click a keyword and add it to your query

2012	2013	2014	2015	2016	2017	2018	2019
plasmons	lasers	drug metabolism	drug efficacy	drug efficacy	innovated technologies	developed technology	developed technology
chemistry	cell structure	drug tolerability	drug tolerability	phase clinical trial topic	disease activity	technology advances	technology advances
side effect	drug metabolism	drug efficacy	phase clinical trial topic	randomized controlled trial topic	energy efficiency	developed	energy performance
sensors	side effect	maximum plasma concentration	drug metabolism	drug metabolism	technology advances	xr community	technological innovation
randomized controlled trials as topic	hyperglycemia	randomized controlled trial topic	randomized controlled trial topic	drug tolerability	targeted study	risk assessment	product demonstrators
radiation scattering	glucose blood level	phase clinical trial topic	diarrhea	side effect	proposal describes	product demonstrators	enabling technologies
photons	drug tolerability	nausea	maximum plasma concentration	pharmacodynamics	including accelerators	innovated technologies	electronic components
pharmacodynamics	drug efficacy	area under the curve	placebo	fatigue	health sectors	energy efficiency	operating trials
learning disorder	diabetes mellitus type	drug half life	nausea	technology advances	existing technology	major challenge	major challenge
laser systems	randomized controlled trial	diarrhea	pharmacodynamics	diarrhea	user acceptability	machine learning	machine learning
ion implantation	radiation exposure	plasma concentration time curve	drug half life	rash	operational experience	disease activity	innovated technologies
hybrid mesh	fibroblasts	placebo	vomiting	nausea	developed technology	visual systems	economic benefits
gold	chemistry	headache	fatigue	main objective	manufacturing smes	industry stakeholders	climate models
drug delivery system	glucosides	drug absorption	drug mechanism	pilot line	main objective	environmental impact	case management
cross coupling	drug administration schedule	fatigue	drug absorption	disease severity	european centre	create technology	future generations

Figure-6: Topic Trends

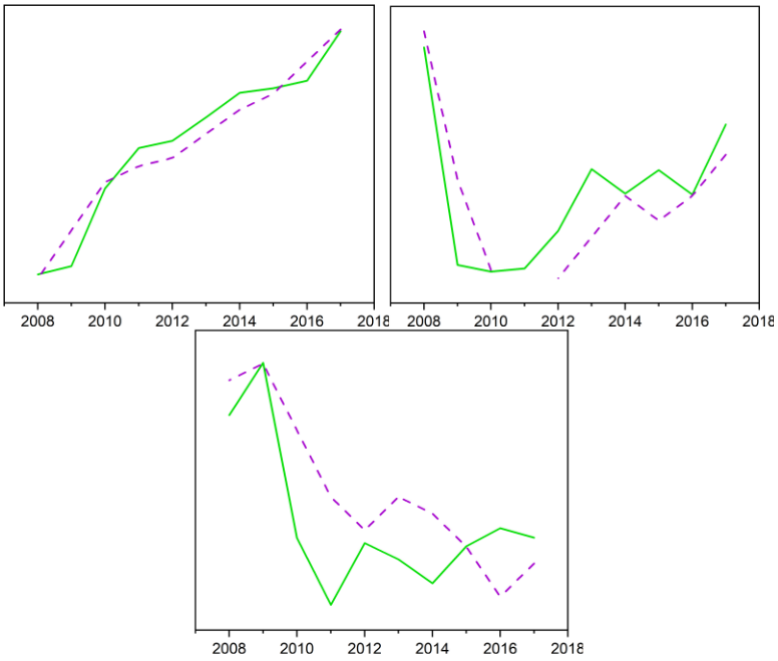


Finally, the tool is not only able to process information regarding the economy of the region as a whole or a given sector, but also how a particular company is performing throughout the year. With data extracted from the tool, Figure 7 presents the trajectory of three different companies for the period 2008-2018. The starting date for this period is not casual, as it is affected by the financial crises that started in 2008.

The three graphs show the total revenue for the company every year (green line) and the number of employees (dotted purple line). The first company presented is considered a "gazelle", a high-growth company that has been rapidly increasing its revenues for the last years. The second company is a "bouncer", a company that had issues at the beginning of the crisis but managed to slowly grow again. Lastly, the third company is a low performer, decreasing its revenue and employee number every year.

This information can be extremely useful for regional practitioners, as they can understand if a particular policy they implemented to aid a certain company or sector is giving appropriate results (as in the first two cases) or not (as the third example). Conversely, it can be used to track companies that have not receive yet support and determine if they are in urgent need for it or not.

Figure-7: SME Performance



4.3. Other tools that can be used

4.3.1. Examples of tools for SMEs segmentation in development agencies

Web analytics has developed enormously in recent years, largely thanks to the rise of Google analytics, as it implies many advantages and business applications. However, web analysis integration in companies' segmentation is still poorly developed. Web metrics, in most cases, has focused on attracting customers, keeping them on the website and getting them to make transactions. Here are some examples of other tools that can be used to improve segmentation:

- *Search Engines Optimisation (SEO) tools:* These tools consider keywords, content and interactions within a website. They offer knowledge to identify user segments and the appropriate messages to address them. With these tools it can be known which particular products or services a certain company provides, going beyond a mere NACE category. SEO tools can give your development agency a broad view of marketing and advertising. There are free and paid tools; in any case, all of them are powerful tools for strategic planning.

- *Web analytics:* Data analysis tools are available for any website to study the potential audience to segment, a very popular tool being Google Analytics reports. These tools can be a rich source of data on the behaviour of the companies that the users visit, useful for market segmentation and the discovery of different types of segments.
- *Surveys to users:* Surveys are an excellent way to receive direct and qualitative feedback. Some survey platforms (e.g. SurveyMonkey) allow the integration of surveys into a website and provide advanced analysis and reports. All this can enhance data collection and the segmentation the audience.
- *Search trends:* An important source of information is to analyse what users search online. Moreover, the keywords used are an extremely useful information from a SEO point of view. This data should be combined with the KPIs of the companies, and geography, products and evolutions. Google Trends is a common tool to find search trends, and it's free to use.
- *Social network information:* Information published in social networks (e.g. Twitter) can be tracked and provide insights into multiple social networks, geographies and dates. The analytics of interaction in social networks can reveal the most popular and highest valued content of a website or blog, and the
- interaction produced. Some examples of tools are BuzzSumo, Twitonomy, TweetDeck, Addthis or Sharethis.
- *Monitoring social media:* Analytical tools about information inserted in social media can help you understand the general trends of the audience, as well as the appropriate reactions in individual cases. These tools can act as an alert system for conversations, publications and the interaction surrounding a brand or business. Examples of tools that could be useful are SocialMention, Hootsuite, etc.
- *Enterprise panels*: Development agencies could establish a set of companies that are representative of a larger group. Monitoring these companies is a very powerful statistical technique to establish the connection between the impact of the

- companies and the public programmes or service that is being offered[9]. They give updated information of the impact of policies and programmes.
- *Segments within RDA's internal databases*: The contents of the support programmes of a development agency are an adequate tool to group current and
- existing companies into segmentation categories[10]. Taking into consideration these defined segments, the marketing department of any development agency can initiate proactive approaches like sending direct offers, emails and messages appropriate to these customer segments, instead of less-effective mass communications.
- *Indirect indicators*: In some cases, is worth to use indirect indicators taking into account that the impact of the innovation policies appear after several years. One operative indicator is the analysis of specific skills recruited in workforce labour contracts. It allows to monitor if a certain emerging technology is really being implemented in the companies. For example, a regional development agency would be able to monitor if there is a good development of the economy related to 3D printing innovations by measuring the labour contracts of specialised engineers in 3D printing and the demand by companies. This information could be validated with other sources, like measuring the number of 3D printing companies exhibiting in trade fairs. If the number is declining in time, it means that the actual adoption of 3D printing innovation is reduced. Other interesting indirect indicator the training requests done by private companies which showcases needs not solved by the market.

[9] This is the case of the Innovation Barometer of Catalonia carried out Agència per a la Competitivitat de l'Empresa (ACCIÓ).

[10] For example, we could identify segments carrying out accurate analyses of the technologies included in the proposals that are submitted by enterprises in the regional innovation support programmes managed by development agencies. Following that particular case, if the programmes of a development agency are receiving many proposals on internal software for "machine learning", it could be concluded this is a relevant emerging technology for many companies in that region and it's really being implemented, allowing the development agency to cluster them to provide targeted support.

4.3.2. Use of data analysis tools for SME segmentation accordingly with innovation criteria

SME segmentation consists of reducing all the complexity of companies' data, which can be hundreds or thousands of cases with dozens of variables, to a single image where companies are grouped into a small number of segments and variables are reduced to a single segment label, which synthesizes the diversity of data that has configured the segment: innovative character, entrepreneurial spirit, internationalisation, etc[11].

The figures presented in the previous section show the advances a platform for data analytics and Competitive Intelligence like the one developed by Linknovate within the OaSIS project can provide. It creates an index of specialised entities which have produced patents, communicate news, participate in projects, made publications, etc. The platform provides clustered results on related terms to the initial query. Each segment of clustered companies has specific behaviours and needs, and innovation agencies should adopt a specific strategy, developing almost a marketing plan for each of them. Strategic segmentation makes the SMEs-centred vision a reality, since it's the only way to set objectives by company.

4.3.3. Application of strategic segmentation for development agencies

Strategic segmentation enables the adoption of decisions in the innovation services provided by the development agency according to the inputs provided by the different SMEs' segments:

- *Performance objectives per company*: Certain development agencies use segmentation of innovation support services to achieve specific quantitative outputs. For example, this approach is used if a development agency seeks to increase the average life of technology-based start-ups to 3 years or enhance the digitalisation of traditional manufacturing companies. The strategic companies' segmentation will be necessary to achieve these goals. They will measure the effectiveness of the innovation measures implemented.
- *Customer vision inside the agencies*: Segmentation of clients is used when it comes to extend the client's vision through different departments of the

[11] See the document published by the European Commission and elaborated by Hollanders, H., and Es-Sadki, N. (2018) "European Innovation Scoreboard Methodology Report" to identify aggregation principles of key innovation indicators.

development agency. Which segments have more presence in which services? Is it interesting to make changes to be more effective? Do we specialise certain departments in specific channels?

- *Strategy of the services offered*: A development agency considers the possibility to start providing new services. This decision should be made considering the types of companies to carry out an analysis that will guarantee success and long-term results. The marketing segmentation techniques provides the appropriate differentiate channels to offer the new innovation services to the companies.
- *Services' offered optimisation:* Defining the best configuration of services is a crucial decision for the development agency; they have to be cost-effective, generate impact and get the benefits acknowledged by the political stakeholders of the agency and society in general.
- *New programmes or services*: It could be a new programme of grants for innovation projects inside of the company, or may be what segments would benefit from seed capital? Or bank guarantees? The establishment of a service to help companies to participate in international trade missions. Or Foreign Direct Investment? For what type of SMEs do we design a programme to cooperate on applied research with the academia? What impact the agency foresees for each company segment?
- *Resize strategy*: What partnership could be established to produce more impact? In which priorities should our territory focus? What are the future emerging activities that will connect better our territory in the global value chains? These questions could be answered by identifying the companies that produce better output with the resources invested.

A strategic segmentation of SMEs gives benefits when this information is used by the directors of the development agencies; they should become a conceptual map of the companies of a certain territory for the development agency to use systematically. Therefore, it's key to consider the views of the types of companies that these decision makers usually use.

4.4. Segmentation in RDAs: Enhancing services

Support measures provided by RDAs can be grouped into five main categories: **Access to capital** (micro-grants/vouchers, seed capital, business angels, venture capital, loans, guarantees, subsidies, equity); **technology development** (technology ideation and application, proof of concept, scaling up, quality improvement and certifications, technology transfer); **legal services** (intellectual property rights protection, patenting registration, legal advisory); **market development** (incubation, first client search, project proposal writing, acceleration, internationalization, marketing/ branding, business intelligence); and **human resources** (networking or training of human resources development).

All these services can be improved by the implementation of a good segmentation strategy enhanced by the correct tools. Segmentation techniques can identify high growth companies based on technologies with high growth potential; the development agency could then provide targeted business acceleration services for those enterprises. RDAs can also identify companies for future investment following the specific requirements: maturity of the company, risk, markets, technologies, etc. With the correct segmentation strategy, a development agency is able to provide a reliable portfolio of potential investments in its territory for business angels and venture capital funds. The agency identifies pre-innovative companies for an innovation voucher scheme that will bring these companies with potential in the innovation ecosystem.

Regarding technology development, the establishment of targeted information channels for technology transfer allows a better approach to the companies that would be interested in a certain technology (taking into account their products and markets); for technology requests it is possible to establish individualised demands to potential providers. The development agency is able to monitor the evolution of the technology transformation of targeted companies, getting information about the need to establish innovation policies for economic growth.

Thanks to the segmentation, it is possible to establish tailored legal advice and assistance regarding patenting and other forms of IPR protection, to those companies that are more likely to need those services. The service could identify those companies that are investing heavily in research and innovation. The statistics of internationalisation could provide information about those companies that need advice about how to protect their products with trademarks in other countries.

Using data of innovative companies recently created, the development agency could launch targeted marketing campaigns to startups offering mentoring

and acceleration support mechanisms. It could identify and target companies with higher innovation potential, in order to get support to their research and innovation projects, as well as organise events with participants from a specific target audience in order to provide better impact and open new market possibilities

Finally, regarding human resources RDA could develop the programme to potential candidates for the clustering activity as well as for the acquisition of critical skills for the deployment of innovative activity. This would be mostly needed by specific segments of SMEs, which, for example, are suffering from lack of experts required for R&D activities.

CONCLUSIONS AND IMPLICATIONS

Enterprises and other entities relevant for the economic development in a territory are diverse. Development agencies have to work with hundreds and even thousands of companies that are different from each other depending on their stage of maturity (start-ups or consolidated), the size of the company (SME or corporation), internationalisation (local, national, European, worldwide), their innovation capacity (leader, early adopter, follower) amongst many others. All this diversity makes it almost impossible to develop an effective support measure that would fit all companies.

There is no doubt that segmentation should be one of the main strategic tools of the innovation support measures implemented by development agencies, whose objective is to identify and determine those groups with certain homogeneous characteristics (segments) towards which the development agency can direct its efforts and resources (from marketing) to obtain profitable results. For this reason, it's critically important that development agencies and other innovation support organizations carry out a good segmentation of the targeted companies, choosing those segments that meet the basic requirements (be measurable, accessible, substantial and differentials).

Development agencies will enjoy the benefits of a good segmentation ranging from improving the public image of the policies implemented to show congruence with the concept of marketing and provide a greater impact in targeted companies. Modern tools powered by current technology, such as Big Data analysis, must be used by RDAs to keep up to present challenges and provide the best service possible to the SMEs in their region, the purpose they were created to serve.

REFERENCES

1. CEN – European Committee for Standardisation (2017) Innovation management - Part 7: Innovation Management Assessment (CEN/TS 16555-7:2017) https://standards.cen.eu
2. Cornell University, INSEAD, and WIPO (2018): "The Global Innovation Index 2018: Energizing the World with Innovation". Ithaca, Fontainebleau, and Geneva.
3. Etzkowitz, H., Leydesdorff, L (2000): "The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University–Industry–Government Relations". Research Policy. 29. 109-123.
4. European Commission (2018): "Eurostat regional yearbook".
5. https://ec.europa.eu/eurostat/web/products-statistical-books/-/KS-HA-18-001?inheritRedirect=true&redirect=%2Feurostat%2Fpublications%2Fstatistical-books%2Fflagship-publications
6. Hill, C. W. L., A. Schilling M.A., Jones G.R. (2017): "Strategic Management: Theory & Cases: An Integrated Approach". Cengage Learning. Boston.
7. Hollanders, H., and Es-Sadki, N. (2018): "European Innovation Scoreboard" European Commission.
8. http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index_en.htm
9. Mazzucato, M. (2018): "Mission-oriented research & innovation in the European Union. A problem-solving approach to fuel innovation-led growth". Directorate-General for Research and Innovation. European Commission
10. OECD (2018): "OECD Regions and Cities at a Glance 2018", OECD Publishing, Paris, https://doi.org/10.1787/reg_cit_glance-2018-en.
11. Kruszenlicki, J., and Zyra J. (2018): "Segmentation of Small and Medium Size Regional Companies Using Data Mining as a Tool for Optimising the Activities of European Regional Development Agencies."
12. Iqbal, M., Manzoor, A., Butt, S.H.A., Kazmi, S.H.A., Soomrani, A.R., and Shaikh, K.A. (2018): A Study of Big Data for Business Growth in SMEs: Opportunities & Challenges.
13. Sen, D., Ozturk, M., and Vayvay, O. (2016): An Overview of Big Data for Growth in SMEs.
14. Ogbuokiri, B.O., Udanor C.N., Agu, M.N. (2015): Implementing bigdata analytics for small and medium enterprise (SME) regional growth.
15. Hanif, A., and Manarvi, I.A. (2009): Performance Based Segmentation of Small and Medium Enterprises: A Data Mining Approach.
16. Lee, S., and Jo, J. (2018): Government R&D Support for SMEs: Policy Effects and Improvement Measures.
17. European Commission (2013): Business Innovation Observatory: Big data – Analytics & Decision Making.
18. Big Data Value Association (2017): SMEs in the European Data-Economy: A representative sample from the BDVA community.
19. EASME/COSME (2019): Supporting specialised skills development: Big Data, Internet of Things and Cybersecurity for SMEs.
20. Sari, J.N., Nugroho, L.E., Ferdiana, R. and Santosa, P.I. (2011): Review on Customer Segmentation Technique on Ecommerce

21. Moroko, L. and Uncles, M.D. (2009): Employer branding and market segmentation
22. Dowling G.R., Lilien, G.L., and Soni, P.K. (2010): Business Market Segmentation Procedure for Product Planning
23. Dibb, S. and Simkin, L. (2001): Market Segmentation: Diagnosing and Treating the Barriers
24. Fonseca, J. (2011): Why does Segmentation Matter? Using Mixed Methodology to Identify Market Segments
25. Doyle, P. & Saunders, J. (1985): Market Segmentation and Positioning in Specialized Industrial Markets
26. Dibb, S. (2005): Market Segmentation Implementation Barriers and How to Overcome Them
27. Dibb, S., Stern, P. and Wensley, R. (2002): Marketing Intelligence & Planning
28. Dibb, S. (1998): Market segmentation: Strategies for Success
29. KPIs:
30. AENOR (2015) Requirements of an innovative SME. (EA 0047), www.aenor.es
31. CEN – European Committee for Standardisation (2017) Innovation management - Part 7: Innovation Management Assessment (CEN/TS 16555-7:2017), https://standards.cen.eu
32. European Commission (2017) European Innovation scoreboard, http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en
33. European Commission (2014) Community Innovation Survey, http://ec.europa.eu/eurostat/web/microdata/community-innovation-survey
34. Panel de Innovación Tecnológica, https://icono.fecyt.es/pitec