*Theoretical and Applied Economics*
*Volume XXI (2014), No. 7(596), pp. 7-22*

# Through creativity and innovation to economic development: is it possible in Romania?

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**Abstract.** *Creativity is a source of innovation. This paper investigates methods of stimulating creativity in firms. Using CIS7 data at the sectoral level, the exploratory analysis carried out first is followed by testing of factors which we identify in order to asses their incidence on R&D activity. The results show intense interactions between R&D investments and methods of stimulating creativity based on extrinsic motivations, as well as between R&D investments and turnover used as an indicator of financial results in firms. Trough such connections observed, this paper invites agents in business and government environments to recognize the importance of stimulating creativity and innovation in Romania, able to allow economic development.*

**Keywords:** firm, creativity, innovation, research and development.

**JEL Classification:** L2, O15.
**REL Classification:** 10B, 17B, 14C.

## 1. Introduction

Innovation is the result of the application of innate human inventiveness and ingenuity. Creativity is something that everyone is capable of, and the application of the innovativeness is a source of excitement, challenge and satisfaction. As organizations are struggling under new market conditions, innovation has become more of the concern. This then leads to the point that organizations must tap into their creative potential in order to develop themselves. Thus creativity may hold more importance to organizations now than in the past, and more in the future than in current times. Change reflected on the market is unfolding on a larger scale and it may be important to consider creativity and innovation on this larger scale, with organizations providing a viable starting point (Robedo et al., 2012).

The explosion of modern technology and the concomitant on the economic development has been the subject of a huge multidisciplinary literature. The industrial revolution and the subsequent developments did not just raise the level of technological capabilities; they changed the entire dynamics of how innovation comes about and the speeds of both invention and diffusion. For much of human history, innovation had been primarily a byproduct of normal economic activity, punctuated by a periodical flashing insight that produced inventions. But sustained and continuous innovation resulting from systematic R&D carried out in firms (Mokyr, 2010).

However, although the importance of the organizational dimension of innovation is recognized, many innovation studies continue to be dominated by an economic approach that allows little room for the analysis of creativity change and innovation within the organizations. By contract, researchers in the field of organizational studies who have developed a rich literature on organizational cognition, learning and creativity rarely relate their work explicitly to innovation. As a result, this stream of work which offers great potential for understanding the microdynamics of organizational change and innovation remains outside the main arena of innovation studies (Lam, 2006).

Using the new data provided by Eurostat (CIS7), this paper outlines an analysis on methods of stimulating creativity practiced by firms. Section 2 looks briefly on the notions of creativity and innovation at the microeconomic level from the perspective of organizational knowledge creation. Section 3 makes an incursion on creativity facilitators and section 4 examines the methods of stimulating creativity in Romanian firms and analyzes the relationships established between the latter and R&D carried out in firms. The last section concludes.

Although our attempt does not eliminate the issues mentioned above, it can be considered the beginning of a way, and its crossing relies undoubtedly on the available data. In fact, generating, adopting and putting into practice of new ideas

relate to the literature of "organizational innovation", which is very diverse, but not integrated into a coherent theoretical framework. Organizational innovation is subject of various interpretations regarding the propensity of an organization to innovate, often focusing on cognition and organizational learning at the level of micro-economic process. In this groundwork, cognitive foundations of organizational innovation are reflected, that relates to learning and knowledge creation process in organizations (companies). Firms vary in their characteristics of knowledge creation and innovative capabilities depending inclusively on their structural forms and activity.

## 2. Creativity and innovation

Creativity is incorporated within several fields of research, including psychology, education, political science and administration etc. In the field of management studies there has long been an interest in creativity because of its links to innovation. Creativity is defined by some authors as the generation of a product that is not only novel and imaginative but also useful and of good quality (Stoycheva and Lubart, 2001). Creativity may also be defined as a mind skill that generates new ideas. In this case, creativity is essentially not a knowledge or science, but appears as a skill that may be promoted and improved through various methods. Creative problem-solving is typically viewed as a form of "high-level" cognition. This, in contrast to the simpler, automatic, cognitive activities are commonly considered to be demanding. As a result of high-level cognition, one makes (conscious) decision, as to whether is willing to invest scarce resources in various problem solving activities occurring at the individual, group or organization levels.

The term cognition refers to the fact that individuals develop mental models, belief systems and knowledge structures that they use to perceive, construct and make sense of their worlds and to make decisions about what actions to take. The psychological literature has focused predominately on the information processing consequences of mental models. The researchers in management have extended the analysis to the group and organizational levels. Their analysis suggests that organizations develop collective mental models and interpretive schemes which affect managerial decision making and organizational action. Organizational cognition differs from individual cognition because it encompasses a social dimension. Much of the research focused on the sociocognitive connectedness seeks to account for the social processes in the formation of collective cognition and knowledge structures.

Creative behavior is a vital ingredient in generating and diffusion of innovations and can be boosted by the acquiring of new knowledge. The need for a better understanding of the factors that exert positive influence on the members engaged in creative activities at the individual or group level is expressed in a creative environment, in order to acquire new knowledge and innovation. In this context, innovation is seen as an activity for implementing ideas and creativity (Amabile, 1996). Individual and group creativity is the starting point in innovation activity. Production of new goods (products and services) or processes as a result of organizational creativity is a social phenomenon involving various actors in turning ideas into new goods or services. Innovation will generally involve more people in the organization who need to understand, to work or contribute to the implementation of the identified solutions.

The idea that organizations can act collectively, and function as a center of organized knowledge has stimulated much research on organizational learning and knowledge creation. This work has sought to understand how social interaction and group dynamics within organizations shape collective intelligence, learning and knowledge generation, and yields important insights into the innovative capability of firms. It has also examined how shared mental models or interpretive schemes affect organizational adaptiveness, emphasizing the “two sides of the same coin” (Lam, 2006, p. 124). On the one hand, some argue that shared interpretive schemes facilitate the organization's capacity to process information in a purposeful manner, promote organizational learning and collective problem solving and thus enhance adaptive potential (Brown and Duguid, 1991). On the other hand, others suggest that organizational interpretive schemes can create blind spots in decision-making and block organizational change (Shrivastava et al., 1987).

Innovation is viewed by some authors as a process of learning and knowledge creation through which new problems are defined and new knowledge is developed to solve them (Lam, 2006). Most theories of organizational learning stress the importance of collective knowledge as a source of innovation capability of firms. Collective knowledge is accumulated knowledge by firms and reflected in rules, procedures, and shared norms which guide the problem-solving activities and patterns of interaction among its members. Collective knowledge resembles the “memory” or “collective mind” of the organization and it can either be a “stock” of knowledge, or represent knowledge in a state of “flow” emerging from various interactions. Collective knowledge may exceed or be below individual knowledge, depending on the mechanisms by which individual knowledge can be anchored in the collective one.

The complex nature of the phenomena underlying creativity and innovations can be examined in the context of firm planning. At the individual level, creativity and innovation are influenced by expertise and motivation. At the group level, creativity and innovation are influenced by phenomena such as group process, climate perceptions, and leadership. At the firm level, firm structure, organizational learning, and strategy are of importance. These many and varied influences broach a critical question for those interested in enhancing creativity and innovation in firms: at what level and with respect to what set of variables should interventions be made in attempts to enhance creativity and innovation? The difficulty arises as these variables are interrelated. For example, climate perceptions and work context are strongly influenced by what the team is working on and how the team is lead.

Innovation is also induced by other factors, implying alongside recognition of new ideas (generated within the organization, transferred etc.), a significant amount of resources. Intangible inputs (knowledge acquired through learning and research activities, organizational skills, patented inventions etc.) or tangible assets (machinery and equipment, information and communication technologies, materials) affect the outcomes (outputs). From the non-linear perspective, the process of innovation becomes more complex, involving many interactions and feedbacks in a system that brings creativity, knowledge creation, research and innovation results all together.

## 3. Facilitators of creativity in firms

Economic growth is associated with efforts of producing of new or substantially improved goods (products or services) and processes as a result of creativity and innovation in firms. Success, in turn, enhances the firm's ability to recruit the best people, improve their integration, and accelerate the pace of change. Furthermore, development projects themselves often are the vehicle by which new approaches and new thinking are adopted. These benefits may be supplemented by obtaining of significant returns from expanding of sales, higher margins, increased value-added, lower costs, and improved productivity as a result of investments. While the potential benefits of innovation are enormous, unfortunately, in most firms they are rarely achievable. Most of the challenges and difficulties faced by firms consist of directing all processes effectively.

A number of empirical studies have been carried out to identify the main influencing factors on the performance of research groups in public institutions and firms. The major findings suggest that a successful creative research environment should have the following (Hemplin et al., 2004):

- clear objectives functioning in a coordinated way for researchers;
- a primary focus on research and a genuine research culture built up over a long time period;
- a positive group climate;
- group members who participate actively in the leadership of the group's research;
- a flat and decentralized organizational structure;
- internal and external communications which are lively and supporting;
- basic resources for staff: adequate time, research funding, research equipment, appropriate premises and library materials;
- diversity in size, age and experience of groups and individuals;
- high level of motivation (and even enjoyment of the job), career structure, promotion and rewards;
- well managed staff selection;
- tools of promoting individual competencies;
- quality control (although not in too excessive or intrusive a form); and
- an institutional base with an established reputation and visibility.

Elements listed above operate at different levels and can be grouped in various categories. Some of those refer to employees, others to firms. Influences on them may be exercised on a larger scale, from the entire society in which individuals and firms operate.

***Personal characteristics*** include *personality attributes*. Individuals that present initiative, independence of judgment, flexibility, openness to new ideas, persistence, self-confidence, tolerance to ambiguity, disposition to take risks and learn from mistakes have greater chances of taking advantage of opportunities to express and develop creative ideas (Alencar, 2012). Besides variables from outside the individual, such as incentive, freedom to express ideas, opportunity and time, some personality traits, such as courage, perseverance and curiosity, can be considered as facilitators of creativity (Alencar & Fleith, 2004).

Creativity is also a result of *motivational factors.* They outline essential components of the tools system developed by firms engaged in encouraging creativity through pecuniary and non-pecuniary incentives. Reward or external recognition can also manifest a positive effect on creative performance. Sauermann and Cohen (2008) analyze the impact of preferences for benefits and job characteristics on innovative effort and performance at the individual level, but many questions remain. In fact, both motivational types—intrinsic and extrinsic—frequently interact, mutually combining to strengthen creativity. Intrinsic motivators (related to intellectual challenge) are sometimes found to be

more important than direct inducements such as compensation for worker performance.

A supportive but intellectually demanding environment or a climate in which individuals, including management team, express appreciation for the efforts of members of the organization can boost creativity. Also, freedom of choice stimulates creativity, suggesting that success can be hindered if researchers are looked excessively. An incentive system that provides more time and opportunity for search and feedback stimulates greater creativity because it encourages researchers to become less instrumental and more exploratory in their thinking, and thus more willing to adopt higher risk, higher payoff approaches to technological challenges (Azoulay et al., 2009). Although the problems associated with the recognition and rewarding are complex (especially those relating to experts in different areas or individuals proving talent), they need to be solved in the management of creativity and innovation.

The level of *expertise* refers to the superior performance gained in a domain or to the capacity acquired through practice or deliberate individual study in order to be valued in an activity involving creativity. Knowledge gained facilitates the acquisition of new knowledge and connections making between ideas, resulting other valuable ideas tailored to the needs of a particular context.

***Organizational environment variables*** that may affect creativity have been the target of numerous studies (see Alencar, 2012 for a survey). The characteristics of a leader who motivates and fosters creativity, elements of groups or teams that may stimulate or inhibit creativity, the organizational climate and its impact on creativity, strategies adopted for stimulating creativity among firms with innovative capacity are some of the topics that have been investigated.

*Rewarding* creative work, defining the career paths that employers might follow, training employees on how to develop new ideas or creativity, using many of the most common methods of encouraging communications and collaboration, such as round-tables on particular areas of interest, talks by eminent visitors, weekly "workhere-in-progress" seminars by employees, lunch meetings and internship programs are practiced in innovative firms. International collaboration accentuates the need for a greater respect for partner competencies. Furthermore, awareness of the commensurate abilities of partners may provide a stimulus to creativity. It may provide, for example, an element of competitiveness between research teams that assists innovation. Of course, all these actions represent aspects of broader organizational development interventions.

Judge et al. (1997) determine that innovative firms have the following characteristics:

- give operational autonomy to researchers, inasmuch as they act entrepreneurially and have a sense of individual accomplishment;
- have managers that possess strategic autonomy, which align individual researcher interests with organizational aims;
- too little control by top management is found to cause a disconnection between business goals and research enterprise. A balance between operational and strategic autonomy promotes innovation by encouraging researchers to be creative in organizationally beneficial ways;
- individual and group success is rewarded extensively through intrinsic methods of personal acknowledgement and recognition by managers and peers, rather than by extrinsic impersonal rewards in the form of salary increases, bonuses etc.;
- "group cohesiveness" developed through particular attention to recruiting people whose "faces fit" and slot into the social environment;
- established goals are reasonable and deadlines are flexible;
- the firm possessed "organizational slack", which allow adaptation to the strategies pursued in the past and the present, and to be projected into the future.

Innovative firms confront with identification of cooperation modes and avoidance of hierarchical frictions. When are faced with a lack of clear performance metrics, traditional organizations increase rules, directives, and monitoring, that only hampers innovative activity. If firms can indeed provide satisfactory ways of measuring relevant aspects of employee performance, they then can provide greater autonomy by using incentives to begin a virtuous circle of work freedom and high reward. In this regard, "sensing" (an entrepreneurial activity) is particularly difficult to calibrate. Because of this, it is difficult to start up a new business inside an existing enterprise (Teece, 2010).

An effective group (team) management is essential for creativity and the success of R&D projects, but it is also important to manage key individuals. Key employees are essential for R&D productivity. The research managers must identify these people, nurture their creativity, and ensure that they remain with the company. On the contrary, a poor management of creativity and of stimulating of new ideas will have weak project management (control and evaluation is undertaken by non-specialists); high levels of bureaucracy and rigid procedures (e.g., in requiring excessive documentation); slow information processing systems; lack of involvement of personnel from the manufacturing function; too high workload (working on too many projects); and lack of funding for longer-term research.

R&D management requires both team management and individual creativity, and the issues of recruiting, rewarding, and organizing teams and individuals are central. R&D workers tend to be highly educated and skilled, and the most effective rewards tend to be more complicated than simple remuneration. High levels of task discretion and autonomy are common, but there is a need for formal organizational decision-making processes. These project management systems take a variety of forms, including those related to specific individuals at particular stages of the project's development. Integrated teams with a common system or product focus have been shown to be effective in the industries.

## 4. Methods of stimulating creativity in Romanian firms

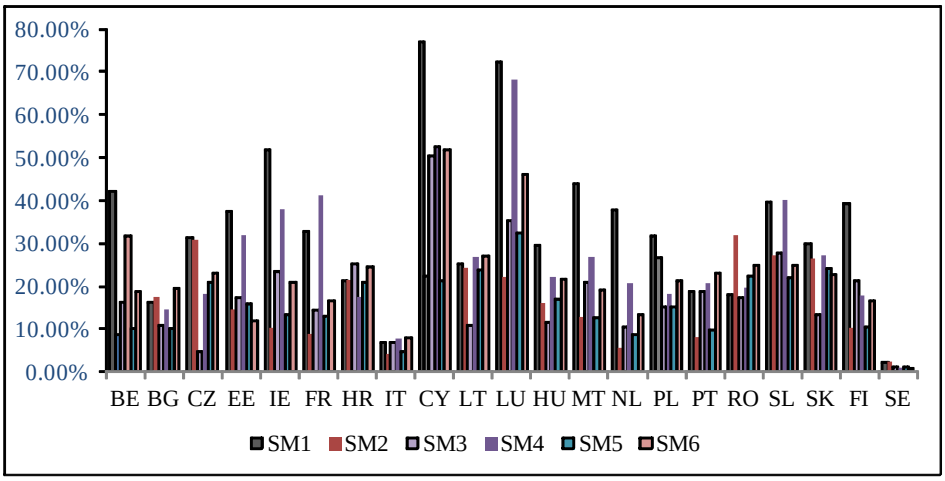
The investigation of methods used by firms in stimulating creativity leads to a better understanding on how the new ideas are managed for their application and obtaining of results. In this respect, Commission Innovation Survey (CIS7) provides, for the first time, information on methods of stimulating new ideas and creativity (SM) as grouped in the following table for the period 2008-2010:

**Table 1.** *Successful methods of stimulating new ideas and creativity*

| | |
|---|---|
| SM1 | Brainstorming sessions, successful method stimulating creativity |
| SM2 | Financial incentives for employees to develop new ideas |
| SM3 | Job rotation of staff |
| SM4 | Multidisciplinary or cross-functional work teams |
| SM5 | Non-financial incentives for employees |
| SM6 | Training employees on how to develop new ideas or creativity |

Innovative and non-innovative firms provide answers to questions that are not mutually exclusive. We can appreciate that the Eurostat initiative is favorable to a better understanding of factors that affect innovation performance. Looking on the methods of stimulating new ideas and creativity in EU countries (Figure 1), we see both similarities and differences. Data express the proportion of innovative firms that have positive answers to the questions of the total on innovators. In general, the most practiced methods appear to be the brainstorming sessions (SM1), job rotation of staff (SM3) and creating of multidisciplinary or cross-functional work teams (SM4). Unfortunately, the Eurostat data are not available for every EU country. It would have been of interest looking on how innovation leaders (Sweden, Denmark, Germany and Finland) manage creativity at the microeconomic level. The data we hold on Finland and especially Sweden appear to be surprising, given the low proportion of firms which responded affirmatively to questions.

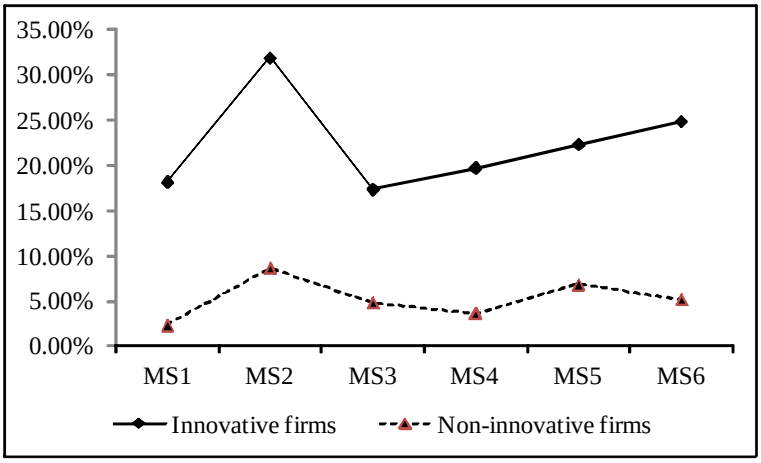
**Figure 1.** *Methods of stimulating creativity in innovative firms by country*




**Source:** Eurostat (CIS7) – all core NACE activities.

The most practiced methods in Romanian innovative firms are granting of financial incentives for employees in order to develop new ideas (SM2), training employees on how to develop new ideas (SM6) and granting of non-financial incentives for employees (SM5). Comparing the answers to the questions of innovative firms with those supplied by non-innovators, the difference appears to be obvious (Figure 2); in general, non-innovative firms are less engaged in stimulating new ideas and creativity and they are less involved in organizing of brainstorming sessions (SM1), forming of multidisciplinary or cross-functional work teams (SM4) and in training employees on how to develop new ideas (SM6).

**Figure 2.** *Methods of stimulating creativity in Romanian firms*




**Source:** Eurostat (CIS7) – all core NACE activities.

Therefore, these methods of stimulating creativity can be considered to be valorized by Romanian firms in order to create new products, processes or services in the innovation process. The questionnaire was designed to illustrate methods of stimulating creativity practiced by firms in various sectors. Two question arise: what kind of links are established between the various methods of stimulating creativity and how are they combined so that the R&D investment increases when they are translated into practice?

A principal component analysis can be used in order to answer to the first question. This enables us to identify the relationships established between the various methods of stimulating creativity and to obtain fewer variables. The latent variables that result can be subsequently used to assess their contribution to the research and development activity of firms.

The principal component analysis is useful in order to reduce a relatively large number of variables into a smaller set of variables that still captures the same information. The initial variables are expressed in relative values as proportions of innovative firms that use such methods of the total innovators in all core NACE activities. We divide the data so that we can get a larger number of cases. The descriptive statistics are shown in the table below:

**Table 2.** *Descriptive statistics: central tendency and variability*

| | Minimum | Maximum | Mean | Std. deviation | Skeweness | Kurtoisis |
|---|---|---|---|---|---|---|
| SM1 | 0.0354 | 0.6786 | 0.208085 | 0.1309366 | 1.411 | 0.733 |
| SM2 | 0.0797 | 0.4654 | 0.313403 | 0.1015638 | -0.558 | 0.733 |
| SM3 | 0.0357 | 0.5000 | 0.193220 | 0.0858168 | 0.805 | 0.733 |
| SM4 | 0.0000 | 0.5714 | 0.218798 | 0.1293857 | 0.744 | 0.733 |
| SM5 | 0.0663 | 0.5714 | 0.219658 | 0.0887622 | 1.506 | 0.733 |
| SM6 | 0.0519 | 0.5714 | 0.273515 | 0.1333282 | 0.561 | 0.733 |
| Valid N | 40 | 40 | 40 | 4040 | 40 | 40 |

The higher the standard deviation, the more different are firms in terms of methods they use to stimulate creativity. In our case, the standard deviations register low values for all variables considered, which means that firms are not strongly differentiated, forming a space with a low variability. Table 3 shows the partial correlation matrix for the six original variables.

**Table 3.** *Correlation matrix*

| | SM1 | SM2 | SM3 | SM4 | SM5 | SM6 |
|---|---|---|---|---|---|---|
| SM1 | 1 | | | | | |
| SM2 | 0.484** | 1 | | | | |
| | (0.002) | | | | | |
| SM3 | 0.692** | 0.682** | 1 | | | |
| | (0.000) | (0.000) | | | | |
| SM4 | 0.934** | 0.541** | 0.615** | 1 | | |
| | (0.000) | (0.000) | (0.000) | | | |

| | SM1 | SM2 | SM3 | SM4 | SM5 | SM6 |
|---|---|---|---|---|---|---|
| SM5 | 0.834** | 0.669** | 0.712** | 0.786** | 1 | |
| | (0.000) | (0.000) | (0.000) | (0.000) | | |
| | 0.857** | 0.692** | 0.703** | 0.898** | 0.765** | 1 |
| SM6 | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Determinant = 0.001.

As we expected, there are strong correlations between all variables, and they are direct. The Bartlett's test is another indication of the strength of the relationship among variables. Table 4 shows the results for the KMO and Barlett tests. The value for KMO is good meaning that pattern of correlations are relatively compact and so factor analysis should yield distinct and reliable factors. The Bartlett's test of sphericity is significant as well ($p < 0.001$), and therefore factor analysis is appropriate.

**Table 4.** *KMO and Bartlett's Test*

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin measure of sampling adequacy | | 0.780 |
| Bartlett's test of sphericity | Approx. Chi-Square | 261.474 |
| | df | 15 |
| | Sig. | 0.000 |

Principal component analysis with varimax rotation was conducted to assess the underlying structure for the six variables. Two factors were requested, based on the fact that the variables were designed to index two constructs: methods of stimulating creativity based on intrinsic motivations and methods of enhancing creativity based on extrinsic motivations. After rotation, the first component accounted for 77.36% of the variance, the second factor accounted for 11.146%, and all the remaining factors are not significant.

Table 5 displays the component matrix after rotation. The methods of stimulating creativity that load highly with component 1 are SM1, SM4, SM5 and SM6 (practicing of brainstorming sessions, constructing of multidisciplinary or cross-functional work teams, granting of non-financial incentives for employees and organizing of training sessions for employers), and all these are related to intrinsic motivations. Therefore, we label this component *as intrinsic motivations*. The methods that load highly with component 2 are SM2 and SM3 (financial incentives for employers and practicing job rotation of staff). Assuming that the rotation at work is a form of skills recognition within the organization, the last two variables correspond to the motivations related to rewards (extrinsic motivations), therefore we might label this factor *extrinsic motivations.*

**Table 5.** *Rotated component matrix*[a]

| | Component | |
|---|---|---|
| | Component 1<br>*Intrinsic motivations* | Component 2<br>*Extrinsic motivations* |
| SM1 | 0.938 | |
| SM4 | 0.927 | |
| SM6 | 0.792 | 0.506 |
| SM5 | 0.719 | 0.551 |
| SM2 | | 0.924 |
| SM3 | | 0.749 |

[a] Principal Component Analysis. Varimax rotation with Kaiser normalization.Rotation converged in 3 iterations.

The results of this analysis show that the initial questions of the questionnaire refer broadly to two types of methods practiced by companies to stimulate employers creativity, based on intrinsic or extrinsic motivations. We formulate the following hypothesis in order to assess the incidence of those methods on the research activity: increasing the proportions of firms engaged in creativity will have impact on the research and development activities by increasing of expenditures for this purpose. Under these conditions, we proceed to identify the best combination (from the econometric point of view) of methods used by firms in order to be implemented in research and development activities. In this respect we use a multiple linear regression model specified by the following general equation:

$$Y_i = \beta_{0i} + \sum_j \beta_j X_{ij} + \varepsilon_i , \quad (1)$$

in which, $Y_i$ - dependent variable *i*; $X_{ij}$ - exogenous variable; $\beta_j$ - parameters that summarize the *j* factor contribution to the dependent variable; $\varepsilon_i$ - an independent and identical distributed error term for *i* with zero mean and $\sigma^2$ variance.

The dependent variable includes total expenditure on (internal and contracted) R&D in absolute value (million of euro) in core NACE sectors with innovation activity (manufacturing and services). The independent variables that we introduce incorporates the factors obtained in the above analysis and they are associated with motivations of intrinsic (Si - factor 1) and extrinsic type (Se - factor 2). The control variable we use is the turnover of period in absolute size (million of euro).

Since we aim at identifying the best model which can explain the relationships between variables, we began the analysis with all variables considered, giving up the weakest predictors at every step. The coefficients of the best model which result, alongside the standard errors and the corresponding econometric tests are shown in Table 6:

**Table 6.** *OLS regression coefficients*

| | Dependent variable: (Y = RD) | |
|---|---|---|
| | Coefficient | Std. deviation |
| Se - factor 2 | 10112.786 | 4245.322 |
| Turnover | 0.004 | 0.000 |
| (constant) | -1047.831 | 5154.515 |
| R-squared | 0.871 | |
| F-statistic | 121.646 | |
| Durbin-Watson | 2.116 | |

The results indicate that stimulating creativity through extrinsic motivations as employees financial incentives and recognition (rotation) of employees in workplaces influence the R&D activities. The influence of the group of methods based on intrinsic motivations appears to be very low, so they were removed from the model above. A significant incidence also shows the size of turnover of the period.

The results show statistically significance, explain a large percentage of R&D variation ($R^2 = 0.871$) and the tests also demonstrate these observations.

We get the same results by introducing the total innovation expenditure (R&D, for acquisition of external knowledge, and of machinery, equipment and software) as a dependent variable. Although we expected that the two sets of results are not converging given the extremely low amount of R&D expenditures, but also the characteristic heterogeneity of sectors, obtaining the same effect profile of influencing with similar effects ($R^2 = 0,888$) strengthens the validity of the identified connections.

## Conclusions

The favorable incidence of the methods of stimulating creativity of extrinsic type on R&D performed by firms can be justified: it is necessary to boost creativity and proper recognizing of employees that work in the research fields based on proven achievements. In fact, the strongest links identified from partial correlations are established between SM2 from the factor 2 and R&D. No doubt that the research itself, as a source of knowledge, is a source of creativity. However, the absence of any statistical connections, resulted both from partial correlations and by introducing the factor 1, between methods of intrinsic type and the size of research, or by introducing innovation expenditure as dependent variable, reveal all a low concern of Romanian firms for training employees, in general, for the dissemination of ideas and knowledge, for collaboration and ensuring a positive group environment based on harmony and support to those are u not favorable for research and innovation.

The most practiced collaborative relationships in Romanian innovative firms are those established with customers and suppliers (of non-interactive type), and the proportion of those employed in collaboration with institutions of higher education and research that are of importance for the innovation process from early stages through interactive transfer of knowledge to the private sector (improving, in the same time, the yields of public research), is one among the lowest in the EU.

A sporadic allocation of financial resources for research and innovation is evidenced by the strong dependence of both the total innovation expenditure and R&D expenditure and the financial results of the period (expressed as turnover). This feature induces discontinuities in innovation activity, and the consequences in terms of financial results are not surprising; the proportion of the turnover of new products to market that incorporates creativity of the total turnover achieved by innovative firms remains one of the lowest in Europe, 4.85%, which is well below the EU average of 8.60% (according to our calculations using Eurostat data). These results are consistent with how innovation is practiced by firms, most of them being adopters of technologies with lower requirements of inventiveness and use of skills that are needed for the design and development of new technologies.

A deeper understanding of the nature of research under the motivational factors is essential in shaping appropriate policies for research and innovation. Learning from the experience of the top innovators regarding the development modes of the creative capital can be useful in order to exploit innovation capacity, and that would be reflected both in government policies or promoted at the enterprise level. Creativity is the key source of economic growth. The best way to prosperity is by investing in creativity in all forms. Promoting a culture of creativity goes beyond the allocation of financial resources in research, involving multidimensionality.

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