The Ideological Reductionism

"To deny Economics its collaboration with ideologies would transform it into an alchemical recipe for wealth, a science of the private laboratory where light doesn't come on because it would compromise the fertility of darkness."

The most controversial form of parsimony – as an expression of postmodern neo-reductionism – is the construction of analyses in the self-sufficiency of mainstream theory hypotheses. The extension of the scientific community which practices the ideas of this theory, whichever it may be and whenever it would have found itself in a leading position, was an exaggeration through both references (favorable or not) as well as through the flux of approaches which configure economic policies. Methodological conventionalism produces simplification, but when it stems from a single theory it reaches excessive forms.

This is not about the fact that a theory occupies the epicenter of conceptualization in Economics, but also about the fact that the alternatives are being pushed to the periphery in their function of contradicting the truth made absolute through partisanship. The referential uniformization unravels the rational counter-argument in this situation. Ideology is insinuated in the path of the deductive discourse. Its social reflex is totalitarian.

An almost immanent trend in Economics, ideological contamination has multiple resources. It seems though that there are only two important ones: the first, the pride of applying the solutions of an analysis in order to recognize its practical validity, the second, the dependence of institutionalized structures of research on politically aligned funding. It is in fact the obverse and reverse of the same coin, human nature, whose circulation is on the highways of human condition (labor, work, action) in a transactional form. The theoretical economist seeking notoriety at any price – including the moral one – and the societal system based on the rationality of the market, especially in regard to public election, are parts of the same mechanism of compromise preferred by ideologies.

At the intersection between the theoretical economist's interest for access to the official logistics of political institutions (for the promotion and daily experiencing of notoriety) and the interest of the systems of power in the scientific cautioning of their line of conduct, there can be found the ideological conversion of the rational process.

The functioning of this convection has an historical character and it assumes paroxysmic values in the eras in which the preference for perfectly uni-dimensioned societal theories is manifested. The textbook example of the socialist experiment is not the only one, while unfortunately not being the first or the last.

Societal constructions following a single leading criterion, applied invariably to the configuration of the functional structure and to the context of randamental over-determination of the management of powers, find in the theory of corporatist capitalism, for instance, a kymographic update. Economic research focuses strictly on the nuances of this theoretical perspective, emerged from the latest ideological parsimony, searching for the short path of imposed notoriety. The entire architecture of confirming the results of economic cognition conspire towards the trend of encouraging research inspired by the objectives of this societal theory. In order to count, symptomatically put, there is only the path of conforming to the trend, leading many to act accordingly.

The problem of whether this problem can be circumvented remains nebulous, with no correct solutions recognized to date anyway. It is true that the specificity of the cognitive process cannot be defined too exactly, the reflexiveness of the fundamental process is inextricable, the rational cannot be radically separated from the emotional in judging the causes and the individual ends. There cannot be practiced a knowledge which is permanently separated from the emotionally conditioned reflexes of subjectivity, and even harder to do it when separated from the reflexes of transactional inter-subjectivity with regard to roles and statuses.

A sort of Promethean curse can be observed here, economic research forever remaining chained to the hard rock of ideological reductionism. Frankly, Economics cannot escape the pressure of its times. Its scientificity arrives on a special path, most of it trodden by the soles of political interests. From this point of view the name of Political Economics given to the science of the economy is logically constructed.

The degree of scientificity pertains to a double measure: the realism of the problem to which solutions are proposed and the wealth effect generated by the solving process. When dealing with problems whose solutions imply effects of a different consistency, even though it seems that the scientific position is betrayed, the relevance of the propagated consequences must be evaluated from sociological and politological perspectives. In a systemic way all social sciences compete in understanding the anthropical universe.

Somewhat unusual to prior experience, there is no need for the use of the limited randamental sense of the cognitive contribution of Economics in order to conserve its quality as a science. When compared to the alignments of the human condition, the rationality function of Economics is evaluated in the substantial terms specific to labor, work and action, meaning that efficiency is concretely measured. In this territory Economics is experimental, while its phenomenology is praxeological.

It is a different story for the senses of cognitive effects when Economics operates in the fluid universe of human nature, where the rationality function targets the categories of understanding and explanation, is imbued with abstraction and is associated with the other forms of knowledge in the complexity of the social – forms either interested in the palpable truth, in the recipes for the control of power or in the plurivalent motivation of human behaviors. To deny Economics its collaboration with ideologies would transform it into an alchemical recipe for wealth, a science of the private laboratory where light doesn't come on because it would compromise the fertility of darkness.

The only vocation which must always be re-confirmed is for Economics to glimpse the alternative sources of light. It will remain fully within the robe of science as long as it makes visible the ideological simplification of reality and does not restrict access to the diversity of the means for constructing the randamental function. It must, at the same time, show the path on which wealth remains the prosperity-generating source tested in accordance with the law of large numbers.

Any theory which temporary structures the operational mechanisms of the components of the human condition holds an episodic meaning, the infinite series of randamental facts being composed by the sub-series of antithetical performances of the human nature.

Marin Dinu

Contents

Optimal Licensing Contracts with Three Innovation Types
Daniela Marinescu, Dumitru Marin 5

Novelties in Competition Regulation in Romania. Impact on Competitors
Cornelia Lefter, Oana Oprea (Teodorescu) 23

A Cause and Effect Analysis of University – Business Cooperation for Regional Innovation in Romania
Cristina Şerbănică 29

Moldavia and Maramureş – Micro-destinations for Relaunching the Romanian Tourism
Aurelia-Felicia Stăncioiu, Ion Pârgaru, Nicolae Teodorescu, Anca-Daniela Vlădoi, Monica Paula Rațiu 45

Corporate Social Responsibility – between Desideratum and Reality
Anca Maria Hristea 57

Identification of Critical Points in the Quality Management System
Tünde Szabó 75

Econometric Modeling of GDP Time Series
Elena-Adriana Andrei, Elena Bugudui 91

Impact of Institutional Credit on Agricultural Output: A Case Study of Pakistan
Nawaz Ahmad 99

The Management of Waste Containing Asbestos in Romania and the European Union
Silvian Ionescu 121

Technological Innovation: Concept, Process, Typology and Implications in the Economy
Mihaela Diaconu 127

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Optimal Licensing Contracts with Three Innovation Types

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Abstract. *In the paper we analyze the features of the optimal licensing contracts in the situation of asymmetric information between the license's owner and the potential buyer. The approach is based on a classical model of adverse selection first proposed by Macho-Stadler and Perez-Castrillo (1991) and solved in an alternative way, using the informational rents as variables, by Marinescu and Marin (2011). Their model is extended in the present paper by assuming that the adverse selection parameter can have one of three possible values (corresponding to three possible types of innovations).*

Keywords: optimal contract; innovation; adverse selection; informational rents.

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Introduction

Competition plays a very important role for the firms' existence on almost every market. One of the main goals of any productive firm is finding new production technologies generating lower production costs, but high qualitative goods or services and yielding to efficient results. The firms pay a special attention to the development of new patents or innovations yielding to a higher competitive position on the market.

Usually, a licensing contract is based on a fixed fee (and this fee is independent of the output produced or the activity) and a variable fee (royalty), dependent on the volume of output. Although the optimality of licensing contracts has been considerable studied in the last twenty years, there is not a general conclusion about the form of these contracts. The terms of licensing contracts depend on many factors such as: if the innovator (the licensor) competes with the innovation in the same market as the potential buyer, the number of firms competing for the innovation (potential buyers of the innovation), the seller's possibility to verify and to monitor the buyer after selling the patent or risk sharing between the two contractual partners (the seller and the buyer).

In the last twenty years, several authors tried to determine, on theoretical reasons, the optimal form of licensing contracts and to explain the necessity of including some variable fees a license contract. In the literature, the initial papers focused on situations with symmetric information between the licensor and the licensee: Katz and Shapiro (1985, 1986), Gallini (1984), Kamien and Tauman (1986). With the rapid development of the incentive theory in the last twenty years, many theoretical studies pointed out that the presence of asymmetric information between the licensor and the licensee influenced the form of licensing contracts: Gallini and Wright (1990), Macho-Stadler and Perez-Castrillo (1991), Begg (1992), Erutku et al. (2008), Antelo (2009), Marinescu and Marin (2011).

In their paper, Gallini and Wright (1990) analyse the consequences of seller's private information on the optimality of contracts and they show that the high quality innovations are signalled through two-part contracts (a fixed fee and a variable fee). Macho-Stadler and Perez-Castrillo (1991) derive the features of optimal licensing contracts in two different situations of asymmetric information between the partners: signalling (the Principal-the seller has some private information and can signal the high quality on the patent through contracts based on royalties) and screening (the Agent-the buyer has some private information about the true value of the patent and the contracts must be based only on fixed fees). Begg (1992) shows that a contract based on royalties are more efficient than a licence contract based on fixed fee, due to the existence of a separating equilibrium of the game he analysed. In another theoretical study on the design of optimal contracts in the situation of incomplete information, Erutku et al. (2008)

consider that the contracts based only on royalties are suboptimal from the buyer's perspective since there is always a two part contract dominating the contract based on royalties. Antelo (2009) analyses in a signalling game the effects of asymmetric information (the contract duration and the choice of the royalties) on the design of royalties-only contracts. Crama et al. (2008) study the form of optimal licensing contracts when the buyer's evaluation of innovation represents incomplete information; they show that the presence of moral hazard and adverse selection can yields to a higher loss.

There are not so many empirical studies about the optimal terms of licensing contracts and the results don't confirm all the features generated in theoretical studies. Some interesting analysis belong to Rostocker (1983), Taylor and Silberstone (1973), Grindley and Nickerson (1996) (chemical industry), Grindley and Teece (1997) (electronics industry), Macho-Stadler et al (1996), Anand et al (2000) (cross industries analysis), Jensen and Thursby (2001), Mukherjee et al (2008), Nagaoka (2009).

The paper is organized as follows. In Section 1 we briefly present the model of Macho-Stadler and Perez-Castrillo. In Section 2 we propose an extension of this model to the case where the potential buyer can have one of three possible types (here represented by the average production cost). We solve the extended model in the next section. In the Principal's optimization problem, we use the informational rents as variables which permit us to interpret the features of the optimal licensing contracts in terms of the problems with asymmetry of information between the contractual partners. Section 4 gives an example of deriving the optimal contracts and discusses possible interpretations of the results. A final section concludes the article.

1. The standard model

In their paper, Macho-Stadler and Perez-Castrillo (1996) analysed two types of problems with informational asymmetry between the seller (the owner of a patent) and the buyer (a firm who's intention is to use the patent) of one innovation (license). The first problem corresponds to a classical signalling problem where the seller knows better than the buyer the quality of innovation. The second problem, where the buyer has an informational advantage (private information), corresponds to an adverse selection problem. This last type of problem is described in our paper.

We assume that a research institute owns a patent (innovation) and it can't obtain profit directly, but only through a licensing contract. We will refer further at this institute as being the Principal.

On the other hand, the Agent is a monopolist (a firm) having a constant average production cost c^0, so that the total cost of production is given by $c^0 \times Q$.

Definition 1. A licensing contract in the situation of symmetric information is a pair (F,ε), where:

F represents the amount paid by the monopolist when signing the contract (this is usually referred as a *fixed fee*);

ε is the amount paid by the Agent to the Principal for each unit produced by the firm using the patent (this is usually referred as a variable fees or royalties).

In the new situation – after buying the license, the average production cost becomes lower than c^0, such that we have $c < c^0$.

We assume that the market demand function for the good produced by the monopolist is given by $D(P)$ and the monopoly price is denoted by $P^m(x)$. Then, for each level of the average cost *x*, the firm's profit function is denoted by $\pi^m(x)$. We give, without proof (the interested reader finds the proof in Marinescu and Marin (2011)), the following proposition:

Proposition 1. The profit function satisfies:

$$\frac{d\pi^m(x)}{dx} = -D\left(P^m(x)\right)$$

1.1. The optimal contract in the situation of symmetric information

First suppose that there is no asymmetry of information between the Principal and the Agent. This corresponds to the situation where both the seller and the buyer (of the patent) know the true value of the innovation.

The Principal's problem is to maximize the total profit subject to Agent's participation constraint (showing that he is willing to pay no more than the profit excess).

We use the following notation:

$$D^m(x) = D\left(P^m(x)\right)$$

The Principal's optimization problem to be solved is written as:

$$(\max_{F,\varepsilon})\left[F + \varepsilon D^m(c+\varepsilon)\right]$$

s.r.

$$F \le \pi^m(c+e) - \pi^m(c^0)$$

$$F \ge 0$$

$$\varepsilon \ge 0$$

The optimal solution of this problem is given in the following theorem (its proof is given in details in Marinescu and Marin (2011)):

Theorem 1. In the case of symmetric information, the optimal licensing contract (the first best solution) in the sense of *Definition 1* is $(\widetilde{F}, \widetilde{\varepsilon} = 0)$, with $\widetilde{F} = \pi^m(c) - \pi^m(c^0)$.

In such a situation, the optimal licensing contract is based only on a fixed fee, which is exactly equal to the buyer's profit excess and the Agent's production is efficient.

1.2. The optimal contract in the situation of asymmetric information

With asymmetry of information, the Agent has private information (hidden information) and knows better than the Principal how important the innovation is. In some situations, the asymmetry of information consists in a better knowledge of the buyer related to the demand function for the output he produces or related to the production technology impact and the real value of the innovation. These situations are more probable when the patent's owner doesn't act on the industry or on the respective product market.

In our model, the Principal (the owner of the license) considers that the Agent's evaluation is one of two types – the type G (good) or the type B (bad), and having the corresponding average cost $c^G < c^0$ and $c^B < c^0$ respective, with $c^G < c^B$. The probability the Principal believes that the innovation has the type G is denoted by γ.

With symmetric information, the Principal, knowing the Agent's type, makes a contractual offer consisting in a contract based only on fixed fee and without variable fees. The optimal contract is represented by:

$(\widetilde{F}^G, \widetilde{\varepsilon}^G = 0)$, with $\widetilde{F}^G = \pi^m(c^G) - \pi^m(c^0)$, if the Agent's type is G

and

$(\widetilde{F}^B, \widetilde{\varepsilon}^B = 0)$, cu $\widetilde{F}^B = \pi^m(c^B) - \pi^m(c^0)$, if the Agent's type is B.

Without knowing the innovation type, it is optimal for the Principal to propose a menu of contracts, one contract for each type of Agent, hoping that each type chooses the contract designed for him. The features of the optimal menu of contracts are summarized in the next theorem:

Theorem 2. The optimal contract in the situation of *adverse selection* (the second best solution) $\left((\overline{F}^G, \overline{\varepsilon}^G), (\overline{F}^B, \overline{\varepsilon}^B)\right)$ satisfies the following:

$\overline{F}^G < \widetilde{F}^G$, $\overline{\varepsilon}^G = \widetilde{\varepsilon}^G = 0$

and

$\overline{F}^B < \overline{F}^G$, $\overline{\varepsilon}^B > 0$.

Before going further, we make some remarks regarding the theorem's results:

A. The contract designed for the firm with high evaluation (type G) is completely based on a fixed fee $\overline{F}^G$ lower than the fixed fee corresponding to the situation of symmetric information (the first best solution). We have therefore, $\overline{\varepsilon}^G = 0 = \widetilde{\varepsilon}^G$.

This contract gives to the Agent of type G a positive informational rent $\overline{U}^G = \phi(\overline{\varepsilon}^B)$.

B. The contract designed for the low evaluation (type B) generates the same profit as the profit obtained without using the new technology. This second best contract is based on two parts: a fixed fee $\overline{F}^B$ and a variable fee, $\overline{\varepsilon}^B > \widetilde{\varepsilon}^B = 0$. With this contract the Agent gets no informational rent.

2. The extended model: three types of innovation

Coming back to the situation of asymmetric information, we now suppose that the Principal believes that the innovation generates a reduction in the average production cost such that there are three possible values of innovation:

- the type G with the probability $\gamma^G > 0$,
- the type M with the probability $\gamma^M > 0$ and
- the type B with the probability $\gamma^B > 0$, where $\gamma^G + \gamma^M + \gamma^B = 1$.

We consider the variables $e^G = \varepsilon^G + c^G$, $e^M = \varepsilon^M + c^M$, $e^B = \varepsilon^B + c^B$, where:

$c^G < c^M < c^B < c^0$ and $\Delta\theta = c^B - c^M = c^M - c^G$.

As we have already seen, under complete information, when the Principal makes a contractual offer to the Agent, the optimal contract is based only on fixed fees and takes the following form:

$(\widetilde{F}^G, \widetilde{\varepsilon}^G = 0)$, with $\widetilde{F}^G = \pi^m(c^G) - \pi^m(c^0)$, for the type G,

$(\widetilde{F}^M, \widetilde{\varepsilon}^M = 0)$, with $\widetilde{F}^M = \pi^m(c^M) - \pi^m(c^0)$, for the type M

and

$(\widetilde{F}^B, \widetilde{\varepsilon}^B = 0)$, cu $\widetilde{F}^B = \pi^m(c^B) - \pi^m(c^0)$, for the type B.

Under asymmetric information, it is optimal for the Principal to propose a menu of contracts, one contract for each type of Agent, such that each type chooses exactly the contract designed for him. The menu of contracts consists in the set of pairs fixed fee-variable fee $\left\{\left(F^G, \varepsilon^G\right), \left(F^M, \varepsilon^M\right), \left(F^B, \varepsilon^B\right)\right\}$.

The Principal's objective function (maximizing his expected profit) is now written as:

$$\max_{\left(F^G,\varepsilon^G\right),\left(F^M,\varepsilon^M\right),\left(F^B,\varepsilon^B\right)}\{\gamma^G\left[F^G+\varepsilon^G D^m\left(\varepsilon^G+c^G\right)\right]+\gamma^M\left[F^M+\varepsilon^M D^m\left(\varepsilon^M+c^M\right)\right]+$$
$$+\gamma^B\left[F^B+\varepsilon^B D^m(c^B+\varepsilon^B)\right]\}$$

When solving the model, we use as variables the informational rents, defined below.

Definition 2. The expressions:

$U^G=\pi^m(c^G+\varepsilon^G)-F^G-\pi^m(c^0)$,

$U^M=\pi^m(c^M+\varepsilon^M)-F^M-\pi^m(c^0)\geq 0$

and $U^B=\pi^m(c^B+\varepsilon^B)-F^B-\pi^m(c^0)$

are the *informational rents for each type of innovation G*, *M*, and *B*, respectively.

Within the set of possible contracts to be proposed by the Principal we have to pay attention to those contracts to be accepted by the Agent.

Definition 3. A menu of contracts $\left\{\left(F^G,\varepsilon^G\right),\left(F^M,\varepsilon^M\right),\left(F^B,\varepsilon^B\right)\right\}$ is *feasible* if it satisfies the following participation constraints:

$$U^G=\pi^m(c^G+\varepsilon^G)-F^G-\pi^m(c^0)\geq 0 \quad (1)$$

$$U^M=\pi^m(c^M+\varepsilon^M)-F^M-\pi^m(c^0)\geq 0 \quad (2)$$

$$U^B=\pi^m(c^B+\varepsilon^B)-F^B-\pi^m(c^0)\geq 0 \quad (3)$$

Each of the above constraints shows that the contract assigned to each type of Agent yields a profit higher than the profit obtained without using the innovation.

Furthermore, for a contract to be accepted it must satisfy the incentive compatibility constraints, meaning that each Agent selects the contract designed for him.

The incentive compatibility constraint for the type G (imposing not to choose the contract of type *M*), expressed in terms of informational rents is:

$$U^G=\pi^m(c^G+\varepsilon^G)-F^G-\pi^m(c^0)\geq\pi^m(c^G+\varepsilon^M)-F^M-\pi^m(c^0)=$$
$$=\pi^m\left(c^M+\varepsilon^M\right)-F^M-\pi^m\left(c^0\right)+\pi^m\left(c^G+\varepsilon^M\right)-\pi^m\left(c^M+\varepsilon^M\right)=$$
$$=U^M+\pi^m\left(c^M+\varepsilon^M+c^G-c^M\right)-\pi^m\left(c^M+\varepsilon^M\right)$$

In what follows we use the notation $f(e) = \pi^m(e) - \pi^m(e + \Delta\theta)$. The function $f(\cdot)$ has the following properties:

i) $f(e) > 0, \forall e \geq 0$

ii) $f'(e) < 0, \forall e \geq 0$

With the above notation, the incentive compatibility constraint can be rewritten as:

$$U^G \geq U^M + f(e^M - \Delta\theta) \tag{4}$$

Similarly, the other compatibility constraint for the type G imposing not to choose the contract of type *B* is:

$$U^G \geq \pi^m(c^G + \varepsilon^B) - F^B - \pi^m(c^0)$$

or

$$U^G \geq U^B + f(e^B - 2\Delta\theta) + f(e^B - \Delta\theta) \tag{5}$$

In a similar manner we can express the incentive compatibility constraints for the type M:

$$U^M \geq \pi^m(c^M + \varepsilon^G) - F^G - \pi^m(c^0)$$

or

$$U^M \geq U^G - f(e^G) \tag{6}$$

and

$$U^M \geq \pi^m(c^M + \varepsilon^B) - F^B - \pi^m(c^0)$$

or

$$U^M \geq U^B + f(e^B - \Delta\theta) \tag{7}$$

For the type B, we also have the following constraints:

$$U^B \geq U^G - f(e^G) - f(e^G + \Delta\theta) \tag{8}$$

$$U^B \geq U^M - f(e^M) \tag{9}$$

We can classify the incentive compatibility constraints into two categories (Laffont and Martimort, 2002, pp. 86-90): local and global incentive constraints. Hence, the constraints (4) and (7) are upward local incentive constraints (ULIC), while the constraint (5) is an upward global incentive constraint (UGIC); the constraints (6) and (9) are downward local incentive constraints (DLIC), while the constraint (8) is a downward global incentive constraint (DGIC).

Definition 4. A menu of feasible contracts $((F^G, \varepsilon^G), (F^B, \varepsilon^B))$ is *incentive feasible* if it satisfy also the following incentive compatibility constraints:

$$U^G \geq U^M + f\left(e^M - \Delta\theta\right) \quad (10) \quad \text{ULIC}$$
$$U^M \geq U^B + f\left(e^B - \Delta\theta\right) \quad (11) \quad \text{ULIC}$$
$$U^G \geq U^B + f\left(e^B - 2\Delta\theta\right) + f\left(e^B - \Delta\theta\right) \quad (12) \quad \text{UGIC}$$
$$U^M \geq U^G - f\left(e^G\right) \quad (13) \quad \text{DLIC}$$
$$U^B \geq U^M - f\left(e^M\right) \quad (14) \quad \text{DLIC}$$
$$U^B \geq U^G - f\left(e^G\right) - f\left(e^G + \Delta\theta\right) \quad (15) \quad \text{DGIC}$$

Note that the menu is feasible, so it satisfies the participation constraints.

3. Solving the extended model

Having all the constraints defined, the Principal's optimization problem is in fact a nonlinear optimization problem with six inequality constraints and the sign constraints for six variables (informational rents and variable fees). The major technical difficulty in solving the problem is generated by the huge number of constraints, but also the number of variables. Before solving it, we try to reduce it, using the following remarks.

Proposition 1. (The implementability condition): If the set of feasible solutions is nonempty, then $\varepsilon^G \leq \varepsilon^M \leq \varepsilon^B$.

Proof

We add the constraints (10) and (13) and we get:

$$f\left(e^G\right) \geq f\left(e^M - \Delta\theta\right)$$

and adding the constraints (11) and (14) we get:

$$f\left(e^M\right) \geq f\left(e^B - \Delta\theta\right)$$

From the above two relations it follows that:

$$e^G \leq e^M - \Delta\theta \text{ and } e^M \leq e^B - \Delta\theta$$

or

$$e^G - c^G \leq e^M - c^M \leq e^B - c^B$$

and this yields to:

$$\varepsilon^G \leq \varepsilon^M \leq \varepsilon^B.$$

More than this result, the condition $e^M \leq e^B - \Delta\theta$ can be rewritten as:

$$e^M - \Delta\theta \leq e^B - 2\Delta\theta$$

and so the upward global incentive constraint (12) is implied by the upward local incentive constraints. Therefore, we can ignore it when solving the Principal's problem.

We also ignore for a while the downward constraints and we check later that the solution derived for the reduced optimization program (without the constraints (13), (14) and (15)) satisfies also these constraints.

The Principal's objective function, expressed in terms of informational rents becomes:

$$\max_{\varepsilon^G,\varepsilon^M,\varepsilon^B,U^G,U^M,U^B} \{\gamma^G\left[\pi^m(c^G+\varepsilon^G)+\varepsilon^G D^m\left(\varepsilon^G+c^G\right)\right]+$$
$$+\gamma^M\left[\pi^m\left(c^M+\varepsilon^M\right)+\varepsilon^M D^m\left(c^M+\varepsilon^M\right)\right]+$$
$$+\gamma^B\left[\pi^m\left(c^B+\varepsilon^B\right)+\varepsilon^B D^m\left(c^B+\varepsilon^B\right)\right]-$$
$$-\left[\gamma^G U^G+\gamma^M U^M+\gamma^B U^B\right]$$

If we add the upward local incentive constraints (10) and (11):

$U^G \geq U^M + f\left(e^M-\Delta\theta\right)$ and $U^M \geq U^B + f\left(e^B-\Delta\theta\right)$

and the non-negativity constraints: $U^G \geq 0$, $U^M \geq 0$ and $U^B \geq 0$, we get a reduced form of the Principal's optimization problem.

We can reduce more the above problem (we reduce the number of optimization variables) using the following result:

Proposition 2. In the Principal's optimization problem, at the optimum, we have:

$U^B = 0$, $U^M = f\left(e^B-\Delta\theta\right)$ and $U^G = f(e^B-\Delta\theta)+f(e^M-\Delta\theta)$.

Proof

Suppose that $U^B > 0$ and let $u > 0$ be a small real value such that $U^B - u \geq 0$. Then the following constraints:

$U^G - u \geq U^M - u + f\left(e^M-\Delta\theta\right)$

$U^M - u \geq U^B - u + f\left(e^B-\Delta\theta\right)$

remain satisfied.

We also have $U^M \geq U^B \geq 0$ and $U^G \geq U^M \geq 0$.

The solution $(\varepsilon^G,\varepsilon^M,\varepsilon^B,U^G-u,U^M-u,U^B-u)$ obtained from the optimal solution $(\varepsilon^G,\varepsilon^M,\varepsilon^B,U^G,U^M,U^B)$ is still feasible, while the value of the objective function is higher (with u) than the optimal value. This is a contradiction with the assumption that $(\varepsilon^G,\varepsilon^M,\varepsilon^B,U^G,U^M,U^B)$ represents the optimal solution.

Therefore, at the optimum it must be $U^B = 0$.

In the same way we can prove that $U^M = f\left(e^B - \Delta\theta\right)$ and $U^G = U^M + f\left(e^M - \Delta\theta\right) = f\left(e^B - \Delta\theta\right) + f\left(e^M - \Delta\theta\right)$.

Using the above result, we can now check that the optimal informational rents satisfy the downward local and global incentive constraints.

Indeed, the constraint (14) becomes:

$$f(e^M) \geq U^M = f\left(e^B - \Delta\theta\right)$$

or $e^M \leq e^B - \Delta\theta$ (and this is true from the implementability condition).

The constraint (13), using the optimal expressions for U^M and U^G can be written as:

$$f\left(e^B - \Delta\theta\right) \geq f\left(e^B - \Delta\theta\right) + f\left(e^M - \Delta\theta\right) + f\left(e^G\right)$$

or $e^G \leq e^M - \Delta\theta$ (and this is also true from the implementability condition).

The downward global incentive constraint is simply implied by the two local constraints. Adding them we get:

$$U^B \geq U^G - f\left(e^G\right) - f\left(e^M\right) \geq U^G - f\left(e^G\right) - f\left(e^G + \Delta\theta\right)$$

or $f\left(e^G + \Delta\theta\right) \geq f\left(e^M\right)$ or $e^G \leq e^M - \Delta\theta$ (and this is true from the implementability condition).

With this huge simplification on the set of incentive feasible contracts, the optimization problem is significantly reduced and becomes an unconstrained optimization problem. Hence, the problem to be solved is:

$$(\mathrm{P}^{\mathrm{r}}) \quad \max_{\varepsilon^G, \varepsilon^M, \varepsilon^B} F(\varepsilon^G, \varepsilon^M, \varepsilon^B) = \gamma^G \left[\pi^m(c^G + \varepsilon^G) + \varepsilon^G D^m\left(\varepsilon^G + c^G\right)\right] + \gamma^M \left[\pi^m\left(c^M + \varepsilon^M\right) + \varepsilon^M D^m\left(c^M + \varepsilon^M\right)\right] + \gamma^B \left[\pi^m\left(c^B + \varepsilon^B\right) + \varepsilon^B D^m\left(c^B + \varepsilon^B\right)\right] - \gamma^G \left[f\left(e^B - \Delta\theta\right) + f\left(e^M - \Delta\theta\right)\right] - \gamma^M f\left(e^B - \Delta\theta\right)$$

The optimal contract satisfies the following first order conditions (the program being concave, these conditions are also sufficient conditions):

a) $\dfrac{\partial F(\cdot)}{\partial \varepsilon^G} = 0$ yields to:

$$\gamma^G \left[\frac{d\pi^m(c^G + \varepsilon^G)}{d\varepsilon^G} + D^m(c^G + \varepsilon^G) + \varepsilon^G D'^m(c^G + \varepsilon^G)\right] = 0$$

or

$$\varepsilon^G D'^m(c^G + \varepsilon^G) = 0$$

or

$\bar{\varepsilon}^G = 0$ (the second best solution is the same as the first best solution for this type of Agent).

b) $\frac{\partial F(\cdot)}{\partial \varepsilon^M} = 0$ yields to:

$$\gamma^M \varepsilon^M D'^m(c^M + \varepsilon^M) - \gamma^G \left[\frac{d\pi^m(c^G + \varepsilon^M)}{d\varepsilon^M} - \frac{d\pi^m(c^M + \varepsilon^M)}{d\varepsilon^M} \right] = 0 \text{ or:}$$

$$\gamma^M \varepsilon^M D'^m(c^M + \varepsilon^M) - \gamma^G f'(\varepsilon^M + c^G) = 0.$$

Solving for $\bar{\varepsilon}^M$ it follows immediately that $\bar{\varepsilon}^M > 0$.

Using the function $f(e) = \pi^m(e) - \pi^m(e + \Delta\theta)$ in the above relation we get:

$$\gamma^M \varepsilon^M D'^m(c^M + \varepsilon^M) - \gamma^G \left[\frac{d\pi^m(c^G + \varepsilon^M)}{d\varepsilon^M} - \frac{d\pi^m(c^M + \varepsilon^M)}{d\varepsilon^M} \right] = 0$$

or:

$$\gamma^M \varepsilon^M D'^m(c^M + \varepsilon^M) + \gamma^G \left[D^m(\varepsilon^M + c^G) - D^m(\varepsilon^M + c^M) \right] = 0 \qquad (16)$$

c) From $\frac{\partial F(\cdot)}{\partial \varepsilon^B} = 0$

it follows that:

$$\gamma^B \left[\frac{d\pi^m(c^B + \varepsilon^B)}{d\varepsilon^B} + D^m(c^B + \varepsilon^B) + \varepsilon^B D'^m(c^B + \varepsilon^B) \right] -$$

$$\gamma^G f'(e^B - \Delta\theta) - \gamma^M f'(e^B - \Delta\theta) = 0$$

Using again the function $f(\cdot)$, the above equation becomes:

$$\gamma^B \varepsilon^B D'^m(c^B + \varepsilon^B) - (\gamma^G + \gamma^M) f'(e^B - \Delta\theta) = 0$$

or

$$\gamma^B \varepsilon^B D'^m(c^B + \varepsilon^B) - (1 - \gamma^B) \left[\frac{d\pi^m(c^M + \varepsilon^B)}{d\varepsilon^B} - \frac{d\pi^m(c^B + \varepsilon^B)}{d\varepsilon^B} \right] = 0$$

or

$$\gamma^B \varepsilon^B D'^m(c^B + \varepsilon^B) + (1 - \gamma^B) \left[D^m(\varepsilon^B + c^M) - D^m(\varepsilon^B + c^B) \right] = 0 \qquad (17)$$

If we denote by $\bar{\varepsilon}^B$ the solution of the equation given in (17), then it must satisfy $\bar{\varepsilon}^B > 0$.

d) The remaining variables $\bar{F}^G, \bar{F}^M$ and $\bar{F}^B$ can be derived using the definitions of the informational rents (1), (2), (3), the results from *Proposition 2* and the result $\bar{\varepsilon}^G = 0$ and the relations (16) and (17).

Therefore, we have:

$$\begin{aligned}\overline{F}^{G} &= \pi^{m}(c^{G}+\bar{\varepsilon}^{G})-\pi^{m}(c^{0})-\overline{U}^{G}= \\ &= \pi^{m}(c^{G})-\pi^{m}(c^{0})-\pi^{m}(c^{M}+\bar{\varepsilon}^{B})+\pi^{m}(c^{B}+\bar{\varepsilon}^{B})- \\ &-\pi^{m}\left(c^{G}+\bar{\varepsilon}^{M}\right)+\pi^{m}\left(c^{M}+\bar{\varepsilon}^{M}\right)\end{aligned} \tag{18}$$

and:

$$\begin{aligned}\overline{F}^{M} &= \pi^{m}(c^{M}+\bar{\varepsilon}^{M})-\pi^{m}(c^{0})-\overline{U}^{M}= \\ &= \pi^{m}(c^{M}+\bar{\varepsilon}^{M})-\pi^{m}(c^{0})-\pi^{m}(c^{M}+\bar{\varepsilon}^{B})+\pi^{m}(c^{B}+\bar{\varepsilon}^{B})\end{aligned} \tag{19}$$

and:

$$\overline{F}^{B} = \pi^{m}(c^{B}+\bar{\varepsilon}^{B})-\pi^{m}(c^{0}) \tag{20}$$

We can now summarize the features of the optimal contracts in asymmetric information:

Theorem 3. In the situation of asymmetric information, the optimal licensing contract (the second best solution) entails:

A. *Optimal variable fees*:

- The contract designed for the type with the lowest average cost (the innovation with type G) is completely based on fixed fees. Therefore, at the optimum we have:
  $\bar{\varepsilon}^{G} = 0 = \tilde{\varepsilon}^{G}$.
- The contracts designed for the Agents with higher average costs (the innovation has the type *M* or *G*) entail strictly positive variables fees, $\bar{\varepsilon}^{M} > 0$, $\bar{\varepsilon}^{B} > 0$, derived from (16) and (17).

B. *Optimal informational rents*:

- The Agent with type B gets no informational rent such that $\overline{U}^{B} = 0$.
- The Agents with type *M* and *G* get strictly positive informational rents, due to the informational advantage. These informational rents have the following forms:

$$\overline{U}^{M} = f\left(\bar{\varepsilon}^{B}+c^{B}-\Delta\theta\right)$$

and:

$$\overline{U}^{G} = f(\bar{\varepsilon}^{B}+c^{B}-\Delta\theta)+f(\bar{\varepsilon}^{M}+c^{M}-\Delta\theta)$$

C. *Optimal fixed fees*:

- The contract designed for the type G is completely based on a fixed fee, given by (18):

$$\overline{F}^{G} = \pi^{m}(c^{G}+\bar{\varepsilon}^{G})-\pi^{m}(c^{0})-\overline{U}^{G}$$

- The contracts designed for the types M and B entail the following optimal fixed fees, given by (19):

$$\overline{F}^{M} = \pi^{m}(c^{M} + \bar{\varepsilon}^{M}) - \pi^{m}(c^{0}) - \overline{U}^{M}$$

and by (20), respectively:

$$\overline{F}^{B} = \pi^{m}(c^{B} + \bar{\varepsilon}^{B}) - \pi^{m}(c^{0}).$$

4. An example

Suppose that the demand function for the good produced by the potential buyer (of the license) is:

$D(P) = a - bP$, with $a, b \in (0, \infty)$

(the parameters *a* and *b* can be easily estimated).

Then, the price maximizing the firm's profit satisfies:

$$P^{m}(x) \in \arg\max_{P}(P - x)D(P)$$

where *x* represents the average production cost.

It is easy to find the optimal value for the price; it is given by:

$$P^{m}(x) = \frac{a + bx}{2b}$$

With the above expression for the price, the demand function becomes:

$$D^{m}(x) = \frac{a - bx}{2}, \text{ with } D'^{m}(x) = -\frac{b}{2}$$

And hence, the profit function is now:

$$\pi^{m}(x) = \frac{(a - bx)^{2}}{4b}$$

Our goal is to derive the optimal menu of contracts in both situations, symmetric and asymmetric situations.

Using the results from the previous sections, the optimal contracts in symmetric information have the following form:

- for type G: $(\widetilde{F}^{G}, \widetilde{\varepsilon}^{G} = 0)$, where $\widetilde{F}^{G} = \frac{(c^{0} - c^{G})[2a - b(c^{0} + c^{G})]}{4}$;
- for type M: $(\widetilde{F}^{M}, \widetilde{\varepsilon}^{M} = 0)$, where $\widetilde{F}^{M} = \frac{(c^{0} - c^{M})[2a - b(c^{0} + c^{M})]}{4}$;
- for type B: $(\widetilde{F}^{B}, \widetilde{\varepsilon}^{B} = 0)$, where $\widetilde{F}^{B} = \frac{(c^{0} - c^{B})[2a - b(c^{0} + c^{B})]}{4}$.

We consider now the case of asymmetric information. We derive the corresponding optimal menu of contracts using the results from *Theorem 3*.

1) Optimal variable fees

From the first order conditions we have:

$$\bar{\varepsilon}^G = 0 \qquad (1')$$

Then, the equation (16) becomes:

$$-\frac{b}{2}\gamma^M \varepsilon^M + \gamma^G \left[\frac{a - b(\varepsilon^M + c^G)}{2} - \frac{a - b(\varepsilon^M + c^M)}{2} \right] = 0$$

and this yields to:

$$\bar{\varepsilon}^M = \frac{\gamma^G}{\gamma^M}\left(c^M - c^G\right) = \frac{\gamma^G}{\gamma^M}\Delta\theta \qquad (2')$$

Using (17), we get:

$$-\frac{b}{2}\gamma^B \varepsilon^B + \left(1-\gamma^B\right)\left[\frac{a - b(\varepsilon^B + c^M)}{2} - \frac{a - b(\varepsilon^B + c^B)}{2} \right] = 0$$

or:

$$\bar{\varepsilon}^B = \frac{1-\gamma^B}{\gamma^B}\left(c^B - c^M\right) = \left(\frac{1-\gamma^B}{\gamma^B}\right)\Delta\theta \qquad (3')$$

2) We derive now the optimal *informational rents*.

In order to go further we need to make an additional assumption. We suppose that the average production costs (assigned to three possible types of innovation) are such that

$\Delta\theta = c^B - c^M = c^M - c^G = 1$ and $c^0 - c^B = 1$

With this new assumption, the optimal variable fees $\left(\bar{\varepsilon}^G, \bar{\varepsilon}^M, \bar{\varepsilon}^B\right)$ become:

$$\left(0, \frac{\gamma^G}{\gamma^M}, \frac{1-\gamma^B}{\gamma^B}\right).$$

The function $f(e)$ has the form:

$$f(e) = \pi^m(e) - \pi^m(e+1) = \frac{2a - b - 2be}{4}$$

From *Proposition 2*, the optimal informational rents are:

$\bar{U}^B = 0$, $\bar{U}^M = f\left(\bar{e}^B - \Delta\theta\right)$ and $\bar{U}^G = f(\bar{e}^B - \Delta\theta) + f(\bar{e}^M - \Delta\theta)$

where:

$$\bar{e}^B = \bar{\varepsilon}^B + c^B = \frac{1}{\gamma^B} + c^0 - 2$$

and:

$$\bar{e}^M = \bar{\varepsilon}^M + c^M = \frac{\gamma^G}{\gamma^M} + c^0 - 2 .$$

Therefore, the final form for the optimal rents are written as:

$$\bar{U}^B = 0 \tag{4'}$$

$$\bar{U}^M = f\left(\frac{1}{\gamma^B} + c^0 - 3\right) = \frac{a}{2} + \frac{b}{4}\left(5 - 2c^0 - \frac{2}{\gamma^B}\right) \tag{5'}$$

and

$$\bar{U}^G = \frac{a}{2} + \frac{b}{2}\left(5 - 2c^0 - \frac{1}{\gamma^B} - \frac{\gamma^G}{\gamma^M}\right) \tag{6'}$$

3) The second best *transfers (fixed fees)* $\bar{F}^G, \bar{F}^M$ and $\bar{F}^B$ are given by the relations (18), (19) and (20). Therefore, we have:

$$\bar{F}^B = \frac{\left[a - b\left(c^B + \bar{\varepsilon}^B\right)\right]^2}{4b} - \frac{\left(a - bc^0\right)^2}{4b}$$

or

$$\bar{F}^B = a\left(1 - \frac{1}{2\gamma^B}\right) + \frac{b}{4}\left(\frac{1}{\gamma^B} - 2\right)\left(2c^0 + \frac{1}{\gamma^B} - 2\right) \tag{7'}$$

From (19) we have:

$$\bar{F}^M = \pi^m\left(c^M + \bar{\varepsilon}^M\right) - \pi^m(c^0) - \bar{U}^M$$

which can be rewritten as:

$$\bar{F}^M = \frac{\left[a - b\left(c^M + \bar{\varepsilon}^M\right)\right]^2}{4b} - \frac{\left(a - bc^0\right)^2}{4b} +$$

$$+ \frac{\left[a - b\left(\bar{\varepsilon}^B + c^B\right)\right]^2}{4b} - \frac{\left[a - b\left(\bar{\varepsilon}^B + c^M\right)\right]^2}{4b} \quad \text{or:}$$

$$\bar{F}^M = \frac{a}{2}\left(1 - \frac{\gamma^G}{\gamma^M}\right) + \frac{b}{4}\left[\frac{2}{\gamma^B} + 2c^0 - 5 + \left(\frac{\gamma^G}{\gamma^M} - 2\right)\left(2c^0 + \frac{\gamma^G}{\gamma^M} - 2\right)\right] \tag{8'}$$

From (20) we have:

$$\bar{F}^G = \pi^m\left(c^G + \bar{\varepsilon}^G\right) - \pi^m(c^0) - \bar{U}^G$$

which can be rewritten as:

$$\bar{F}^G = \frac{\left[a - bc^G\right]^2}{4b} - \frac{\left(a - bc^0\right)^2}{4b} + \frac{\left[a - b\left(\bar{\varepsilon}^B + c^B\right)\right]^2}{4b} - \frac{\left[a - b\left(\bar{\varepsilon}^B + c^M\right)\right]^2}{4b} +$$

$$+ \frac{\left[a - b\left(\bar{\varepsilon}^M + c^M\right)\right]^2}{4b} - \frac{\left[a - b\left(\bar{\varepsilon}^M + c^G\right)\right]^2}{4b}$$

or:

$$\overline{F}^G = \frac{a}{2} + \frac{b}{4}\left(\frac{2}{\gamma^B} + \frac{2\gamma^G}{\gamma^M} - 2c^0 - 1\right) \qquad (9')$$

We can summarize the results in the next table:

Table 1

The results: optimal contracts in symmetric/asymmetric information

Innovation type	Optimal contracts in symmetric information	Optimal contracts in asymmetric information
Type G	$\tilde{\varepsilon}^G = 0$ $\tilde{F}^G = \frac{3a}{2} + \frac{3b}{4}\left(3 - 2c^0\right)$	$\overline{\varepsilon}^G = \tilde{\varepsilon}^G = 0$ $\overline{F}^G = \frac{a}{2} + \frac{b}{4}\left(\frac{2}{\gamma^B} + \frac{2\gamma^G}{\gamma^M} - 2c^0 - 1\right)$
Type M	$\tilde{\varepsilon}^M = 0$ $\tilde{F}^M = a + b\left(1 - c^0\right)$	$\overline{\varepsilon}^M = \frac{\gamma^G}{\gamma^M}$ $\overline{F}^M = \frac{a}{2}\left(1 - \frac{\gamma^G}{\gamma^M}\right) +$ $+ \frac{b}{4}\left[\frac{2}{\gamma^B} + 2c^0 - 5 + \left(\frac{\gamma^G}{\gamma^M} - 2\right)\left(2c^0 + \frac{\gamma^G}{\gamma^M} - 2\right)\right]$
Type B	$\tilde{\varepsilon}^B = 0$ $\tilde{F}^B = \frac{a}{2} + \frac{b}{2}\left(1 - 2c^0\right)$	$\overline{\varepsilon}^B = \frac{1 - \gamma^B}{\gamma^B}$ $\overline{F}^B = a\left(1 - \frac{1}{2\gamma^B}\right) + \frac{b}{4}\left(\frac{1}{\gamma^B} - 2\right)\left(2c^0 + \frac{1}{\gamma^B} - 2\right)$

Remark: The variables values found in this particular problem (the results of this application) are very sensitive to the assumptions made on the demand function form, the beliefs of the Principal with respect to the average production cost of the Agent (the probabilities) and the assumption regarding the spread of the adverse selection parameter values.

Conclusions

We analyzed in the paper the effects of asymmetric information between an owner of an innovation and the potential buyer (having a monopoly position) on the design of optimal licensing contracts. The main assumption of the model proposed here is that the innovation can have one of three possible types and these types influence the average production cost. If it is the buyer who has private information innovation's type, then the type with the lowest average cost receives a contractual offer entirely based on fixed fees and this type gets a

positive informational rent. On the other hand, if the firm (monopoly) has a low evaluation about the innovation (the average costs are still high), then the contract designed by the Principal is based also on variable fees. The approach presented can be easily generalized for a finite number of Agent's types (finite number of possible types of innovation), fitting better to empirical studies.

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Novelties in Competition Regulation in Romania. Impact on Competitors

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Abstract. *Upon the coming into force of the Law No. 149/2011, the recent changes in the Competition Law bring a significant decrease of the fines level, while encouraging competitors to support the maintenance of a healthy and transparent competition. However, some provisions require application guidelines, while others are tougher than the European law principles.*

Keywords: economic operator; lower fines; presumption of dominant position; serious competition constraints; lawyer-client privilege.

JEL Code: K21.
REL Codes: 14K, 17F.

As for the impact on competitors, the main novelty aspects Law No. 149/2011 has introduced are: reduction of the bail the companies have to pay so that the court can decide to suspend the execution of a Competition Council's decision to impose fines; reduction of authorization tax for economic concentrations; increase of maximum fine reduction for law violation confession, but introduces additional obligations; until otherwise proven, companies with over 40% market share are supposed as holding a dominant position.

We will analyse below each main novelties introduced by the new regulation, also attempting to get a glimpse of the effects this new approach has on the market, competitors and competition itself.

The notion of "economic operator" is introduced, long before used by European jurisprudence

The enterprise is defines by the regulator as any economic operator carrying on an activity in goods and services sphere, without any constraints related to its legal condition or to its financing (Art. 2 paragraph 2 - EGO No.75/2010 approved by Law No. 149/2011).

Authorization tax for economic concentrations is reduced

According to the previous regulation, the authorization tax for economic clustering was set up at 0.04% of total turnovers achieved on Romania's territory by the companies involved in authorized economic clustering, calculated based on the turnover for the financial year preceding the authorization decision. In the future, the economic operators will pay an authorization tax worth between EUR 10.000 and EUR 25.000 (Art. 32 paragraph 2 – EGO No. 75/2010 approved by Law No. 149/2011).

The authorization tax cut down should encourage acquisitions and simplify authorization procedure, all the more as we consider that the turnovers of the involved economic operators are no longer a reference element.

The new authorization taxes will be applied based on some guidelines the Competition Council is expected to issue in the next future.

The bail the companies have to pay so that the court can decide to suspend the execution of a Competition Council's decision to impose fines is cut down

According to the previous regulation, the court could order, upon request, the suspension of the attacked decision execution, on condition of a bail payment amounting to 30% of the fine set up by the attacked decision.

In the light of the new provisions, the economic operations will be submitted to the provisions of the Code of Fiscal Procedure, the court being

able to set up the bail up to 20% of the fine (Art. 47^1 paragraph 2 - EGO No.75/2010 approved by Law No. 149/2011).

It is expected that this cut down of the bail maximum value, matched with the court possibility to adjust this threshold depending on the typology and specific features of each case, should lead to a higher accessibility to court of the sanctioned economic operators. Until now, some economic operators did not afford financially to address the Competition Council in contesting the fine and in asking for the decision suspension as they did not have enough financial resources to pay the 30% bail.

However, the new regulation refers to the Fiscal Code, while the bail is regulated by the Code of Fiscal Procedure, which makes us believe that the near future will bring new changes of this new regulation.

Increase of maximum fine reduction for law violation confession, but introduces additional obligations

If after the receipt of investigation report and exertion of its file access file the economic operator admits its anti-competition deed during the observations or hearing phases, this will be regarded as a special mitigating circumstance under the form of collaboration during the administrative procedure and will lead to the reduction of the fine amount by a percentage ranging between 10% and 30% of the basic level (Art. 52 paragraph 2 of Competition Law, amended and completed).

At the same tine though, to benefit of a fine reduction in the above mentioned conditions, the economic operator's obligation is introduced to propose remedies leading to the removal of the violation causes, where the case. This fine reduction provision is different from the voluntary evidence presentation which makes the object of "clemency policy".

The Competition Council is also expected to draw up the required set of Guidelines for the application of these provisions, so as to avoid their discretionary application on the fine threshold cut down, especially in the lack of clear and precise criteria for the distinction of the remedies which can be proposed by the economic operators to remove the violation causes.

Until otherwise proven, companies with over 40% market share are supposed as holding a dominant position

According to the previous regulation, until otherwise proven, it was supposed that one or more enterprises are not in a dominant position if their market share or cumulated market shares on the relevant market reached during the analysis period did not exceed 40%.

The new law stipulates that, until otherwise proven, it is supposed that one or more enterprises are in a dominant position if their market share or cumulated market shares on the relevant market reached during the analysis period exceed 40% (Art. 6 of Competition Law, amended and completed).

This new provision is contrary to European practices, according to which a high market share is only a clue and does not have the value of an assumption. European Commission can reach such a conclusion only after analyzing all the factors leading to competition limitations for the respective economic operator.

Especially highlighted are the cases representing serious constraints of competition (Art. I pct. 3-5 - L No. 149/2011)

The new regulation specifically provides for the serious competition constraints induced by any understandings between companies, decisions of company's associates and concerted practices, by taking them over from the relevant regulations and instructions

The "serious constraints" refer to those which, directly or indirectly, have as object:

- setting up products selling prices to third parties;
- limitation of production or sales;
- markets or clients sharing;
- narrowing the buyer's capability to set up his selling price without hindering the supplier's possibility to impose a maximum selling price or to recommend a selling price, on condition the latter are not equivalent to a fix or minimum selling price set up due to the pressures exerted by one of the parties, or due to the stimulation measures practiced by them;
- territorial limitations or related to the clients to whom the buyer can sell the goods or services making the contract object;
- shrinking the active or passive sales to the final users made by the members of a selective distribution system acting on the market as retailers, without hindering the possibility to forbid a member of the system to carry on his activities from an unauthorized secondary premise;
- narrowing cross deliveries between distributors within a selective distribution system, including between distributors acting at various trade levels;
- restriction agreed between a components supplier and a buyer which assemblies these components, limiting the supplier's chance to sell these components as separate parts to final users, to menders or to other services performers which were not appointed by the buyer to repair or maintain his goods.

The law defines such and those restrictions which are not regarded as serious:

(i) shrinking the active sales to an exclusive territory or to exclusive clients reserved to the supplier, or assigned by the supplier to another buyer, without limiting the sales performed by the buyer's clients;

(ii) narrowing the sales to final users made by a buyer acting on the market as a retailer;

(iii) restriction of sales to unauthorized distributors made by the members of a selective distribution system;

(iv) restriction of the buyer's capacity to sell components meant to be assembled by clients who could use them to manufacture similar products to those of the supplier.

Lawyer-client communication privilege (Art. I pct. 21 - L No. 149/2011)

The provisions of the former regulation are preserved in the sense that "the preparatory documents made by the investigated company or association of companies to the exclusive purpose of exerting the right to defence cannot be taken or used as evidence".

The content of these provisions still includes a final stipulation which made impossible the taking over or use as evidence of those documents which were not sent to the lawyer or which were not created to the purpose of physically being sent to a lawyer.

The new regulation eliminates this last stipulation, it seems with the intention to limit the category of documents which cannot be taken or used as evidence to those actually dedicated to lawyers.

Reduction of fines applicable to authorities, public administration institutions and start-ups (Art. 50^1 Competition Law, amended and completed)

Until this new regulation, the Competition Council could apply fines only to economic operators, ranging between RON 5.000 and RON 40.000. With the new regulations, the maximum fine is cut down by 50%, and the minimum one, by 20%, which makes that the failure of central and local public authorities to supply the requested information and documents, or the supply of inaccurate or incomplete information be sanctioned with a fine between RON 1.000 and RON 20.000.

At the same time, the fines for start-ups which had no turnover in the year before the sanctioning and for which no percentage from the turnover can be set up as fine, are also cut down by half (in this way, the maximum fine is now of RON 2.5 million).

To conclude, by cutting down fines and taxes, the new regulation could stimulate the competitors to contribute to the clarification of certain cases with anti-competition risk.

However, there are still a series of aspects requiring a rapid treatment, such as those regarding: the drafting of guidelines regarding the calculation of authorization taxes for economic concentrations; the correction of some legislative references such as that to the Fiscal Code; the drafting of Guidelines for the fines application in case of anti-competition deeds, so that to avoid the provisions discretionary application related to the fine threshold reduction; the review of dominant position assumption in the light of European legislation and jurisprudence.

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A Cause and Effect Analysis of University – Business Cooperation for Regional Innovation in Romania

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Abstract. *This paper underlines the main roles of universities in regional innovation systems, as well as the barriers to university – business cooperation for regional innovation. At the same time, the study proposes a qualitative content analysis of Regional Innovation Strategies (RIS) that were drafted for six of the eight Romanian NUT 2 regions, in order to identify the causes of the weak university – business cooperation. Results are then shyntethised in a cause and effect map that can be a useful diagnosis and control tool in regional planning.*

Keywords: regional innovation systems (RIS); university – businesses cooperation; Romanian Regional Innovation Strategies; cause and effect map.

JEL Codes: O3, R5.
REL Codes: 16H, 16J.

1. Introduction

Innovation systems studies, whether national or regional, have emphasized the importance of universities and there is a broad literature that discusses the potential mechanisms through which they might stimulate regional innovation activity. One important transfer channel is the teaching and training of the students, which increases the knowledge of the labor force. This may also strengthen the absorptive capacity of the private sector and lead to improve innovative performance. University research itself might have spillover effects on the regional innovation system and may serve as an "incubator" for knowledge spin-offs. More, the university has a role in facilitating the access to knowledge: scientific publications, seminars, workshops, and informal relationships can also be important ways of a transfer of academic knowledge to the private sector.

The impact of universities on the economic development and innovative potential of regions has been the object of intense scholarly and policy interest in the last years. Uyarra (2008) suggests five models of universities portrayed in the literature, highlighting a different set of roles, influenced by different factors and manifested in multiple mechanisms and scales of engagement. First, universities are considered as producers of scientific knowledge—"knowledge factories", which can have a direct local economic impact. Second, university-industry studies take a "relational" approach, acknowledging a variety of links and processes for knowledge sharing between firms and higher education institutions. More recently, the "entrepreneurial" aspect of universities is encouraged via dedicated organisational arrangements in universities. Fourth, innovation system studies see universities as boundary-spanning institutional "nodes" whose influence will be shaped by the specific regional innovation system in which it is embedded. Finally, universities are further ascribed a "developmental" role in recent regional policy.

However, despite the theoretical and political emphasis on universities' roles in regional innovation studies, there are plenty of examples showing that higher education institutions are a relatively minor source of information and knowledge for creating new products and processes in firms. According to the European Innobarometer on *Strategic trends in innovation* 2006-2008, strategic partnerships to support of innovation exists particularly within the supply chain, with suppliers (42%) or with some specific (presumably large or important) customers or clients (39%). Strategic links with educational (24%) and research organisations (15%) were less frequently reported. Universities and businesses experience significant gaps in their collaboration, whose causes are related to a reciprocal lack of trust, difficulties in accessing resources for innovation,

differences in objectives, organizational cultures, timetables and expectations, lack of appropriate structures and so on.

While presenting the roles of universities in regional innovation systems and the main barriers to university – business cooperation, this paper brings evidence from Romanian region and tries to map the relationships through a cause and effect analysis.

2. Roles of universities in regional innovation systems

Regional innovation systems are just one of the so-called territorial innovation models (TIM) – a generic name for models of regional innovation in which local institutional dynamics play a significant role (Moulaert, Sekia, 2003). From these authors' points of view, at least three traditions can be distinguished within the population of the TIM. *The innovative milieu* and the *industrial district,* both with a strong focus on local institutional endogeneity, can be considered as a first family of TIM. A second tradition is more in line with the broader systems of innovation literature and is related to *regional systems of innovation* and *regional learning economies*. A third tradition stems from the Californian school of economic geography: *the new industrial spaces*. A residual category, with little affinity to regional economics but close to Porter's clusters of innovation, is the *spatial clusters of innovation* (Moulaert, Sekia, 2003). However, according to Arbo and Benneworth (2007), only three of these models have received high political affinity, especially for regional policy managers: regional innovations systems, regional clusters and learning regions, whose definitions are essential to understand the role universities can play.

Advocating the use of narrow and precise definitions of central analytical concepts as tools in empirical studies and as a basis for policy-making, at the European Union level it was decided to resume *regional clusters* to geographical concentrations of interconnected firms and use the concept of *regional innovation systems* to denote clusters plus "supporting" institutions. As a matter of the fact, to constitute a regional innovation system, firms in a regional cluster first have to form *regional innovative networks* involving more organised and formal co-operation between firms in innovation projects. D.L. Constantin (2004) appreciates regional networks are the most complex type of regional clusters, because they integrate all regional ties between companies (especially SMEs), banks, higher education and research institutions, consultancy centres, chambers for industry, producers' associations, local administrators and other social groups. The three definitions are systemised in the Table 1:

Table 1

A hierarchy of three concepts

Concepts	Definitions and differences
Regional cluster	A concentration of "interdependent" firms within the same or adjacent industrial sectors in a small geographical area
Regional innovation network	More organised co-operation (agreement) between firms, stimulated by trust, norms and conventions, which encourages firms' innovation activity
Regional innovation system	Co-operation also between firms and different organizations for knowledge development and diffusion

Source: European Commission, (2002). "Observatory of European SMEs". No. 3, *Regional Clusters in Europe.* Online at: http://ec.europa.eu/enterprise/policies/sme/files/analysis/doc/execsum_2002_en.pdf.

Thus, regional innovation systems consist of (i) firms from the industrial clusters of the region, including their support industries, and (ii) "supporting" knowledge organisations such as universities, colleges, training organisations, R&D institutes, technology transfer agencies, business associations, and finance institutions and (iii) the interaction between these actors. This idea is in line with Cooke's definition of RIS (Cooke, 2001): a region is considered to have a RIS in place when its *knowledge generation subsystem* – universities, research institutes, research associations, industry associations, training agencies, technology transfer organisations, specialist consultancies, government development programmes, etc. – and its *knowledge exploitation subsystem* – the regional industrial structure and its clusters in particular – are systematically engaged in interactive learning through knowledge networks.

From an OECD view point, *regional innovation systems* – in contrast to regional clusters – put knowledge rather than the firm in the centre of the process. More than that, in RIS, shared practices, attitudes, expectations, norms and values facilitate the flow and sharing of tacit and other forms of proprietary knowledge. Policy makers have to assure a continuous flow of ideas facilitating the right linkages that favour an interactive environment (OECD, 2007b).

As Arbo and Benneworth (2007) have emphasized, regional clusters and RIS give higher education institutions and research institutions somewhat different place. In their opinion, even many of the regional policy cluster initiatives have involved HEIs, the perspective is undoubtedly that it is the companies that create value. *Focus is on the companies and their connections*. By contrast, in the theory of RIS, the knowledge institutions are more cleary involved. The emphasis is on knowledge bases, their careers, communication channels and mechanisms for learning and sharing knowledge.

Universities are assumed to accomplish a number of different functions in a regional innovation system. According to Todtling (2006), there are four

important roles for universities in innovation systems and regional economies: „antennas" for adopting external knowledge and mediator for local knowledge circulation, source of highly skilled labour, knowledge providers in university – industry linkages and incubators for academic spin-offs, a relatively new route for commercialisation of academic inventions.

In their turn, Arbo and Benneworth (2007) have identified two waves of regional innovation systems, stressing different roles for universities. In the first one, universities were seen to perform straightforward roles, responding to the demands of key regional actors and identifying useful knowledge for networks of regional producers. It was the case of the *learning region* concept promoted by Morgan (1997), which links lifelong learning with economic and social development. For Moulaert and Sekia (2003), the learning region could be considered as an intermediate synthesis in the debate on the territorial innovation model, with a stronger focus on the role of institutions than the RIS model. However, the learning region concept was critiqued as being excessively simplistic and for failing to acknowledge the reality. In second wave models, universities are seen as bringing in external resources to regions, to create "local buzz" in such places. Cooke and Piccaluga have developed the idea of the *regional knowledge laboratory* (Arbo, Benneworth, 2007). They note that the RIS can be subdivided into two key-elements: the knowledge production sector (universities, research laboratories and commercial research facilities) and knowledge-using sector (high tech firm and commercial development facilities) and that both sectors are articulated within their own global networks of production. That's the reason why these capacities do not just have a territorial significance, but they help to position better within its own global network. As a result, the best regions are those which can produce regional knowledge laboratories with effective connections between local actors, but with global impact.

3. Barriers to university – business cooperation to support regional innovation

In 2009, the European Commission presented a set of measures to develop and strengthen cooperation between universities and businesses, as part of wider efforts to support the modernization of higher education. It was accepted that examples of successful cooperation between the two sides existed throughout Europe and EU programmes have sought to build partnerships between the two domains. However, *the level of cooperation remains very unequal across countries, universities and academic disciplines*. Furthermore, few universities have an institution-wide strategy for cooperation with enterprise; those that do are concentrated in a small number of Member States. In many countries, the legal and financial framework still fails to reward or may

even inhibit the efforts of universities to cooperate with business (*Commission of the European Communities COM(2009)/158 final*).

Effective university – business cooperation is seen as being particularly important for regional development and this theme has attracted growing attention in recent years. Too often, however, the potential for synergy is thwarted by failures of communication between regional stakeholders and higher education institutions, weak or unclear policy signals, and conflicting agendas in institutions. As resulted from an OECD review of HEIs and regions, *universities and regional business experience significant gaps in their collaborative relationships*: first, they may have divergent objectives and priorities, as well as difficulties in identifying partners. Second, universities are not always interested in research topics proposed by firms, whereas firms may favour a more professional approach than the one followed by academia. Third, restrictions on publishing research results may act as a disincentive for HEIs (OECD, 2007a).

Between 2006 and 2007, The German Academic Exchange Service (DAAD, 2006) carried out a project entitled *University-Enterprise Cooperation* at the European level. An online survey with 403 respondents in 34 countries showed there was a need for structures to promote on-going dialogue and better understanding between universities and business. A number of obstacles to cooperation were highlighted by this study. There is a lack of trust between universities and enterprises: they operate with different objectives, different timetables (universities focus on the long term; enterprises on short term results, looking for quick solutions which universities are not always in a position to provide); they have different cultures and expectations. The project produced a number of recommendations for Higher Education Institutions and the European Commission, with a view to further progress with the important dimension of University-Enterprise cooperation as one of the key elements to enhance Europe's competitiveness and contribute to EU policy and activities in this area.

The UK has a substantial amount of published data and research on business and university collaboration. Data from industry surveys in 2004 and 2008 show there remain important barriers to interaction between universities and industry. The barriers that were most important were the long-term orientation of universities as well as the lack of suitable government programmes in specific research areas. In addition, over 55% of the sample cited regulations and rules, imposed by universities and governments, as concerns over confidentiality, intellectual property and the role of the Technology Transfer Offices of the universities. The barriers that were seen to be least important were a low profile of the Technology Transfer Office, finding a suitable partner, strong orientation to basic research and lack of mutual understanding (Table 2).

Table 2

Barriers to interaction with universities, 2004 and 2008

	2004 % responding „agree" or „strongly agree"	2008 % responding „agree" or „strongly agree"
Long term orientation of university research	31.1	65.4
Lack of suitable gov. programmes to support University – Industry interactions	51.9	61.4
Potential conflicts with regards to Intellectual Property Rights	32.4	55.6
Rules and regulations imposed by governments	42.4	52.9
Unrealistic expectations from Technology Transfer Officies	24.0	49.3
University researchers seeking immediate dissemination	22.3	39.8
Lack of information about what university does	27.8	37.4
Difficulty in finding the appropriate partner	19.9	33.5
University oriented towards pure science	22.3	33.4
Mutual lack of understanding about expectations	25.7	33.0
Absence or low profile of Technology Transfer Offices	16.7	28.7
Relevant universities are too far away	7.0	10.0

Source: Bruneel J. et al. (2009).

Considering the current situation and the needs identified, two general policy objectives were established for university – business cooperation at the European level: to improve the relevance of tertiary education for the labour market and to improve Europe's innovation capacity. Universities are asked to provide incentives for structured partnerships with the business community. They should support the identification of those skills that graduates are expected to have when entering the labour market, develop appropriate governance structures, cooperate with companies to identify and provide appropriate training/retraining programmes, support the exchange, sharing and creation of knowledge through increased mobility between universities, research organisations and business (*Commission of the European Communities Staff Working Document SEC (2009)/423*).

4. University – business cooperation for regional innovation in Romania

4.1. The national context

According to the National Innovation Strategy, at the center of innovation support actions is *co-financing pre-competitive research projects initiated by companies, particularly those that involve collaboration with universities and research institutes,* together with actions that support the transfer of research results, creating innovative networks or support for investments in infrastructure.

The Study on Innovation in Industry and Services (2006-2008) published by the Romanian National Institute of Statistics highlights a weak cooperation

between universities and businesses, despite the increased number of innovative companies (one third of the total number of Romanian companies).

Thus, information in support of innovation processes was obtained mainly from own staff (44.6%) and from suppliers of equipment, materials, components and software (33.0%). Institutional sources were less used: sources from universities were used by only 3.9% of innovative companies, while sources from governmental or public research institutions were used by only 3.2%. As regards cooperation, only 13.8% of all innovative firms have cooperative arrangements for carrying out innovation. The main cooperation partners were suppliers (10.5%) and customers or buyers (8.2%). Only 5.1% of innovative companies had cooperation agreements with universities/ higher education institutions and only 3% of them with government institutions or public research institutes (Table 3).

Table 3

Share of companies involved in cooperation, by size and partener type

Cooperation partners	Total	Small enterprises	Medium enterprises	Large companies
All cooperation partners	13,8	11,1	15,1	27,3
Partners from inside the company	4,6	2,8	5,3	14,2
Suppliers	10,5	8,2	11,5	22,3
Clients/ Buyers	8,2	6,6	9,2	16,0
Competitiors	4,8	3,4	5,2	12,3
Consultants	4,4	2,2	6,4	13,5
Universities/ Higher education institutions	5,1	3,5	5,3	14,7
Government institutions/ public research institutes	3,0	1,3	3,8	11,8

Source: Institutul Național de Statistică (2010), "Inovarea în Industrie şi Servicii în perioada 2006-2008". Online at: http://www.insse.ro/cms/rw/pages/comunicate/inov_ind.ro.do**.**

The analysis of regional innovation supply and demand confirms the results of national statistics, as presented in the following part of this study.

4.2. Research question and method

This study proposes a qualitative content analysis of Regional Innovation Strategies (RIS) that were drafted for six of the eight Romanian NUT 2 regions, namely: Bucharest – Ilfov (BI), North-East (NE), North/West (NW), West (W), South – Muntenia (SM) and South-East (SE).

Regional Innovation Strategies were drafted following a SWOT analysis of regional innovation systems. The analysis of innovation supply and demand was carried out using both secondary data analysis (European and national official statistics) and primary data from field studies with innovation actors: companies, researchers, public authorities and so on. The following research

question will be answered by this study: *Which are the* causes *of the weak university – business cooperation for regional innovation in Romania's regions?* The research proposes qualitative inferences and follows the classic framework of qualitative content analysis (Adams et al., 2007): identify the units of analysis (the regions), choose a set of categories (causes of the weak university – business cooperation), coding and assignment of assertions to one of the categories, tabulate, illustrate the results and drawing conclusions. All results were visually captured in a cause and effect map (Annex 1).

4.3. Research results

The Regional Innovation Strategies reveal a weak university – business collaboration for innovation.

Weaknesses in Bucharest – Ilfov region are those related to: *low levels of cooperation between R&D sector and industry, non-correlation between the researches conducted by universities and research institutes and the real needs of SMEs,* as well as *poor protection of intellectual property rights.* To some degree, the situation is somewhat different depending on types of activities: for example, the ICTs and electronics sectors recorded a higher level of collaboration between universities, research centres and companies, especially due to the INFRATECH program.

An insufficient level of collaboration between SMEs and universities/ R&D units is also highlighted in the North East Regional Innovation Strategy: *cooperation with universities and technical colleges has been declared the only cooperative relationship by one in three companies*, but all respondents have reported the intention to begin this process. Collaboration wasn't reported as tights or regular. In spite of this, former collaboration has led to good innovative results, *because most universities and R&D centers are interested in developing such activities.* Regarding the technology transfer from universities and research institutes to businesses in the North West region, one can appreciate the following: *cooperation with businesses is weak, research centers do not receive applications from companies* and *there are a few national or European research and innovation projects that engage companies.* Closer collaboration exists within technical fields such as chemical engineering, petroleum, pharmaceutical industry, machinery and equipment, computers or food industry.

Weak points in collaboration are also reported in the West Region: few partnerships between R&D providers and companies, low capacity to adapt to market condition, a reduced number of young people who remain in universities and research units to work in research – because they prefer other jobs, with higher salaries. Contracts with companies are up to 25% of all contracts undertaken by research centers in the West Region and they bring about 19.65%

of total revenues. Not all the institutes in the region have adapted easily to the market economy. Probably, due to their specific profile, *some institutions remained dependent on government financing and couldn't find business partners interested in their research results*.

In the South Muntenia Region, local SMEs have partnerships with universities or research institutes, but the level of cooperation is very low. This kind of collaboration *is not a priority for regional businesses*, and most of the partnerships are concluded in order to apply for European programs.

The partnership in R&D activities between enterprises and universities/R&D institutions in the South East Region is still at a low level and mainly based on scientific collaborations. The cooperation driven by economic demand is very poor and very few projects are financed by private companies. At the same time, regional disparities are very pregnant, and therefore, there is an unbalanced repartition of investments over the region territory. Galati, Tulcea and Constanta are among the most active counties in research and development. *For businesses, innovation is a rarely used word.*

There is also some evidence from the other two NUT2 regions in Romania. Thus, according to the Central Region's Development Plan for 2007-2013, there was a dramatic decrease in collaboration between technology transfer centres at universities and industry after 1990. Economic transformations in the region, together with the lack of performant institutions in scientific research and technology transfer are the main reasons of the decrease. At the same time, the South West Development Strategy (2007-2013) points out some weak points in cooperation: applied research is limited to large enterprises, research infrastructure is poorly developed and there is a low degree of applicability of universities' research results.

The main causes of weak cooperation between universities and businesses were clustered under four cathegories (services/offer, communication/ marketing, perceptions/ attitudes, resources/ structures) and are detalied below.

■ *SERVICES/ OFFERS: Universities' offer is not in line with market needs.*

The analysis pointed out that one of the main reasons for the low level of cooperation for innovation is the lack of correlation between universities' research objectives and those of businesses. As shown in the South Muntenia RIS, *universities' fundamental research is widely recognized nationally and internationally, while applied research projects are not linked and oriented towards the needs of the regional economy.*

In the North-West Region, there are few services offered by universities, research institutes or development centers to the business community; more than that, the offer has a poor applicability – especially for socio-humanistic field. A greater number of offers is avalilable for technical areas.

Most research units have agreed they could develop a wide range of training courses for enterprises, but only half of them were able to exemplify. When

developing service offerings, universities generally do not collect information from the businesses (due to a lack of communication), but take into account the European market trends or the themes from their own research programs.

As resulted from Bucharest – Ilfov and West RISes, an important obstacle to university – businesses cooperation is the unclear or inappropriate offer of R&D providers. From an organizational point of view, the challenge is to shift emphasis from fundamental research toward applied research or to transfer research results in innovative products and services on the market.

■ *COMMUNICATION/ MARKETING: There is no coherent cooperation strategy for university – businesses relationship and the R&D offer is not adequatly promoted.*

Lack of marketing strategies to promote the R&D offer is another cause of poor cooperation between universities and companies. As regarding the marketing policy, only half of the R&D units in the North-West region consider their activities are known by enterprises, especially through professional articles in scientific publications and through participation in fairs, exhibitions and seminars. There are few visits to companies or other organizations and few promotional brochures, catalogs or audio-visual materials. For external information and communication, the interviewed units widely used journals, databases, conferences and, to a lesser extent, feedback from suppliers, customers and technology centers.

According to Bucharest – Ilfov Regional Innovation Strategy, there are some external restrictions that lead to a less profficient activity for innovation: insufficient information about sources of funding or innovation support infrastructure, asymetric information on providers offering innovation and, to a some degree, limited advertising and communications actions.

The conclusion of the analysis form the North-East Region is very convincing in this respect: *there is a clear lack of accurate and productive channels of cooperation, and, in some cases, a lack of institutional communication.* To these, they add poor managerial skills of researchers. As to the South Muntenia Regional Innovation Strategy, researchers and teachers lack the entrepreneurial culture. Moreover, commercialization of research results is an almost unknown concept for researchers, while the spin-off initiatives are relatively absent in R&D systems.

■ *PERCEPTIONS/ ATTITUDES: Research is perceived as a purely scientific issue and that perception leads to anti-innovation attitudes.*

Another weakness identified in the Regional Innovation Strategies was the entrepreneurs' lack of awareness regarding the benefits of research and innovation, together with a persistence in their lack of interest for innovation.

On the one hand, the findings of the North East Regional Innovation Strategy indicate that research is perceived *as a matter of purely scientific and academic interest,* while innovation is seen as *an expensive activity, without tangible benefits in the short or medium term.* On the other hand, SMEs have not matured

sufficiently a clear vision on the role of universities and R&D centres, whose potential is not sufficiently known and, sometimes, is underestimated.

The South Muntenia study highlights the lack of business awareness of the benefits resulting from the RDI. *In most case,s innovation is essentially equated with product and process innovation. Innovation itself is considered to be an expensive activity, without tangible benefits on the short and medium term*. Innovation culture is in its early development phase for regional companies. Thus, the vast majority of entrepreneurs do not consider innovation as one of the important factors for business success and are reluctant to undertake innovative activities. They often prefer to use "ready-made" solutions and to purchase equipment, technologies, software, etc., rather than to fund internal or external research. Developing cooperation with the SMEs has been reported to be low and difficult; researchers complain because of entrepreneurs anti-innovation attitudes and their low interest for cooperation.

To these, one can add the lack of an innovation culture, low awareness of innovation benefits in order to become competitive (North-West RIS), the lack of motivation for the R&D activities, and, consequently, low investments in research and innovation (West RIS). According to Bucharest Ilfov analysis, business representatives believe *problems can be solved internally because the external solutions are very expensive*. In addition, they prefer short-term profits in detrriment of long-term development strategies. Finally, according to the South East analysis, most of the companies have difficulties in defining innovation as concept. For some of the organisations, innovation means research, for others technological transfer or new ideas, products and processes: *for businesses, innovation is a rarely used word.*

■ *RESOURCES/ STRUCTURES: Limitied financial and logistical resources. Inefficiency/lack of regional support structures.*

As regarding universities, the North East study shows that there are no modern equipments for R&D activities nor in universities, not in R&D units. The North-West RIS highlights the inadequancy of equipments and facilities, a lack of specialized staff, low level of access to international databases, laboratories that do not comply with European regulations etc. As mentioned by West Regional Innovation Strategy, a small number of young people remain in universities and research units because they choose better-paid jobs. The interim analysis of West RIS has revealed a very important detail, namely that there is a risk of increasing dependence of public funding in detriment of resouces from enterprises.

From a business point of view, lack of adequate resources is mentioned as follow: entrepreneurs have a weak co-financing capacity and have difficulties in finding qualified staff to use of technologies and/ or innovative materials (Bucharest – Ilfov study). Some of the main threats commonly found in the R&D analysis are the lack of access to sources of funding or the lack of

competitiveness of the projects submitted in this regard (West RIS), as well as the lack of financial resources to be allocated to activities with long-term profits etc.

All Regional Innovation Strategies highlight the inefficiency/absence of intermediary support structures for innovation. On the one hand, there are no interface structures within universities (eg. technology transfer offices, departments for corporate relationship, industry liaison offices). On the other hand, the interface structures within companies, if any, are poorly developed.

Creation of an integrated regional innovation support structure is the solution that transcends all RIS studies. Acestea pot fi una dintre soluțiile care să ajute la relansarea sectorului IMM din România, afectat profund de criza financiară. According to a survey conducted in 2010 by CNIPMMR in the eight regions, half of SMEs claimed to be severely (25.49%) or very severely (23.53%) affected by the current economic context (Visinescu, Micuda, 2011). The West RIS mentions it's necessary to establish a Regional center for technology transfer, in which to know about both sides, to readily identify potential customers and to attract research funds. The South Muntenia RIS proposes the establishment of *information circles*, where leaders of innovation in the region, persons from academia and companies' representatives can meet and creat collaborative innovation groups. The North West RIS mentioned as being necessary to establish a Regional institute of technology transfer and to create databases for regional supply and demand innovation activities. The North-East RIS proposes the creation of spaces for knowledge transfer within the universities and research centers, with special attention to creating new companies based on new technologies.

The establishment of these centers will activate the strengths of the educational and research system in Romania: the existence of well known research centers (Bucharest IlfovI) or of business incubators and science parks (South-East), closely related to the predominant industries in the region (South Muntenia), the technical expertise of universities (North-West), their research potential (West). To these one cad add the training potential for future research specialists and the potential to provide quality business services (North-West), together with researchers' commitment and interest to have R&D activities (North-East).

Conclusions

Results of the previous research were shyntesised in a causal map.

A causal map can be a useful tool for both practitioners and researchers in many ways, as a diagnosis, communication, risk mitigation and control tool (Adams et al., 2007). A causal map is a network diagram representing causes and effects; it contains two basic elements: concepts which are the nodes in the network and causal relationships which are represented by the arcs between the nodes (Scavarda et al. 2004). "Cause and Effect" diagrams are frequently used

in quality management to illustrate how factors may contribute to a target effect, and help to order these into broad categories.

The cause and effect diagram presents many advantages. First, it provides a representation that facilitates a simultaneous viewing of areas for intervention. Secondly, the map dissociates the causes and effects and thus can become a useful tool in the diagnosis and control of regional planning. Finally, the great advantage of this map is that it presents the logical sequence of interventions that are appropriate to achieve the desired effect: stimulating cooperation between universities and businesses.

As the map illustrates, the first intervention is required to be done on resources/structures. Opportunities related to the EU policies that support R & D or the possibility to access structural funds during 2008-2013 can provide solutions to the lack of resources for innovation. At the same time, they can give impetus to the creation of liaison structures, without which there can be no coherent and sustainable cooperative relations.

As it can be seen, the absence of these structures creates other causal relationships. For universities, the lack of liaison offices makes their offer to be unclear, inappropriate or with poor applicability. At the same time, companies are required to appoint liaison officers, boundary agents or technological agents, whose role is to take new information from external sources, decode it, disseminate the results internally and use it in innovation processes.

Finally, as illustrated in RIS studies, the establishment of regional structures that support effective innovation is a sine-qua-non condition for the creation of a regional innovation systems. Otherwise, as happens now, the lack of a formal framework for interaction leads to the persistence of anti-innovation attitudes amond business representatives.

The creation of support structures could also solve the deficiencies related to communication and marketing activities. Liaison offices have to draw coherent cooperation strategies, foster the dialogue to identify real needs, disseminate the research results etc. In the absence of a structured dialogue, universities' offer for businesses becomes uncopetitive and won't attract companies' attention. A vicious circle is thus created: in the absence of demand, universities and research centres are not stimulated to improve their offer and this situation creates an attitude of distrust from the part of the businesses.

Changing perceptions towards research and the anti-innovation attitudes is probably the most difficult, but also the most important task in fostering dialogue between universities and businesses. As noted above, universities should prove their reasearch's utility and change Romanian entrepreneurs' visions about the importance of innovation. If a sense of mutual distrust persists, then "forcing" university – businesses interactions will only serve to stimulate opportunism in accessing funds and not the promotion of sustainable innovation.

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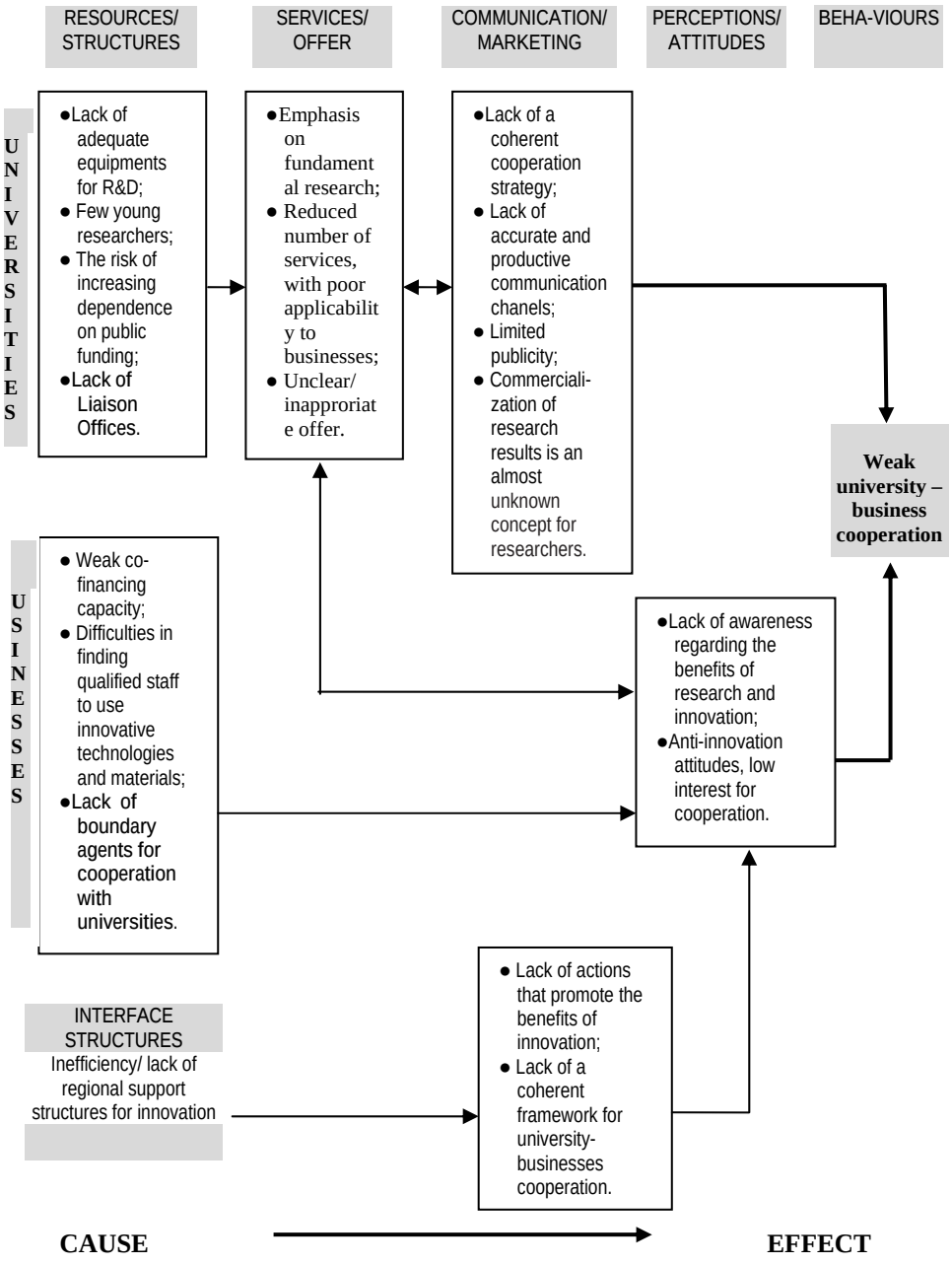
Annex 1

A cause and effect map of university – business cooperation for regional innovation



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Moldavia and Maramureş – Micro-destinations for Relaunching the Romanian Tourism*

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Abstract. *Since Romania holds a rich tourism heritage and a great tourism potential, the tourism division into zones was drawn up as "a possibility toward a superior and complex development of the tourism resources, in a unified vision…" (Erdeli, Gheorghilaş, 2006, p. 264), this representing a permanent concern of the specialists from all fields that are related to the tourism management. Although the criteria for selection and ranking of the tourist attractions have been the subject of some controversies, regarding the types of tourism that can be practiced in these areas, there were arrived almost unanimous conclusions. In order to ensure the representativeness and considering that all historical regions of the contemporary Romania are to the same extent micro-destinations with a substantial "tourism heritage", the regions of Moldavia (including Bukovina) and Maramureş were merged into one for the elaboration of the research that presents, in essence, the main types of tourism and a part of the treasury of Romanian age-old heritage.*

Keywords: tourism destination; tourism micro-destination; destination image; regional tourism brand; type of tourism; destination marketing.

JEL Code: M31.
REL Codes: 14F, 14G.

* The paper is part of a research presented in detail in No. 2(555)/2011.

Introduction

The tourism micro-destination of Moldavia is situated in North-Eastern Romania and covers two historical regions, namely: Moldavia and Bukovina. From the beginning it should be mentioned that nowadays the historical region of Bukovina stretches out on the territory of two countries: Romania (the adjacent area of the cities Rădăuți, Suceava, Gura Humorului, Câmpulung Moldovenesc, Vatra Dornei, Siret and Vicovu de Sus) and Ukraine (Chernivtsi, Cozmeni, Zastavna, Vashkivtsi, Vyzhnytsia, Sadhora and Storozhynets). Regarding the administrative-territorial division, the tourism micro-destination of Moldavia includes on the territory of the modern Romania the following counties: Galați, Vrancea, Bacău, Vaslui, Neamț, Iaşi, Suceava and Botoşani. The most important cities of this historical region are: Bacău, Bârlad, Botoşani, Dorohoi, Focşani, Galați, Huşi, Iași, Paşcani, Piatra Neamț, Roman, Suceava, Târgu Frumos and Vaslui.

The North of Moldavia hosts important ecclesiastic monuments of feudal art, the most of them were built by the former Moldavian rulers (voivodes) and boyars (Muşat family, Alexander the Good/Alexandru cel Bun, Stephen the Great/Ştefan cel Mare, Peter IV Rareş/Petru Rareş, Alexandru Lăpuşneanu, etc.): Voroneț Monastery, Humor Monastery, Sucevița Monastery, Putna Monastery, Arbore Monastery, Dragomirna Monastery, Pătrăuți Monastery, Probota Monastery, etc., all of them being real evidences of the continuity of the ancient faith. This tourism micro-destination also hosts many memorial houses of some personalities such as: Ion Creangă (Iaşi), Mihai Eminescu (Ipoteşti), Vasile Alecsandri (Mirceşti), George Enescu (Liveni), Nicolae Labiş (Mălini), Ciprian Porumbescu (Stupca). Along with the religious tourism, the recreation and the cure are sporadically practiced, in the suburban areas (entertainment) and in the areas with mineral water (medical spa activities), a widespread form of tourism being represented by the transit tourism practiced by many external tourists coming from the Republic of Moldova and Ukraine (Cocean, 2010: p. 225).

Similar to the historical region of Bukovina, the historical region of Maramureş covers nowadays the territory of the two countries: Romania (the North-Eastern part of the county of Maramureş) and Ukraine (the East of the region of Transcarpatia, covering the districts: Rakhiv, Solotvyno, Tiachiv and Khust). On the territory of the modern Romania, in terms of administrative-territorial division, the tourism micro-destination of Maramureş comprises the two counties: Satu Mare and Maramureş. The most important cities are: Baia Mare, Borşa, Satu Mare, Sighetu Marmației, Vişeu de Sus.

The tourism micro-destination of Maramureş is famous not only for its spectacular and charming landscape it offers to the tourists, but also for the customs and traditions that endured over the years and for the wooden churches, remarkable examples of Orthodox architecture, eight of them were included in the list of UNESCO World Heritage in 1999. The Merry Cemetery situated in the village of Săpânța represents a popular tourist attraction. It became famous due to the colorful painted crosses of the graves and due to the epitaphs written on them.

In the following, the historical regions of Moldavia (including Bukovina) and Maramureş will be presented exclusively from the perspective of the Romanian territory.

Operational framework

The research conducted in October – December 2010 – January 2011 on a sample of 1,887 young people aged 20-24 years, with ongoing studies, aimed to identify the extent to which the perceptions of the residents coming from different Romanian regions related to the tourism micro-destinations of Moldavia and Maramureş helps in the development of the identity within the elaboration process of the destination marketing strategy.

According to the classification of the types of tourism proposed by the World Tourism Organization (WTO/UNO) in 1979, which takes into account the reasons guiding the choice of tourism destination (business and professional tourism, medical spa tourism, cultural tourism, leisure tourism, visiting friends and relatives and other types of tourism), the respondents could choose the main type of tourism practiced within the historical regions of Moldavia and Maramureş.

Regarding the distribution of the types of tourism for the two micro-destinations, the results are as follows: 61.2% of the respondents considered the *cultural tourism* as being representative for the two regions, 30.3% opted for *leisure tourism*, 3.6% chose *medical spa tourism*, 3.0% opted for *visiting friends and relatives*, 1.6% chose *other types of tourism*, while 0.3% of the respondents opted for *business and professional tourism* (Figure 1).

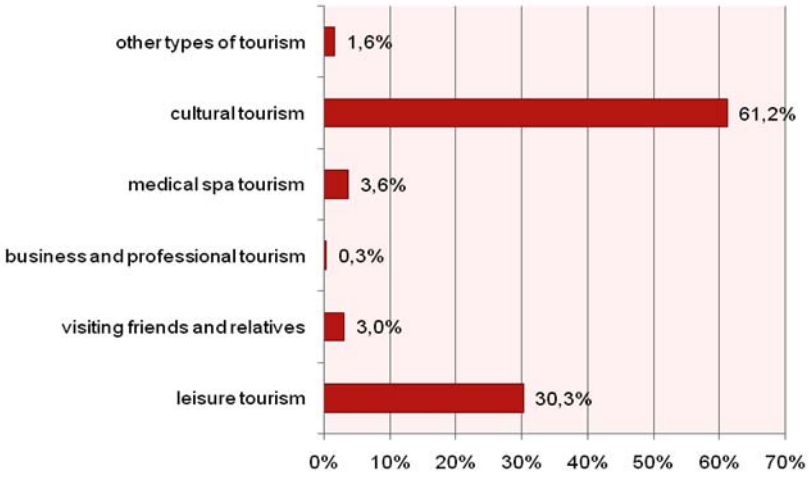

Figure 1. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş*

Taking into consideration the regions of origin of the respondents, it can be noticed that the *cultural tourism* constantly holds the first position as predominant type of tourism for the two historical regions and it is frequently followed by the *leisure tourism*. The last place was occupied in general by the business and professional tourism. An exception occurs in the case of the respondents with Muntenia as region of origin, situation in which the last place belongs to other types of tourism. Regarding the established regional structure, the situation is as follows (Table 1):

1) Muntenia as region of origin (Figure 2):
   - 63.5% of the respondents chose *cultural tourism* as representative type of tourism for the historical regions of Moldavia and Maramureş;
   - 28.9% opted for *leisure tourism*;
   - 3.9% chose medical spa tourism;
   - 3.1% opted for visiting friends and relatives;
   - 0.4% chose business and professional tourism;
   - 0.2% of the respondents – other types of tourism.

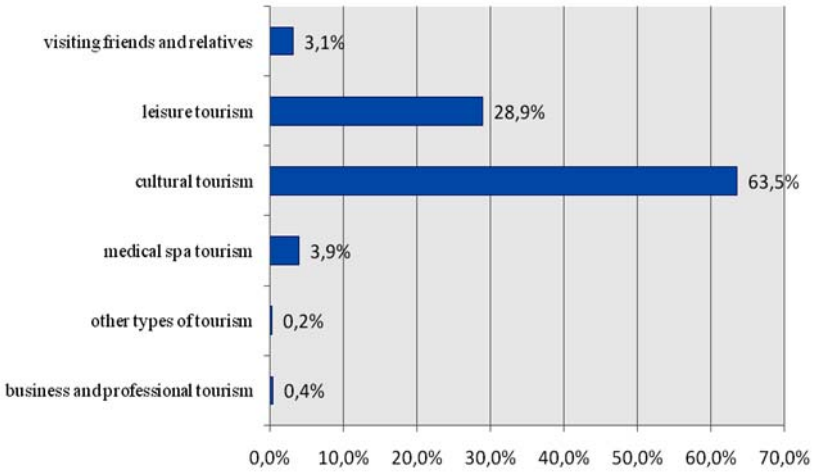

Figure 2. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Region of origin of the respondents: Muntenia*

2) Oltenia as region of origin (Figure 3):
   - 62.9% of the respondents chose *cultural tourism* as representative type of tourism for the historical regions of Moldavia and Maramureş;
   - 30.1% opted for *leisure tourism*;
   - 3.5% chose medical spa tourism;
   - 1.8% opted for other types of tourism;
   - 1.3% chose visiting friends and relatives;
   - 0.4% of the respondents opted for business and professional tourism.

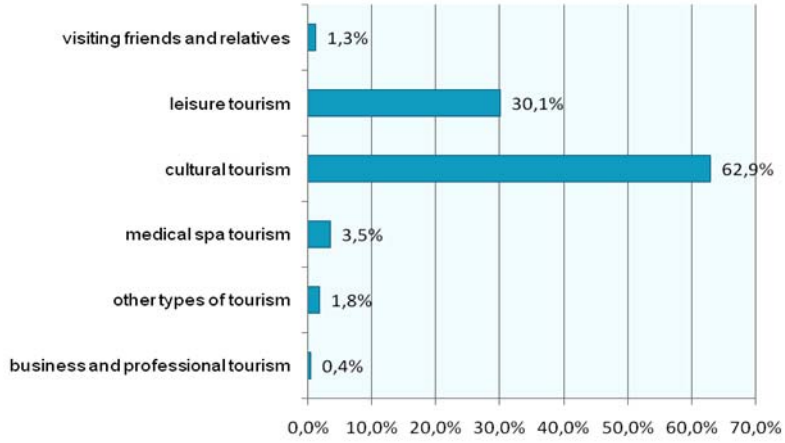

Figure 3. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Region of origin of the respondents: Oltenia*

3) Banat-Crişana as region of origin (Figure 4):
   - 48.3% of the respondents chose *cultural tourism* as representative type of tourism for the historical regions of Moldavia and Maramureş;
   - 29.2% opted for *leisure tourism*;
   - 12.4% chose medical spa tourism;
   - 5.6% opted for other types of tourism;
   - 3.4% chose visiting friends and relatives;
   - 1.1% of the respondents opted for business and professional tourism.

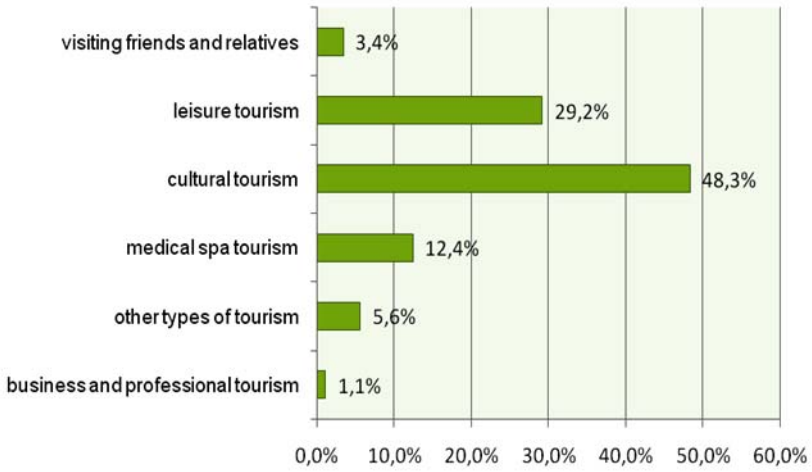

Figure 4. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Region of origin of the respondents: Banat-Crişana*

4) Transylvania as region of origin (Figure 5):
   - 53.6% of the respondents chose *cultural tourism* as representative type of tourism for the historical regions of Moldavia and Maramureş;
   - 38.4% opted for *leisure tourism*;
   - 4.2% chose medical spa tourism;
   - 2.1% opted for visiting friends and relatives;
   - 1.3% chose other types of tourism;
   - 0.4% of the respondents opted for business and professional tourism.

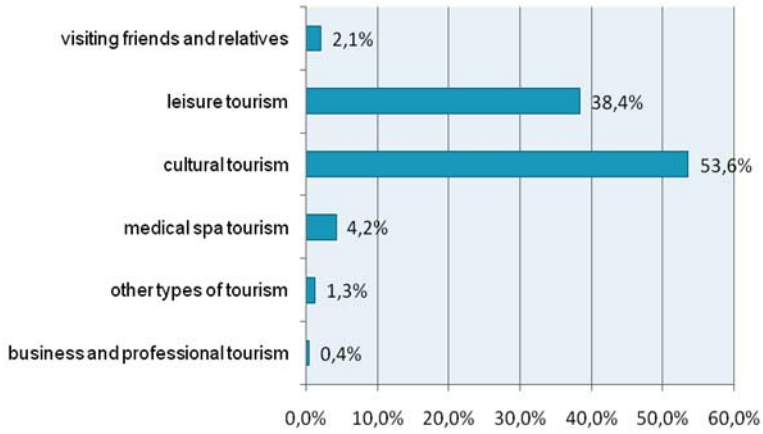

Figure 5. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Region of origin of the respondents: Transylvania*

5) Bucovina as region of origin (Figure 6):
   - 59.4% of the respondents chose *cultural tourism* as representative type of tourism for the historical regions of Moldavia and Maramureş;
   - 30.8% opted for *leisure tourism*;
   - 3.8% chose medical spa tourism;
   - 3.0% opted for other types of tourism;
   - 2.2% chose visiting friends and relatives;
   - 0.8% of the respondents opted for business and professional tourism.

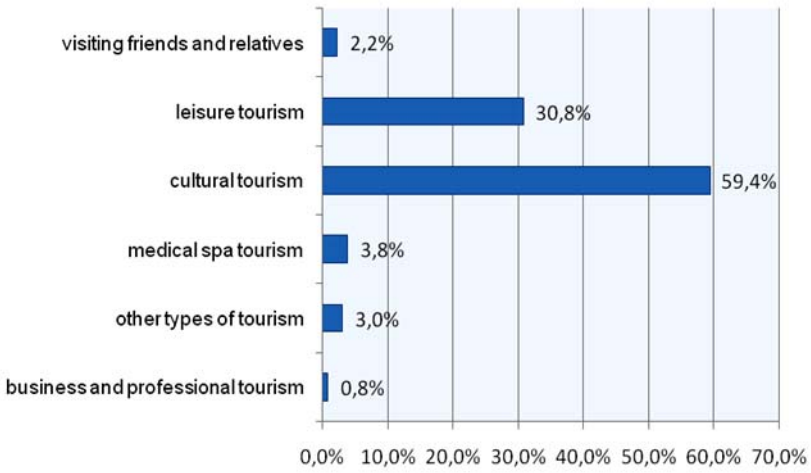

Figure 6. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Region of origin of the respondents: Bucovina*

6) Moldavia and Maramureş as regions of origin (Figure 7):
   - 52.5% of the respondents chose *cultural tourism* as representative type of tourism for their regions;
   - 37.8% opted for *leisure tourism*;
   - 5.5% chose medical spa tourism;
   - 2.3% opted for visiting friends and relatives;
   - 1.4% chose other types of tourism;
   - 0.5% of the respondents opted for business and professional tourism.

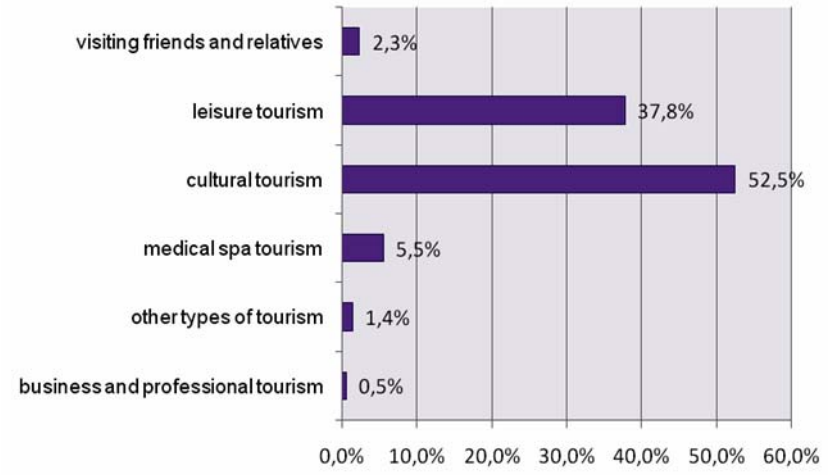

Figure 7. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Regions of origin of the respondents: Moldavia and Maramureş*

7) Dobrogea as region of origin (Figure 8):
   - 65.0% of the respondents chose *cultural tourism* as representative type of tourism for the historical regions of Moldavia and Maramureş;
   - 20.6% opted for *leisure tourism*;
   - 6.9% chose medical spa tourism;
   - 4.4% opted for other types of tourism;
   - 2.5% chose visiting friends and relatives;
   - 0.6% of the respondents opted for business and professional tourism.

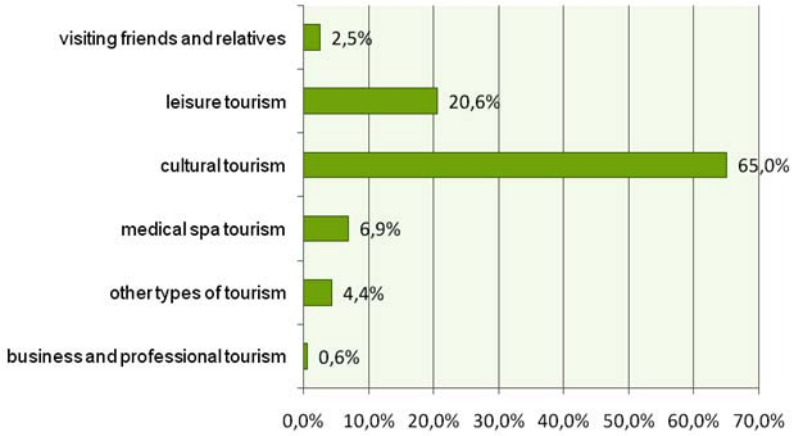

Figure 8. *The distribution of the types of tourism for the micro-destinations of Moldavia and Maramureş. Regions of origin of the respondents: Dobrogea*

Table 1

The distribution of the responses by types of tourism and by region of origin of the respondents (%)

Types of tourism / Region of origin of the respondents	Business and profes-sional tourism	Other types of tourism	Medical spa tourism	Cultural tourism	Leisure tourism	Visiting friends and relatives
Muntenia	0.4	0.2	3.9	63.5	28.9	3.1
Oltenia	0.4	1.8	3.5	62.9	30.1	1.3
Banat – Crişana	1.1	5.6	12.4	48.3	29.2	3.4
Transylvania	0.4	1.3	4.2	53.6	38.4	2.1
Bucovina	0.8	3.0	3.8	59.4	30.8	2.2
Moldavia and Maramureş	0.5	1.4	5.5	52.5	37.8	2.3
Dobrogea	0.6	4.4	6.9	65.0	20.6	2.5

The choice of the respondents for the *cultural tourism* as representative type of tourism for the tourism micro-destinations of Moldavia and Maramureş can be explained mainly due to the fact that the two historical regions are well-known as places of pilgrimage, so destined for practicing the religious tourism. The tourism micro-destination of Maramureş is famous for the wooden churches, while the tourism micro-destination of Moldavia hosts many monasteries founded by Moldavian voivodes and boyars, some of them having one specific color: Voroneț Monastery (blue), Humor Monastery (red), Sucevița Monastery (green), Moldovița Monastery (yellow), Arbore Monastery (combination of colors).

The references made by respondents to the natural and anthropic tourism resources of the tourism micro-destinations of Moldavia and Maramureş are illustrated by order of relevance in Figure 9.

A. NATURAL POTENTIAL	% of respondents
topography: the Moldavian Plateau, the Moldavian Plain, the Moldavian Subcarpathians, the Suceava Plateau, the Central Moldavian Plateau, the Bârlad Plateau, the Carpathians of Maramureş and Bukovina, the Bârgău Mountains, the Gutâi Mountains, the Maramureş Mountains, the Oaş Mountains, Obcina Feredeu/ the Feredeu Ridge, Obcina Mare/the Great Ridge, the Rodna Mountains, the Ţibleş Mountains, etc.	3.3
climate/climatic elements: mountain air, hard/severe winters, crivăț (north-easterly wind).	0.7
hidrography: Prut River, Siret River, Tisza River, Iza River, Vişeu River, Cailor Waterfall/Horses' Waterfall, etc.	1.0
flora and fauna: Maramureş Mountains Nature Park, Creasta Cocoşului Geological Reserve.	0.4

B. ANTHROPIC POTENTIAL	% of respondents
historical traces and art monuments: Neamț Citadel, Princely Citadel (Suceava), "A.I. Cuza" Memorial Palace (Ruginoasa), the statue of Stephen the Great/Ştefan cel Mare (Iaşi), etc.	2.8
elements of ethnography and folklore: folk music, folk costumes, folk dances, gastronomy, customs and traditions, pottery, weaving, egg decorating, etc.	16.4
museums and memorial houses: the memorial house "Ion Creangă" (Humuleşti), Bojdeuca "Ion Creangă", the memorial house "Mihai Eminescu" (Ipoteşti), the memorial house "George Enescu" (Liveni), the memorial house "Ciprian Porumbescu" (Stupca), the memorial house "Mihail Sadoveanu" (Vânători Neamț and Iaşi), the Palace of Culture (Iaşi), "Mihai Eminescu" Museum, the History Museum (Suceava), etc.	6.4
cultural-artistic institutions: wooden churches, Putna Monastery, Moldovița Monastery, Dragomirna Monastery, Church of the Three Hierarchs (Biserica Trei Ierarhi), Sucevița Monastery, Humor Monastery, Arbore Monastery, Bârsana Monastery, Văratec Monastery, Golia Monastery, Metropolis of Moldavia and Bukovina, Galata Monastery, Cetățuia Monastery, the National Theatre "Vasile Alecsandri" (Iaşi), the Philharmonic (Iaşi), etc.	34.5
events: the Snow Festival (Borşa), the Daffodils' Festival (Repedea), Vişeu Days (Vişeu de Sus), Sânziene, Cavnic Days (Cavnic), International Wedding Festival (Vadu Izei), etc.	2.9
contemporary constructions: the Merry Cemetery, Botanical Garden (Iaşi), the Copou Park (Iaşi), "A.I. Cuza" University of Iaşi, etc.	12.5
human settlements: Iaşi, Galați, Suceava, Botoşani, Baia Mare, Satu Mare, Bacău, Vaslui, Piatra-Neamț, Vatra Dornei, Bârlad, Fălticeni, Rădăuți, Paşcani, Târgu Frumos, Huşi, Roman, Seini, Sighetu-Marmației, Slănic Moldova, Borşa, Baia Sprie, etc.	9.3

C. MISCELLANEOUS	% of respondents
personalities: Stephen the Great/Ştefan cel Mare, Alexandru Ioan Cuza, Ion Creangă, Mihai Eminescu, Vasile Alecsandri, Mihail Sadoveanu, Nadia Comăneci.	2.2
other elements/aspects: the first university, the gates from Maramureş, "Voroneț blue", narrow-gauge train, etc.	7.6

Source: adapted after Minciu, R. (2001). *Economia turismului*, Editura Uranus, Bucureşti, p. 161.

Figure 9. *Structure of the tourism potential of the regions Moldavia and Maramureş*

Conclusions

From the conducted research it can be concluded that the *cultural tourism* is the representative type of tourism for the regions of Moldavia and Maramureş, the two tourism micro-destinations being intensely promoted not only as places of pilgrimage, but also as Romanian areas where the customs and traditions remained alive, intact, despite the passage of time.

In comparison with other Romanian historical regions, the historical region of Moldavia is considered to be the poorest in tourism resorts, aspect that should be "[...] taken into consideration in any strategy for tourism development, especially since, in perspective, the tourism flows from Eastern Europe will intensify" (processed after Cocean, 2010, p. 225).

For an accurate assessment of the tourism micro-destinations of Moldavia and Maramureş, similar researches should be conducted for other categories of population, of different ages and with different level of education.

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Corporate Social Responsibility – between Desideratum and Reality

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Abstract. *The corporate social responsibility is a desideratum of the world and it is an important premise of the business environment. The objectives of this presentation are: conceptual understanding, the identification of the advantages generated by the social responsibility for the company and for the society as a whole, the determination of the correlation between the enterprise's efforts and the obtained effects, the pointing out of the necessity of setting up of the corporate social responsibility on ethical criteria. As a corollary, one can appreciate that the corporate social responsibility is a source of competitive advantage and a strategic intercession.*

Keywords: corporate social responsibility; business ethics; innovation; sustainability; competitive advantage.

JEL Codes: A10, F02, M14.
REL Codes: 7G, 18G.

1. Introduction

Corporate social responsibility [(1)] became starting with the year 2000 one of the hot topics in the field of business. Concept that refers to the contribution that the companies have to the development of the modern society, the "responsible" initiative was theorized the thinking trends, and it was promoted through a great diversity of terms: corporate citizenship, corporate philanthropy, corporate societal marketing, community affairs, community development etc. The supporting and the obeying of the fundamental human rights, the right to free association, the elimination of all the forms of forced labour, the fight against corruption, the promoting of responsibility towards the environment are just a few of the principles aimed by the CSR. We can say that corporative social responsibility is a way of durable development through which the companies chose to treat the environment problems and the social ones as integral parts of the business operations.

The corporations as well as the mass media accepted the fact that in the relationships between the companies and the community social responsibility has advantages for both sides. On the one hand, it generates profit for the companies and, on the other hand, CSR gives support to the groups or the communities that need help, and it participates to the local development.

It appeared right after the Second World War as a new tendency in the post-war society, corporate social responsibility is nowadays a widely used concept, a desideratum for any company that wants to advance economically and socially in a competitive context that is extremely aggressive. Well known personalities from the field of strategic management and marketing (Friedman, Porter, Kotler), teachers and researchers, mass media and even the managers of the companies that had over time remarkable contributions to the shaping of the concept of CSR phenomenon so that today recent studies and surveys show the fact that social responsibility is a desideratum of the vast majority of the companies. The large volume of papers and articles on this theme (several dozens of million references that appear in seconds from the mere Internet access) confirm the interest shown by the managers and the scientific world for this subject.

More than never, on the international level there are important preoccupations for the insurance of equilibrium between morals and the personal interest of the companies. The economic growth of a company does not mean only the obtaining of profit but also its reinvestment. In any business, we need financial capital and assets and human resources and, in the last couple of years, a social capital formed by reputation and trust. The strategic approach of CSR is a condition of obtaining business success. Still vulnerable for some

specialists that claim that CSR generates cost too high in social investments without visible effects, this concept must be understood and promoted through the prism of the long term benefits, without minimizing its strategic role.

Communication is an important element of CSR that ensures the transparency towards the interested groups. The promoted social programs should not be watched exclusively from the perspective of the PR and marketing benefits that they have. In establishing the CSR strategy the companies should start from the community's real needs and then to define objectives that can be measured and that are honest.

In the author's opinion the conclusion from the social perspective and from the economic one is that CSR, through the forms and strategic policies it adopts, is a game with a positive sum. From this strategic intercession, the initiators and the beneficiaries of the programs win, when they are conceived and unrolled in a responsible manner.

2. Some considerations regarding corporate social responsibility

The literature of this field and the practical experience of the last two decades show the fact that in the context of the globalisation and the regionalization of the economies, of the growth of interdependence between the states or the segmentation of the markets, the development of the economic entities (may it be small and middle-sized enterprises, multinational or transnational corporations) only on the criterion of rentability and on the sales volume it becomes limited, sometimes even impossible. A notion that is already well-known to an international level, corporate social responsibility(2) became a reality present for Romania too, being a concept that is in full evolution and an important premise for the business world. Although there is not yet a standard, universally accepted definition, RSC is, in the opinion of many specialists, the way to success and performance, one that is more complex and viable compared to the classical vision of the industrial capitalism or of the tertialization of the economy, as exclusive chances of economic growth.

The implication in the life of the community became necessary for any company that wants to have not only commercial success, but also the respect of the community where and for which it operates. Michael E. Porter, first rang authority in the field of competitive startegy, says in one of his articles that "social responsibility became a priority that is impossible to avoid by the business leaders of any country and any field" (3). Many studies made in the last decade emphasise the importance of the corporatist behaviour that is responsible and durable, this being perceived generally as representing a way through which an entity integrates the social, enviromnet and economical

preoccupations to its own cultural values, in the taking of decisions, in establishing strategies and activities in a transparent and responsable manner. Thus CSR represents a way of establishing exemplary practises of creating, of wealth and improvement of the qualitative and sustenable level of the society.

2.1. The defining of the concept of corporate social responsibility

World Business Council for Sustainable Development describes corporate social responsibility as representing the contribution brought by the organisation to the economical development on durable criteria, being based on the obeying of the rules and legislations, "the engamement of the business environments to contribute to the durable economical development working together with the employees, with their families, the local community and society as a whole to improve their life quality". No matter how it is called, the enterprises' ethics, corporatist social conscience, durability, triple account, corporatist philanthropy, "corporate citizenship", communitary business, corporative social responsibility is a concept that refers to the contribution that any company has to have to the development of modern society. Corporative social responsibility can be perceived as based on the personal social responsibility, on the care and the availability of each individual to build his existence in a strong correlation with the environment, in the context of finding one self in the values promoted by the companies.

The European Commision, a forum with constant interest in this field, defines corporative social responsibility as being a phenomenon through which the companies decide in a voluntary manner to contribute to a better society and a clean environment. According to the definition given by the European Commision in order to be social respected a company must integrate in its actions and strategies the social and environment problems that are related to the interactions in which it is involved. From here it results that two are the *distinctive traits* of a corporative responsibility programme. First of all CSR has a voluntary character, implying moral responsibility assumed by the companies, above the ones imposed by the law. Then CSR means the creation of relationships on long term and equally profitable with the market and social environment, so more than the simple act of philanthropy or donation. Although it implies costs, CSR is a profitable management strategy because it generates long term credibility and trust that are necessary to a company in the relationships with the ones that it depends on, respectively the shareholders, business partners, clients. The European intercession of CSR permits the operationalisation of the notion of durable development between companies. In a practical sense, the term of societal responsibility is associated to the concept

of "triple-bottom-line": economical prosperity, respecting the environment, respecting and improving social solidarity. Thus the development of the company is represented through the emphasis of the following objectives: an economical one (creating wealth for everyone, based on the production and durable input modalities), an ecological one (resources preservation and management) and a third, social one (equity and the participation of all social groups) as one can see in Figure 1.

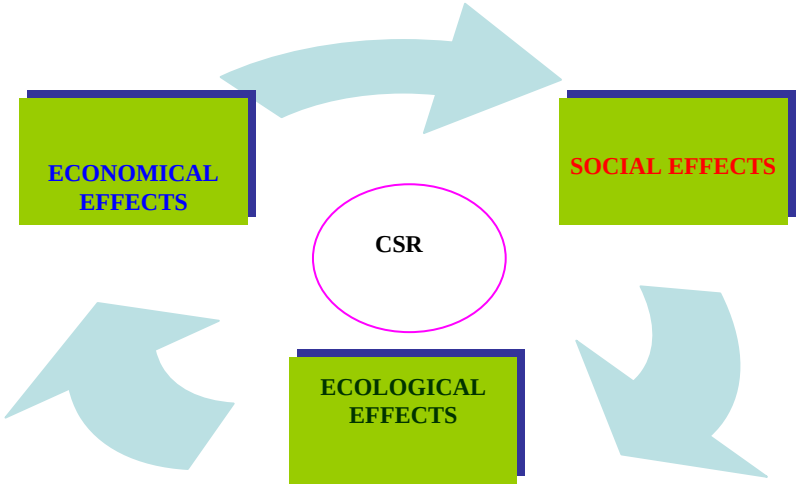

Figure 1. *The impact of corporative social responsibility on society*

The CSR practice is exposed to big debates and critics, idea that is supported by the large number of books, papers, articles, comments that are presently made on this theme.

The importance and the relevance of this global concept are argued by the effort made by the experts and the observers from 99 countries that are members ISO and 42 institutions and private organisations that worked together for the elaboration of a "new paradigm", respectively the ISO 26000 Standard regarding Social Responsibility. This initiative comes to support all the companies in the "making of economical benefits on a long term, with low social costs and having minimum harmful effects on the environment" [(4)].

2.1. The content and the role of the corporative social responsibility

The phenomenom of social assumation of responsibility was supported since January 1999, at the Worldwide Economical Forum from Davos, when Koffi Annan emphasised in his speech the force of the collective action, through the Global Compact initiative, that promotes the growth of the role of

the corporatist citizenship responsabile through ten universal principles from the field of human rights, work standards, environment protection, anticorruption. UN Global Compact wants the companies to embrace, support and adopt, in their influence sphere, this set of fundamental values:

Universal Human Rights:

P1. The business sector has to support and respect the universal human rights that are proclaimed at an international level;

P2. The business sector has to make sure that it is not an accomplice to abuses in the field of universal human rights.

Work standards:

P3. The business sector has to support the freedom of association and actual recognition of the rights to collective negociation;

P4. The business sector has to eliminate all the forms of forced and compulsory labour;

P5. The business sector has to eliminate the work of the infants;

P6. The business sector has to eliminate the discriminations in the field of hiring and occupying the work force.

Environment protection

P7. The business sector has to support the application of the caution principle in the environment problems;

P8. The business sector has to take actions that promote the growth of the responsibility towards the environment;

P9. The business sector has to encourage the development and the dissemination of clean technologies;

P10. The business sector has to combat corruption in all its forms, including the giving and taking of bribe.

Corporative social responsibility is thus perceived as being a commitment through which any economical entity, no matter its size, assumes in a "standard" manner the care for:

1. the protection of the environment and the durable develoment of the society in the interest of future generations, through the preservation of the resources, the assurance of health and security of the population, the diminishing of the disparity regarding the rights between the sexes, the elimination of child exploatation, the diminishing of poverty and the growth of the degree of population training;

2. the development of the relationships with the employees through the creation of civilised work conditions, the taking of some measures regarding employees' health and security, giving of stimulents for personal and professional motivation of the employees;

3. the promoting of an honest attitude in relation to the business partners from upstream and downstream, respectively the contractors and the clients;

4. taking transparent directions of action regarding the company's activity towards its employees, consummers, community and administration.

5. the involvement in the community's life through actual participation, development and investments with precise destinations in this sense;

6. the insurance of human rights, including the fundamental right to work and social integration;

7. the compliance of the native population and the implication in the improvement of the quality of life;

8. the application of anticorruption measures etc.

It is implied that any corporation that is socially responsabile is interested in having a profitable activity, but this has to be evaluated simultaneously with the making of an analysis regarding the positive and negative effects that are created from a *social*, *economic and environment* point of view on the society as a whole. Corporative social responsibility refers to the way in which business has an impact on one's own capilazation and on the behaviour and the expectations of the ones involved: employees, shareholders, clients, creditors, authorities. In Figure 2 we present the correlation between CSR and the business environment:

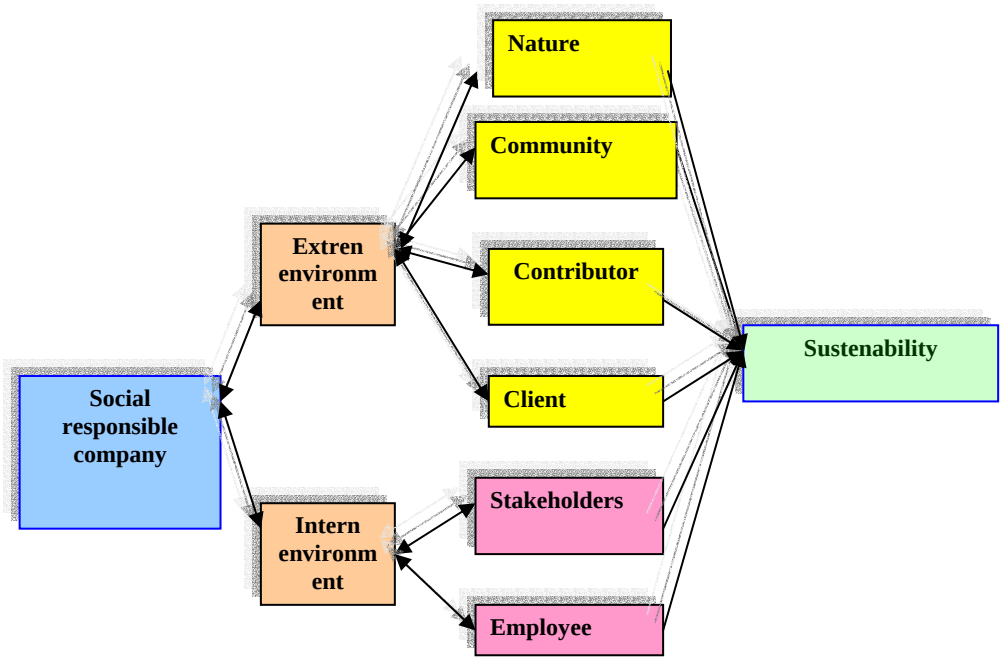

Figure 2. *The interaction responsible Company – Environment*

RSC is an integrant part of the concept of "durable development", being shaped through the contribution brought by the responsible organisation to the compliance to the sustenability principles. The social and environmental responsibility are not separated, but they are two pieces of the same puzzle, and together with the basic economical activity they form business responsibility.

2.2. Business ethics and the judicial frame of the corporative social responsibility

Throughout history public figures and scientists have militated for the society's development on ethical criteria. Stricto senso, ethics means the compliance of the values and human conditions from the perspective of the moral principles, thus a result we have a demeanour that corresponds to a certain ideology. Social responsibility has in the specialists opinion a powerful ethical intercession. As Stephen B. Young, Global Executive Manager Caux Round Table, Harvard Law School professor, said that the equilibrium between morals and personal interest it is not only possible but also necessary for a comapny's development in future perspectives.

I consider that the ethical aspects have to characterise the ensamble of human activities, through the promotion of some rules of moral conduct that aim all the parties involved in a business: investors, buyers, sellers, producers, managers, employees or the civil society, where is the case. Corporative social responsibility does not mean only the fulfillment of some duties towards the company. The orientation of one part from the company's profit towards the human resources, the economical assets, the social capital or good-will can create a durable form of capital.

Through the adoptation of some efficient ethical programms of CSR, the companies can have multiple benefits:

- the reduction of the costs;
- the improvement of the brand image;
- the stimulation and the motivation of the employees;
- the improvement of the chances to access capital;
- the attraction of clients and the growth of the business numbers;
- the diminishing of the risks.

Based on the obeying of the rules and legislations, corporative social responsibility includes numerous engagements and activities that have to respond as it was shown to the judicial exigencies from several fields:

- environment protection;
- health and security;
- human rights, including the rights from the field of work;

- ethics in enterprises;
- the management of human resources;
- the involvement and the respecting of native population;
- the satisfaction of the clients' needs and the obeying of the principles of loyal competition;
- the ensurance of transparency through the publication of raports regarding the efficiency of the company;
- anticorruption measures.

Transnational and multinational companies, frequently named global companies, through their judicial specific have to obey the laws of the states in which they activate and to always give importance to the maintaining of the highest ethical standards.

In conclusion, although corporative social responsibility imposes itself more as a necessity for the business world, a settlement frame that has judicial obligations of implementation does not exist; besides business ethics is a standard for CSR and the companies that are involved in such projects are under the jurisdiction of the host countries.

According to the online study "Transparency and credibility in the practise of corporative social responsibility"(5) that was published at the beginning of 2010 by www.csr-romania.ro, 76% of the ones that took the survey say that their companies have ethical codes, and 87% said that the companies for which they work invest socially.

3. Economic justification of corporative social responsibility

Most of the studies identified a sure relationship, but not always directly proportional, between CSR activities and the performances of the company that is evaluated, that is measured with some *specific indicators*, as business numbers, profit, share profit or the marketing impact.

In the specialists opinion, the economic justification of CSR differ from case to case, according to different *factors:* the size of the company, the activities it has, the offer of products or services, where it is located, the management, its reputation, the contractors or the importance of the field of activity. Between the social responsibility and a company's success there is a strong consensus. We can notice statistically that the companies that do not involve in their activities *social and ecologic reasons* cannot remain competitive; thus it is necessary for them to adapt constantly their strategic measures to the requests of the market and of the society, the new stakes of humankind have to become key factors of success in a world of interdependences and of the fight for supremacy.

World Business Council for Sustainable Development emphasised the fact that a coherent strategy in the field of CSR, based on integrity, solid values and a long term approach, give the companies important commercial advantages and they contribute to the wellfare of the civil society. The objective of any economic organisation must be redefined, because it is no longer just a purely economical one aiming the individual profit, but an economical, social and ecologic one that wants public wellfare. At a worldwide level CSR became a part of everyday business. International renowed companies invest in this type of social programms important shares of their business figures. The budgets given by the organisations for the development of partnerships with the community often reach shares that, at a first glance, seem not real. These sums represent, in the vision of the managers of the companies involved, a sure investement, with significant results for the business.

Business ethics and organisational culture have become for many companies business cards. The presidents of big concerns (Motorola, General Motors, Ford, Amway) that have integrated in their preoccupations CSR consider that a profound social conscience determines the growth of rentability. Furthermore, experience has proven that the enterprises that have a "good file" in the field of social citizenship are more durable, have a bigger credibility and are a sure long term investment. In the filed of investments the stock and capital markets with a world wide reputation complete the traditional financiar criteria used for the taking of investment decisions with social and environment information that are characteristic to the aimed company. The market indices and the consulting cabinets offer to the mutual funds companies private funds of shares, funds of risk-capital, commercial banks and other investors a much larger range of characteristics of the companies, especially referring to the management of the human resources, health and security, environment protection and communitary development; there are some examples of indices that are focused on responsible investments: Dow Jones Susteinability, FTSE 4Good100 Index, the Canadian index Jantyi Social Index, Innovest.

4. CSR, source of competitive advantage and strategic intercession

The majority of the specialists consider that the implementation of ferm politics of corporative social responsibility give companies many social, economic and financial advantages, that come to cover the efforts made with the launching of these programms. Often the results appear late, but the studies made by institutions from the field (The French Institute for Business Ethics, for example) show that those companies that included in their activity object

CSR are exposed to lower risks and the commercial advantages, mirrored through the company's image are sure in the future.

RSC have to *respect* always the practises regarding the ethical values:

- of all the parties that are involved in the process (employees, creditors, clients, shareholders, caterers, competitors),
- of the community (local collectives, consummers associations, ONG),
- of the environment.

From the bibliographical sources and the case studies made by the big corporations with experience in CSR we have reached the conclusion that the main *categories of advantages* obtained by the social responsible companies are grouped as such:

1. the growth of the financial and commercial performances;
2. the diminishing in time of the judicial, industrial, operational risks,
3. the emphasis of the competitivity.

For argumentation, I will present only some of the most suggestive advantages that a company might have from this intercession:

The forecast and the management of a large palette of risks. It has been noticed that the efficient management of judicial, economic, financial, social, environment, country risks on a complex market, that is in a continual change, corroborated with the strict supervision of the company's activities in connection with "the participant interested parties" (stakeholders) can improve the company's security in the field of safety and catering. Thus, a modality to forecast and risk control is the taking into consideration of the interests of all the partners of the company that is responsible that can react very different in time, according to the context of the market.

Reputation improvement. Empirically it was noticed that the organisations that invest in CSR record a plus in image in building of reputation, with positive effects in the plan of economic performance. In the case of their exposal to certain risks, because of the popularity and of the socio-economic initiative that they promote through different programms of social responsibility, the unwanted effects are not devastating. For example, for the en detail commerce companies, where the values and the importance of the brand are big (in many cases the brand sells the product, and not his utility, see Coca-Cola) and often pressures are exerted by the mass media, consummers or the activity itself, the reputation given by the capital of the brand represses the negative effects through credibility, reliability, initiative, constance in the field of CSR.

The improvement of competitivity and of the market position, can be made through the differentiating and innovation politics as well as through some CSR practice that facilitates the access to new markets. For example, through the

compliance of some ecologic and social rules some companies obtain certifications that allow the gaining of new clients.

Easier access to the recruitment and forming of the staff; the increase of the employees' professional interest. This effect can be obtained either as a direct consequence of the profile of the activities and practise of the company, or through the application of the best practices in the field of human resources, like the family-favourable politics (kindergardens for the employees' children, free access to medical checks, social politics), the adoptation of programms of improving the physical and psyhical capacities of the employees.

The growth of the operational efficiency and of the savings at the level of the organisation through politics of permanent perfecting of the staff, the adoptation of of social and environment programms (the growth of work productivity through specific techniques leads to the diminishing of the charges with wages; the transformation of the waste in sources of income and the diminishing of the global energy consumption generates savings).

The growth of the capacity to adapt to change. The maintenance of close partnerships relations based on ethical principles with the stakeholders can prevent, through information, the unexpected changes that appear in the plan of social, economic, environment settlements and can diminish the unwanted effects.

Easier access to capitals, in the conditions in which, at the present moment, the financial and credit institutions focus on the evaluation of the projects based on social and environment criteria.

Better relationships with the reglemantation organisms. Certain government administrations urge the approval processes of some applications because they consider that the companies with practises that are before CSR already fulfill the normative exigences.

Based on a two year study the conclusion of World Business Council of Business Development is that any company has to promote coherent strategies in the field of CSR, that bring them a plus of value and competitive advantages on the market.

5. Another approach to CSR – Reflections of the author

Long researched and promoted, the social responsibility of the corporations is a reality of today's world whose existence cannot be denied. The majority of the specialists, no matter if they come from the scientific field or from the economic practice, consider that CSR opened a new era and it represents a starting point for the creation of a new society, less egoistical, oriented towards the future and people. Far from me the desire to place the

concept in a shadow but I believe that some aspects still raise question marks and that some questions have not received a clear answer.

For example, in the majority of works I have read, special attention is given to the social, altruist spirit of the company towards what is around it, the people and the environment. On a secondary plan we see the correlation that is born on the "gestures" made by the company through the launching of some programms, between the efforts made and the obtained ones. The emphasis is placed on the typology and the description of the social programms with a lot of details and in a lesser measure the fact that through these intercessions society really wants economic performance, profit, image, derogations or obtaining of rights, competitive advantages.

In some measure, I share Milton Friedman's opinion that remained famous through the conclusion according to which "the social responsibility of a company aims the increase of profit". It is not very credible, at least from a personal point of view that a company, no matter its size and object of activity, takes into discussion the wellfare of the humankind, durable development and it searches for solutions in this sense, and only then it makes efficiency accounts. Most of the studies shown by the companies consider CSR as a distinct filed in the practice of the commercial companies, and they analyse the results based on the activity raports that are affrent to each project, giving a minimal importance to the economico-financial results. I would conclude that the recommended transparency refers only to the way of making the objectives of the CSR programme, not the impact it has on the commercial company.

In the conditions of the actual market, as a financial analyst, I agree that no economical entity can obtain profit only from the basic activity and that the multiplication of wealth is made through global practise and strategies. In my opinion, in order to have motivation, any company has to analyse its availability for projects of social responsibility only after a strict diagnosis that takes into account one won economic result, through the determination of at least one of the vectors:

- CSR effect on the volume of sales;
- The modification of the market share;
- The company's image towards its clients and creditors;
- The effect on rentability;
- Costs savings;
- Market evolution;
- CSR's effect on the employees' behaviour and efficiency.

Also, I share other authors opinion according to which the concept of corporative social responsibility can be regarded as a part of the marketing politics, through which the company wants an increase of its reputation and the

improvement of its image/brand in the given competitive context (the frequent association in mass-media of the company's name with the name of a CSR project can be considered as a form of free publicity through which the economic entity becomes more well known, thus being preffered by the clients compared to a similar one that does not have such actions).

Through the made analysis, other specialists consider that some companies have CSR programms under the form of hiring underprivileged staff (with handicap, institutionalized youngsters) not from a civic spirit but because of the advantages given by the public institutions, the giving of funds given by the state for social integration, to cover productivity loses.

Other companies accept social responsibility because through charity actions, philatropical ones, donations, "charity business" they benefit from fiscal advantages and tax deductions.

The exemplification can continue in other fields. We must mention the fact that thoughout this paper the author did not use names of companies, programms, initiatives or organisations because of the vastness of information, the purpose was not to focus on CSR in certain fields, regions, objects of activity but the emphasis of the role and the necessity of implementing CSR, in a transparent and square manner.

As a conclusion I could say that corporative social responsibility and the marketing of the parties involved in the process are a part of the classical commercial practises, used for a better sustenation of the exploatation environment. Athough they are presented as having benefical effects on the community and the environment, the real CSR objective is to maximize the company's profit. This fact is not a negative one and it is another form of economic growth, on sustenable criteria.

6. Conclusions

The analysis made throughout the research laid to the following conclusions:

1. Corporative social responsibility is a reality of today's world and an important premise of the business environment;
2. Creativity and innovation must dominate the economical activity of any entity;
3. Corporative social responsibility is a form of knowledge that must obey the principles of organization's management;
4. Corporative social responsibility is an important pawn of Knowledge management;
5. The lack of communication influences in a negative manner corporative social responsibility and Knowledge management;

6. A confused or passive management influences negatively the capacity of innovation and the intercessions regarding corporative social responsibility;
7. Knowledge management is in a interconnection with the corporative social responsibility;
8. Knowledge management and Corporative social responsibility are not only attributes of the companies, may they be local or multinational, but they are also;
9. The big consulting international centers consider that in order to attain important objectives "the un-measurable must become measurable";
10. Knowledge and social responsibility phenomena must be always be monitored and managed elementary conditions of the economic game on a open market;
11. Corporative social responsibility is a reality of today's world and an important premise of the business environment;
12. RSC is a way of establishing exemplary practises of creating wealth and of improving the qualitative and sustenable level of the society;
13. Through CSR any company has a contribution to the development of modern society on sustenability criteria;
14. RSC has a voluntary character and not one imposed by the law;
15. RSC is a profitable management strategy, because it generates credibility and trust, on the long term;
16. CSR has to obey the fundamental principles regarding the human rights, the right to work and environment protection;
17. CSR is an engagement through which any company assumes in a standard way the care for the environment, employees and the community;
18. CSR is a modern practise through which all the parties involved (stakeholders) have to win;
19. By adopting efficient ethical CSR programms, the companies can have multiple advantages: the diminishing of the costs, the improvement of the brand image, the stimulation and motivation of the employees, improving the chances to get to capital, the attraction of the customers, the increase of the business figures, the diminishing of the risks;
20. There is no legal framework to regulate the obligativity of adopting the CSR by the commercial companies;
21. The adoptation of coherent strategies in the field of CSR, based on integrity, solid values and a long term approach, give enterprises

important commercial advantages and they contribute to the wellfare of the civil society;

22. CSR is an eligibility criterion for the financial and capital market;
23. CSR is a source of competitive advantage and a strategic intercession;
24. CSR has to always respect the practises regarding the ethical calues of the partners;
25. Explaining the concept of CSR is often made from a socilogic point of view, and not from an economic one;
26. Corporative social responsibility and the marketing of the parties involved in the process are a part of the classical economic practises, used for a better support of the exploatation environment.

The social responsibility of the corporations has standards in the field. Although there is interest for implementation, CSR is not a reality in all the companies. There is a series of questions that appear in the context of the actual crisis:

- In what measure the world crisis affects the unreeling of the social responsibility programms?
- CSR can be an important direction of action for overpassing the crisis by the companies?
- Commercial companies have the same interest for profit reinvestment in the social field?
- CSR appeared as a saving solution in the conditions in which the world market became very competitive?

The making of studies, surveys, comparisons imposes itself furthermore for finding some answers and solutions to the identified problems. The author's preoccupation in this field will continue with complex evaluations and conclusions.

Notes

(1) Abbreviations: CSR in English and RSC in Romanian.
(2) We will abbreviate it next CSR.
(3) Michael E. Porter & Mark R. Kramer in "Strategy & Society – The Link Between Competitive Advantage and Corporate Social Responsibility", Harvard Business Review, 3rd December 2006, p. 4.
(4) Comment made by the President of the ISO/WG SR work group, Mr. Jeorge E.R. Cajazeira, for the closing of the plenum reunion from Copenhagen, Denmark, 17-21 May 2010.
(5) http:/www.sfin.ro/article_20904/social_responsibility_trend_or_necessity.html.

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Identification of Critical Points in the Quality Management System

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Abstract. *Creating a quality management system can help organizations and other stakeholders in satisfying customer needs and expectations. Moreover, a well-implemented quality management ensures the organization a capable structure to make continuous improvement actions. Thus, after the evaluation of the quality management system elements, the identification of critical points is a very important element. There are several ways of assessing and identifying these critical points; in this case, identification will be done by questionnaire survey carried out at the Székely National Museum in Saint George. The questionnaire aimed to assess the whole system of management and staff attitudes towards some considerations established by international standard ISO 9001:2008.*

Keywords: quality management system; visitor satisfaction; management responsibility; resource management; social-economic development.

JEL Codes: C12, M31, L83.
REL Codes: 14B, 14K.

Introduction

Quality management system is a broad concept and can be defined as a systemic set of management procedures used to monitor, check and improve the organization of financial and operational actions in order to provide the best products/services at reduced costs.

Management procedures which constitute the quality management system include subsets of activities listed as follows: quality assurance, quality control and quality improvement. Quality assurance activities aim to assure that all exchanges of this process are clearly identified and evaluated. Quality control is a process also known as "statistical quality control" – which allows the evaluation of current organizational achievements individualizes and does the necessary actions to eliminate unwanted operations. Improving quality is a continuous and systemic activity, which includes all company processes, aimed at performance. In this case standard sets out some key points related aspects of quality objectives such as management responsibility, resource management, product realization, measurement analysis and improvement.

Methodological framework

Descriptive research and causal research, based on probability representative samples, require knowledge of research variables in the studied population. This knowledge requires achieving inference or extrapolation of the achieved results from the descriptive statistics on the population from which the sample came. Inferential statistics allows the estimation of population parameters with some error and a confidence level or probability. It also allows statistical hypothesis testing research, measuring the intensity of the relationship between variables, comparing the differences between parameters from different groups or populations. The logic of statistical inference is based on statistical tests.

Statistical hypothesis does not concern the survey statistics, but the real values of the parameters involved and the characteristic forms of the considered distributions. Operation of the assumption is made by the data sample that represents the element of knowledge, which through the procedures provided by the theory of estimation, brings more or less closer to the true value of a parameter.

Hypothesis testing is closely related to the theory of estimation. It is a procedure that, according to certain rules of decision, can reject a hypothesis or not allowed on a parameter or distribution. The problem of the outcome of an experiment appears, if the values recorded are indeed distributed according to the proposed theoretical law. The hypothesis which is formulated on the parameters of distributions or distribution law which the variable statistics

follows is called statistical hypothesis. For a statistical hypothesis to be verified the term null hypothesis H_0 is used. H_0 hypothesis expresses the situation that researcher would have to discredit after the testing. Hypothesis that the researcher starts with and wants to confirm is called alternative hypothesis, denoted by H1. Null hypothesis H_0 is formulated so that its denial would lead automatically to the acceptance of alternative hypothesis. Alternative hypothesis is always expressed as an inequality, whose meaning can be known or unknown.

The research that I conducted measures the employees attitudes, preferences and behaviors towards the activities of the Székely National Museum. So we took our sampling from the museum staff, both from external and internal divisions. The questionnaire was structured into four major "chapters" that structure the questions such as public policy formulation, civil service, expenditure management system, public procurement, public internal audit, information regarding to the management system and in the final part general identification data of the respondents.

The identification of critical points was performed using the statistical assumptions.

➲ **Management responsibility**

Top management must provide evidence of engagement (involvement) in developing and implementing the quality management system and improving its effectiveness through: communication to the organization the importance of customer requirements to meet statutory requirements with a regulator role, setting quality strategy, ensuring the establishing of quality objectives, leadership of management reviews, ensuring the availability of resources

Hypothesis 1

H_0: media for the degree of knowledge of the organization's goals is four points

H_1: media for the degree of knowledge of the organization's goals is different from the four points

H_0: $\pi_0 = 4$ points

H_1: $\pi_0 \neq 4$ points.

Table 1

One-sample statistics - degree of knowledge - goals

	N	Mean	Std. Deviation	Std. Error Mean
Degree of knowledge - goals	48	3.21	.967	.140

Source: according to the study carried out during the doctorate.

The media obtained on this aspect of degree of knowledge of the organization's goals is 3.21 points with a standard deviation of 0.97 (Table 1).

Table 2

One-sample test - degree of knowledge – goals

	Test Value = 4					
	t	df	Sig.(2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
Degree of knowledge – goals	-5.674	47	.000	-.792	-1.07	-.51

Source: according to the study carried out during the doctorate.

The value of t_{obs} is -5.674 which will be compared with the value of t for 47 degrees of freedom and $\alpha = 0.05$. For a test unilateral to right $t_{0,05,47} = 2.01$ (Table 2), $t_{obs} < t_{0,05,47}$ results that the null hypothesis is accepted. This can also be seen in the value of Sig. (2-tailed) which is less than 0.05 (the value of α), so we can guarantee 100% that the media for the degree knowledge of the organization's goals is not different from four points - and that the confidence interval contains the value 0, indicating the acceptance of the null hypothesis.

Hypothesis 2

H_0: media for the degree of information on the needs and expectations beneficiaries is 3.4 points

H_1: for the degree of information on the needs and expectations beneficiaries is different from 3.4

H0: $\pi_0 = 3.4$

H1: $\pi_0 \neq 3.4$

Table 3

One-sample statistics - informing the staff

	N	Mean	Std. Deviation	Std. Error Mean
informing the staff	48	3.23	.805	.116

Source: according to the study carried out during the doctorate.

For the 48 subjects who answered this question the obtained media is 3.23 points with a standard deviation of 0.805 points (Table 3).

Table 4

One-sample test - informing the staff

	Test Value = 3.4					
	t	df	Sig.(2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
informing the staff	-1.470	47	.148	-.171	-.40	-.06

Source: according to the study carried out during the doctorate.

The value t = -1.470 (Table 4) represents the value of the critical report t_{obs}, with a number of 47 degrees of freedom. This value is compared to the value from distribution law table Student $t_{0,05;47}$ = 2.01. It is noted that $t_{obs} < t_{0,05;47}$ and then H_1 is rejected and H_0 is accepted. Thus subjects surveyed believe that informing the staff is acceptable tilting towards better information.

Next the relationship between two variables will be tested, and with χ^2 test will try to highlight the link between respondents' opinion on the staff information about their needs and their activity impact on customer satisfaction.

χ^2 test is a non-parametric test used to analyze the links between two variables measured with nominal scale. As in the case of such variables the average can not be calculated, the test will be applied based on absolute and relative frequencies, as with all non-parametric tests. With this test it is aimed to highlight the significance of differences between observed frequencies and some frequencies based on an assumed distribution of the population, called the expected frequencies.

For the test application, based on observed frequencies are presented in contingency table expected theoretical frequencies are calculated assuming that null hypothesis were true. Expected frequencies, denoted with E_{ij}, are determined from the observed frequencies as follows:

$$Eij = \frac{(total\ line\ i) \times (total\ line\ j)}{grand\ total} \quad (1)$$

A size $\chi 2_{calc}$ is calculated necessary for the test application:

$$\chi^2_{calc} = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}} \quad (2)$$

To make the decision, the size χ^2_{calc} is compared to the theoretical value $\chi^2_{\alpha,df}$ from the χ^2 distribution table given the level of significance chosen and the number of degrees of freedom.

The decision rule is:

- H_0 is accepted if $\chi^2_{calc} \leq \chi^2_{\alpha,df}$
- H_0 is rejected and H_1 is accepted if $\chi^2_{calc} > \chi^2_{\alpha;df}$.

Hypothesis 3:

H_0: there is no relationship between staff informing and impact of information on customer satisfaction

H_1: there is link between staff informing and impact of information on customer satisfaction

H_0: $O_{ij} \neq E_{ij}$

H_1: $O_{ij} = E_{ij.}$

Observed absolute frequencies are shown in the table below (Table 5).

Table 5

Crosstabulation - staff informing × the impact of customer satisfaction

		business impact on customer satisfaction						Total
		+1 medium important	+2 important	+3 very important	-1 less important	-2 insignificant	-3 very less important	
staff informing	*poor*	0	0	0	8	1	0	9
	acceptable	2	0	1	12	6	0	21
	good	4	1	2	8	0	1	16
	very good	0	1	0	1	0	0	2
Total		6	2	3	29	7	1	48

Source: according to the study carried out during the doctorate.

Table 6

Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.871	15	.039
Likelihood Ratio	23.625	15	.072
Linear-by-Linear Association	5.130	1	.024
N of Valid Cases	48		

Source: according to the study carried out during the doctorate.

The value of χ^2_{calc} is 25.871 (Table 6) it will be compared with $\chi^2_{0,05;15}$ = 24.99. How $\chi^2_{calc} > \chi^2_{0,05;15,}$ hypothesis H_1 is accepted in the sense that we can guarantee with a probability of 95% in the total population that there are significant deferens regarding impact assessment work on customer satisfaction and staff information on the beneficiaries expectations.

The same conclusion can be made based on minimum level of significance for what H_1 can be accepted. It has a value of 0.039 (Asymp. Sig. (2-sided)) which is less than $\alpha = 0.05$, therefore the hypothesis H_1 is accepted.

Regarding to periodic tests to ensure service quality, the formulated hypothesis is:

H_0: Up to 40% of employees say that controls/regular review of quality assurance are performed

H_1: More than 40% of employees say that controls/regular review of quality assurance are performed

Table 7

One-sample statistics - quality assurance

	N	Mean	Std. Deviation	Std. Error Mean
Are periodic tests made on quality assurance?	48	.92	.279	.040

Source: according to the study carried out during the doctorate.

At the level of the 48 respondents, the average binary feature is 0.92, which means that 92% of respondents claim to be made inspections to ensure the quality of services (Table 7).

Table 8

One-sample test - quality assurance

	Test Value = 0.4					
	t	df	Sig.(2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
There are performed periodic tests on quality assurance	12.816	47	.000	.517	.44	.60

Source: according to the study carried out during the doctorate.

The value of t_{obs} is 12.816, which will be compared with the value of t for 47 degrees of freedom and α=0.05. For an unilateral test to right $t_{0,05;47}$ = 2.01 (Table 8).

$t_{obs} > t_{0,05;47}$ results that the alternative hypothesis is accepted. This can be seen in the value of Sig. (2-tailed), is less than 0.05 (the value of α), so we can guarantee 100% that more than 40% of the staff claims that controls/regular reviews of quality assurance are made.

➲ Resource management

ISO 9001:2008 standard requires the organization to identify the necessary resources to support and improve the quality system processes, and fulfill customer requirements. Resources include human resources, infrastructure and working environment.

Regarding human resources, the standard requires that before the organization appoints the staff to a task, it must first define the minimum requirement of competences for that activity in terms of education, training, skills and experience. This can be solved for example in the job description, although there are no specific documentation requirements. Furthermore, the

standard requires that, if there are gaps of competence, the organization has to provide training or take other measures to fill those gaps. Standard argues that staff should be aware of the relevance and importance of its activities and how they contribute to the completion of quality objectives. Special importance is acknowledged to costumer needs. Briefings and meetings are some possible ways to ensure this awareness. Effectiveness of actions taken should be evaluated, for example, performance monitoring process.

Regarding infrastructure, the organization must identify the needs of areas, to provide necessary facilities and to maintain, perform these actions on two levels: as part of senior management consideration and based on individual contract. ISO 9000:2008 standard defines infrastructure as "a system of buildings, equipment and services required to run an organization." Infrastructure includes, as appropriate, buildings, workspace and associated utilities, process equipment (hardware and software) and support services as transport and communication. Accordingly, the same standard defines the work environment as "set of conditions in which the work is carried out" (conditions that include physical, social, psychological and environmental factors, physical conditions include factors such as temperature, humidity, vibration, air quality light and cleanliness). The organization must determine the effects of physical factors on the quality and ensure that appropriate conditions exist.

Regarding the working environment of the Székely National Museum, the respondents' opinion on this is presented in the table below. Respondents who answered affirmatively in the sense that there are 35 people out of 48 respondents which in percentage is 72.9% and the remaining 27.1% responded negatively.

Table 9

Descriptive statistics

			Statistic	Std. Error
Do you believe that the environment is appropriate for achieving service?	Mean		.73	.065
	95% Confidence Interval for Mean	Lower Bound	.60	
		Upper Bound	.86	
	Median		1.00	
	Std. Deviation		.449	
	Skewness		-1.065	.343
	Kurtosis		-.905	.674

Source: according to the study carried out during the doctorate.

The same aspect is confirmed by the data in the table above, where we can guarantee with a 95% probability that the media for the work environment appreciation is adequate, the confidence interval is [0.60, 0.86], 0.6 meaning the

lower limit and 0.86 the upper limit (Table 9). The sampling error is ±0.065, a value that is subtracted from and gathered with the sample average to obtain the confidence interval. The average for this criterion is 0.73 points with a standard deviation of 0.449 points.

In the management of financial resources, the data is as follows (Table 10):

Table 10

Descriptive Statistics – Budget performance

		Financial resources of the institution	Development programs are respected	The existence of a strategic planning document	activity orientation towards efficiency and effectiveness
N	Valid	48	48	48	48
	Missing	0	0	0	0
Mean		3.52	3.92	4.19	3.96
Std. Deviation		1.010	.871	1.142	1.202

Source: according to the study carried out during the doctorate.

The media of the responses to assess the institution's financial resources is 3.52 points on a scale of 1-5 with 1 being unsatisfactory and 5 if the respondent does not know how to evaluate the criterion.

Table 11

Existence of a strategic planning document

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	satisfactory	6	12.5	12.5	12.5
	good	9	18.8	18.8	31.3
	very good	3	6.3	6.3	37.5
	i don't know	30	62.5	62.5	100.0
Total		48	100.0	100.0	

Source: according to the study carried out during the doctorate.

A key element in activity orientation towards efficiency and effectiveness is the existence of a strategic planning document. In connection with this most of the respondents were unaware of the existence of such a document in percentage meaning 62.5% (Table 11) and regarding the activities targeting efficiency and effectiveness 47.9% (Table 12) of them said they do not know if the activities are oriented towards efficiency and effectiveness. These two issues are defining in the normal ongoing of the quality management system processes so that the management representative is required to give importance to staff information, regarding these issues, using existing instruments.

Table 12

Activity orientation towards efficiency and effectiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	satisfactory	10	20.8	20.8	20.8
	good	5	10.4	10.4	31.3
	very good	10	20.8	20.8	52.1
	i don't know	23	47.9	47.9	100.0
Total		48	100.0	100.0	

Source: according to the study carried out during the doctorate.

➲ Product achievement

This chapter of product achievement includes the planning of product achievement, processes related to the customer, design and development, production and service assurance, control of the monitoring and measuring instruments. Usually, all these activities are part of the process, namely jobs and activities within an organization with an effort to produce something for internal and external customers, and therefore they will be taken into account when the processes will be identified. When the standard is presented separately, they may seem illogical.

To understand better product achievement and quality management system as a whole, typical processes that consist the quality management system are: 1) management processes including strategic decisions, the strategy of quality determination, quality objectives and other management tasks; 2) product achievement processes that describe the organization, including activities that are necessary to produce products and services for internal and external customers; 3) resource management processes including the determination and allocation of human resources, infrastructure and environment; 4) measurement, analysis and improvement processes that ensures that product and quality management system fulfill the requirements and the system is continuously improved.

Regarding the management system there are few records at the Szekely National Museum on the integrated management system but they do not constitute a formal management system.

About quality management programs only 4 people said they knew about these programs at a rate of 8.3%. 66.7% said that there weren't such programs and 25%, respectively 12 people, said they did not know if there are such programs at the institution.

Regarding the environmental management programs, 62.5% of the respondents knew of the existence of these programs, and 37.5% said they did

not know about these programs or that there weren't such environmental management programs. For programs related to occupational health and safety management 70.8% said they know about this type of program.

Table 13

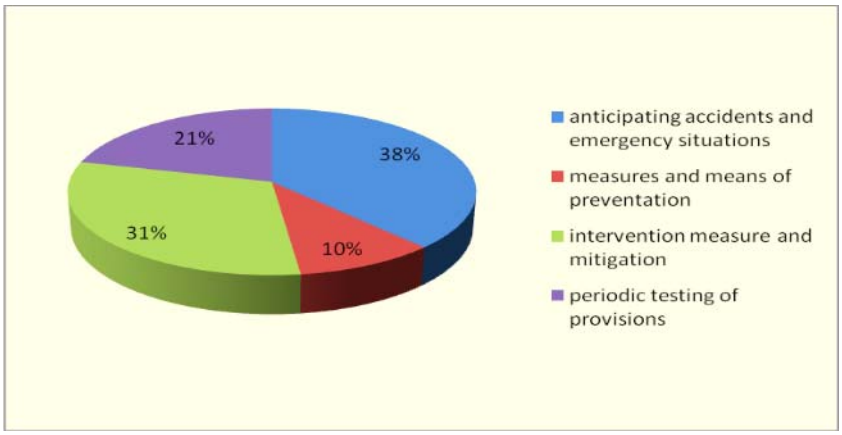
The service control means for you….

	Frequency	Percent	Valid percent
Availability of information describing the characteristics of the service	11	22.9	22.9
Appropriate equipment usage	9	18.8	18.8
Availability of work instructions	12	25.0	25.0
Implementation of monitoring and measuring activities	16	33.3	33.3
TOTAL	48	100.0	100.0

Source: according to the study carried out during the doctorate.

There is planning regarding the service achievement and this can be observed in the employees answers who in a percentage of 85.4% said there existed planning on service achievement.

As it can be seen in the table above (Table 13), service control means for each employee something else due to the specifics of each job and the activities within them.

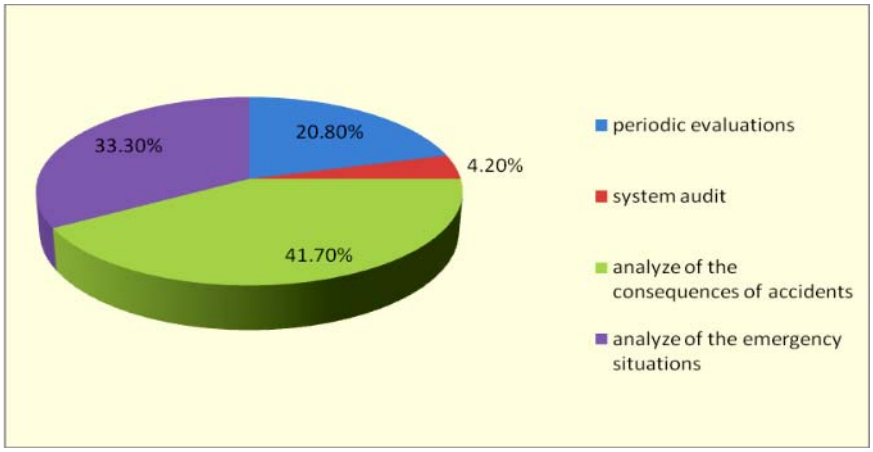


Source: according to the study carried out during the doctorate.

Figure 1. *Preparations for emergency situations*

Preparations for emergency situations is reflected in most respondents' opinions in anticipation of accidents for 38% of respondents, while 31% opted for intervention measures and to reduce the impact, as can be seen from the data presented in Figure 1.

Any nonconformities occurred in most cases are identified by analyzing the consequences of accidents, followed by analysis of the emergency rate which in percentage means 33.3% of respondents opted for this. Data are presented in Figure 2.



Source: according to the study carried out during the doctorate.

Figure 2. *Identifying nonconformities occurred*

The following hypothesis tries to identify the existence of the connection between the activity orientation towards efficiency and effectiveness within the institution and the socio - professional category of the respondents. Thus, the formulated hypothesis is:

H_0: *there is no connection between the activity orientation towards efficiency and effectiveness within the institution and the socio - professional category of the respondents*

H_1: *there is a connection between the activity orientation towards efficiency and effectiveness within the institution and the socio - professional category of the respondents*

Table 14

Crosstabulation - activity orientation towards efficiency and effectiveness × category of staff

Activity orientation towards efficiency and effectiveness		specify the category of the staff you fit in					Total
		executive director	specialist in museography	restorer	conservator	administrative staff	
	satisfactory	1	8	1	0	0	10
	good	1	2	0	1	1	5
	very good	0	1	1	5	3	10
	i don't know	0	9	2	2	10	23
Total		2	20	4	8	14	48

Source: according to the study carried out during the doctorate.

The value of χ^2_{calc} is 25.581 (Table 14), this will be compared with $\chi^2_{0,05;\,12} = 21.02$. As $\chi^2_{calc} > \chi^2_{0,\,05;\,12,}$ hypothesis H1 is accepted in the sense that we can guarantee with a probability of 95% of the total population that there are significant differences in the connection between the activity orientation towards efficiency and effectiveness within the institution and the socio-professional category of the respondents.

The same conclusion can be made also based on the minimum level of significance when H_1 can be accepted. It has a value of 0.012 (Asymp. Sig. (2-sided)) which is less than $\alpha = 0.05$, therefore the hypothesis H_1 is accepted.

Table 15

Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.581	12	.012
Likelihood Ratio	28.225	12	.005
Linear-by-Linear Association	9.818	1	.002
N of Valid Cases	48		

Source: according to the study carried out during the doctorate.

Table 16

Symmetric measures

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	.730			.012
	Cramer's V	.421			.012
	Contingency Coefficient	.590			.012
Interval by Interval	Pearson's R	.457	.097	3.485	.001(c)
Ordinal by Ordinal	Spearman orrelation	.391	.126	2.882	.006(c)
N of Valid Cases		48			

(a) Not assuming the null hypothesis of.

(b) Using the standard error assuming the null Asymptote hypothesis.

(c) Based on normal Approximation.

Source: according to the study carried out during the doctorate.

From the above table we can comment on the following coefficients (Tables 15 and 16):

Contingency coefficient 0.590, confirming that there is correlation between the two variables, and the connection is an average one.

Cramer's V coefficient has a value of 0.421, which, like other indicators, shows an average connection between the two variables.

Ciuprov's T coefficient is calculated using the following formula:

$$T = \sqrt{\frac{\chi^2}{n \times \sqrt{df}}},$$

where substituting known values we get the result: T = 0.3922, which shows a medium connection between the variables.

➲ **Monitoring and measuring**

This clause includes four main chapters: monitoring and measurement control of nonconforming product, data analysis and continuous improvement.

The monitoring and measurement clause requires the organization to prove that a system that provides information on 1) customer satisfaction, 2) internal audits, 3) making process 4) product compliance has been established, to "demonstrate the product the compliance, to ensure quality management system compliance and continuously improve effectiveness of the quality management system." The idea is to prove that there is a systematic way to monitor processes and products (eg. by inspection and test), information about the customer, product, process, and based on these information to take relevant measures for improvement. When the standard sets as a requirement, it may sound complicated and difficult, but in practice there are normal flows of information, inspections and checks to tolerances during production, reserves and other so-called self-recorded reserves in daily operations. When processes are documented, proves the existence of all the relevant requirements.

Conclusions

Management processes are specifically required by ISO 9001:2008, all used by top management and applied to the entire organization. Resource management can also be understood as a part of the management process, while providing resources is one of the top leadership debts. Product realization processes are different within every organization although some processes exist generally in any organization: event coordination, the evaluation of customer

satisfaction etc. Customizing these issues at the Szekely National Museum in Sfântu George, after the performed tests the following can be established:

- the degree of staff information by the management of the institution is relatively high;
- controls are performed to improve service;
- there is a connection between the appreciation of activity the impact on the satisfaction of customer needs and the staff information on the beneficiaries expectations, so constant communication is required within the organization and at all of its levels;
- the main problem found is not including the entire staff in implementing an advanced management system. Based on the premise that "quality is everyone's business" - it must be the key element;
- the training level of personnel, especially the administrative staff training has only secondary training, most of the staff attended training courses, employment is based on the competitors knowledge, the specialized staff is highly trained, with training level and doctorate in the field.

The standard emphasizes the importance of customer satisfaction. ISO 9001:2008 standard states: "As one of the measurements of the quality management system performance, the organization shall monitor information concerning the to customer perception that the organization has fulfilled customer requirements." It is essential that the organization's staff to be aware of the satisfaction and dissatisfaction of the customer. Information should be gathered about both. Ways of obtaining feedback from customers are, for instance, the direct communication with them, resolving complaints, customer satisfaction questionnaires. To achieve these aimes and for creating an advanced quality management system those critical points that require attention must be known, resolved, to build a system that would lead the organization towards excellence.

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Econometric Modeling of GDP Time Series

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Abstract. *Article aims of time series econometric model of macroeconomic variable GDP in the US economy. Because that is a nonstationary time series, there are used several statistical tests in order to turn into a stationary series. After applying these tests, the time series became stationary and integrated of order I; thus, we use Box-Jenkins procedure for the determination of ARMA. We estimate by OLS the parameters of various models. Performances chosen ARIMA model (1,1,1) are verified on the basis of classical statistical tests and forecasting.*

Keywords: stationary time series; nonstationary time series; statistical tests.

JEL Codes: C22, E01.
REL Codes: 8C, 10G.

In order to set time series, we use macroeconomic variable GDP during 1947 (first quarter) – 2010 (third quarter) in the US economy. Times series values are observed at the same frequency, namely quarterly; each of these values are random variables. Therefore, we can say that GDP is a stochastic process and the actual values observed in period mentioned above are individual achievements of this process.

Descriptive analysis time series gives us informations about the following indicators:

i) time series mean:

$$\bar{y} = \frac{\sum_{t=1}^{T} y_t}{T} = 6{,}372.390$$

ii) time series variance:

$$s^2 = \frac{\sum_{t=1}^{T} \left(y_t - \bar{y} \right)^2}{T-1} = 12{,}735{,}711$$

iii) Jarque-Berra statistic value, which suggest a normal distribution of time series in terms of asymetry and flattening.

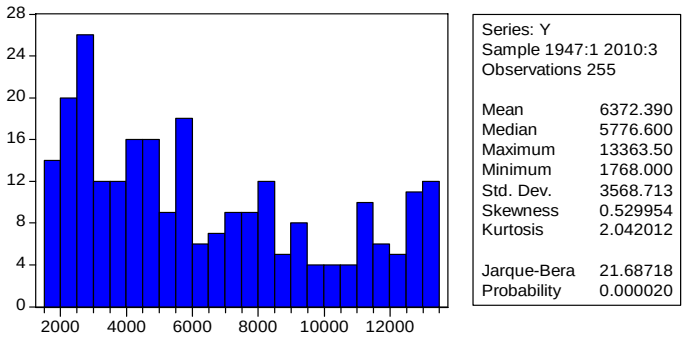


Figure 1. *Histogram and descriptive indicators*

View time series graph shows a linear path with positive slope; therefore it is *nonstationary homogenous type*, characterized by constant changes from one period to another.

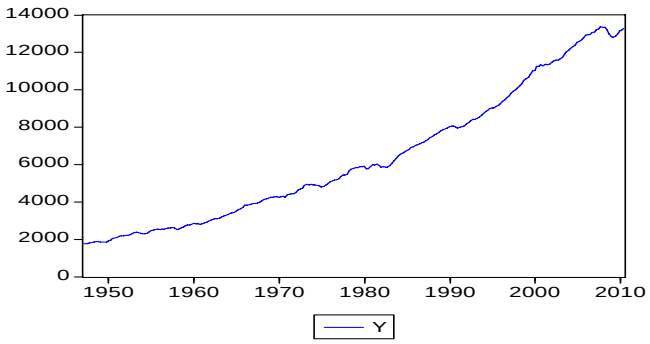


Figure 2. *GDP, US, 1947-I to 2010-III*

In order to check time series stationarity or nonstationarity we performed statistical tests, such as:

- *Unit root Test -Dickey – Fuller Test (DF):*

$$\Delta Y_t = \alpha_0 + \gamma \times Y_t + \alpha_1 \times \Delta Y_{t-1} + e_t$$

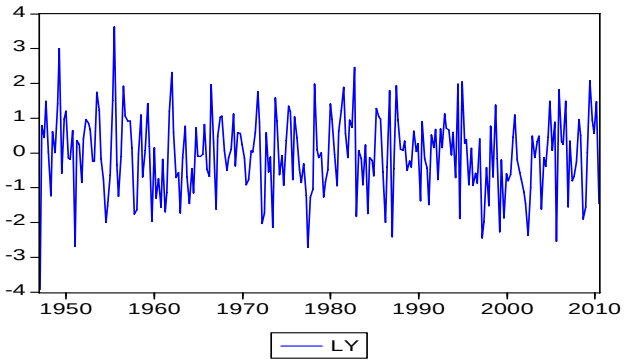


Figure 3. $\ln Y_t$ evolution

We obtain the following results:

$$\Delta Y_t = 0.020348 + (-0.01768) Y_{t-1} + 0.353951 \Delta Y_{t-1}$$

t = (2.407469) (-1.817024) (6.020099)

R^2 =0.146846 d = 2.062047

Our primary interest is in the t ($=\tau$) value of the Y_{t-1} coefficient. Since $\hat{\tau}$ = -1.82, and critical τ value is 2.87, for the 5 percent confidence threshold (τ >0.05) we can not reject RW null hypothesis.

Therefore, GDP time series is *nonstationary*, i.e. it contain a unit root; this conclusion is supported also by the ρ-value (0.3717) associated with t-statistic, which is higher than 0.005.

- *Autocorrelation function (ACF) and correlogram*

Table 1a

GDP Correlogram, US, 1947-I to 2010-III

Sample: 1947:1 2010:3
Included observations: 255

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.989	0.989	252.25	0.000
		2	0.977	-0.016	499.65	0.000
		3	0.966	-0.015	742.15	0.000
		4	0.954	-0.001	979.82	0.000
		5	0.943	0.001	1212.8	0.000
		6	0.931	0.000	1441.1	0.000
		7	0.920	-0.011	1664.8	0.000
		8	0.908	-0.018	1883.7	0.000
		9	0.896	-0.028	2097.7	0.000
		10	0.884	-0.021	2306.6	0.000
		11	0.871	-0.008	2510.5	0.000
		12	0.858	-0.021	2709.2	0.000
		13	0.846	0.011	2903.0	0.000
		14	0.834	0.005	3092.1	0.000
		15	0.822	0.010	3276.6	0.000
		16	0.810	-0.003	3456.7	0.000
		17	0.799	-0.004	3632.3	0.000
		18	0.787	-0.004	3803.6	0.000
		19	0.776	-0.002	3970.6	0.000
		20	0.764	-0.008	4133.4	0.000
		21	0.752	-0.008	4291.9	0.000
		22	0.741	-0.010	4446.3	0.000
		23	0.729	-0.009	4596.4	0.000
		24	0.718	0.008	4742.6	0.000
		25	0.707	0.000	4884.9	0.000
		26	0.695	-0.007	5023.3	0.000
		27	0.684	-0.014	5157.8	0.000
		28	0.673	-0.019	5288.4	0.000
		29	0.661	-0.012	5415.0	0.000
		30	0.649	-0.006	5537.7	0.000

The autocorrelation coefficients start at a very high value - $\hat{\rho}_1 = 0.989$, $\hat{\rho}_2 = 0.977$, …, $\hat{\rho}_5 = 0.943$ – and decline very slowly; thus, GDP time series is *nonstationary*.

Since *statistical tests* concluded that time series is nonstationary, the solution is the first differences of GDP time series.

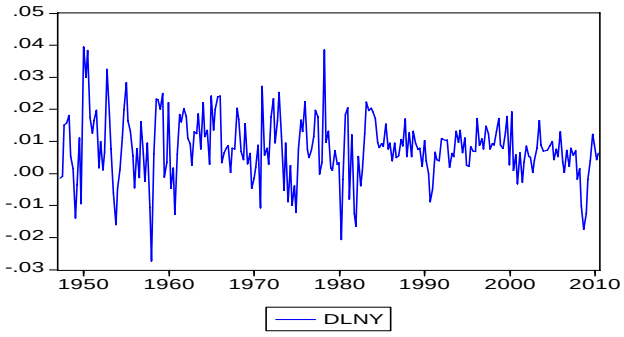


Figure 5. *GDP first differences, US, 1947-I to 2010-III*

$$\Delta Y_t = 0.005049 Y_t - 0.632433 Y_{t-1}$$
t = (6.783151) (-10.79566)
R^2 = 0.317093 d = 2.068089

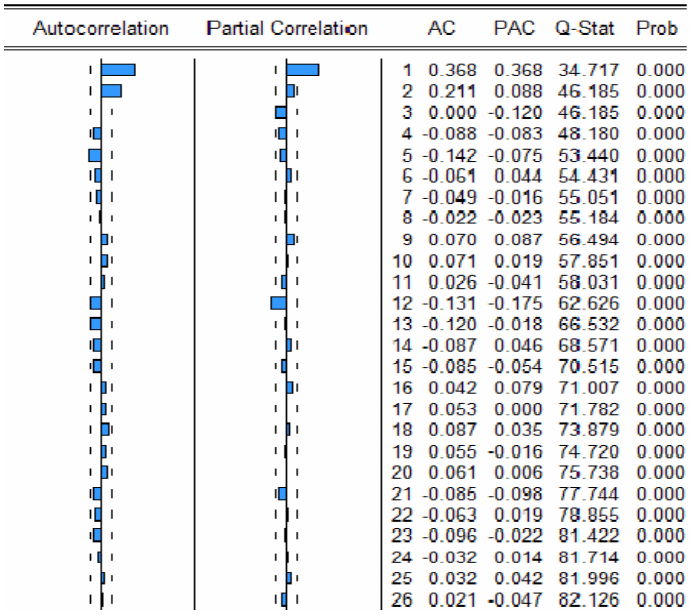
The 1 percent critical DF τ value is - 3.456093; since τ < 0.01, we conclude that we can *reject RW null hypothesis* (H_0: $\gamma = 0$). Thus, GDP first differenced is stationary, i.e. time series is I(1).

From first differences correlogram we observe that values of autocorrelation coefficients – $\hat{\rho}_1 = 0.368, \hat{\rho}_2 = 0.211, \hat{\rho}_3 = 0.000, \hat{\rho}_4 = -0.008, \hat{\rho}_5 = -0.142$, decline very quickly, so after the first lag it is likley to have an autoregressive process (AR) component of order p = 1.

Table 1b

First differences time series correlogram

Sample: 1947:1 2010:3
Included observations: 254



	Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
			1	0.368	0.368	34.717	0.000
			2	0.211	0.088	46.185	0.000
			3	0.000	-0.120	46.185	0.000
			4	-0.088	-0.083	48.180	0.000
			5	-0.142	-0.075	53.440	0.000
			6	-0.061	0.044	54.431	0.000
			7	-0.049	-0.016	55.051	0.000
			8	-0.022	-0.023	55.184	0.000
			9	0.070	0.087	56.494	0.000
			10	0.071	0.019	57.851	0.000
			11	0.026	-0.041	58.031	0.000
			12	-0.131	-0.175	62.626	0.000
			13	-0.120	-0.018	66.532	0.000
			14	-0.087	0.046	68.571	0.000
			15	-0.085	-0.054	70.515	0.000
			16	0.042	0.079	71.007	0.000
			17	0.053	0.000	71.782	0.000
			18	0.087	0.035	73.879	0.000
			19	0.055	-0.016	74.720	0.000
			20	0.061	0.006	75.738	0.000
			21	-0.085	-0.098	77.744	0.000
			22	-0.063	0.019	78.855	0.000
			23	-0.096	-0.022	81.422	0.000
			24	-0.032	0.014	81.714	0.000
			25	0.032	0.042	81.996	0.000
			26	0.021	-0.047	82.126	0.000

Box-Jenkins procedure takes into account the value of *d* parameter, equal to the initial time series differences order applied to obtaine a stationary time series.

Since first differences time series in stationary, $\ln Y_t$ time series is $I(1)$, i.e. $d = 1$.

To calculate *p* and *q* we estimate model parameters by OLS; estimation results are presented in the table bellow.

Table 2a

US GDP time series estimated models results

	Eq1	Eq2	Eq3	Eq4
c	0.007984	0.008025	0.007999	0.008012
ar(1)	0.367567	0.332860	0.485481	-0.218832
ar(2)		0.088608		0.302587
ma(1)			-0.134935	0.557360
AIC	-6.520910	-6.518205	-6.51786	-6.520263
SCI	-6.492978	-6.476188	-6.47596	-6.464240
DW	2.068089	1.967281	2.020407	1.981934

We choose between competing models Eq3 model, ARIMA (1,1,1), which admits the following representation:

$$Y_t = 0.007999 + 0.485481 Y_{t-1} - 0.134935 e_t$$

ARIMA model selection was done taking into account: a) the classical criteria (*adjusted R-square, F test*); b) indicators based on information theory (*Akaike and Schwartz statistics*).

For diagnostic checking we analysed:

- *residual correlogram*: autoregressive model defined by Eq3 suggest that residuals series do not present autocorrelation, i.e. is no need to look for another ARIMA model.

Table 2b

AC, ACP and Q-stat for Eq3

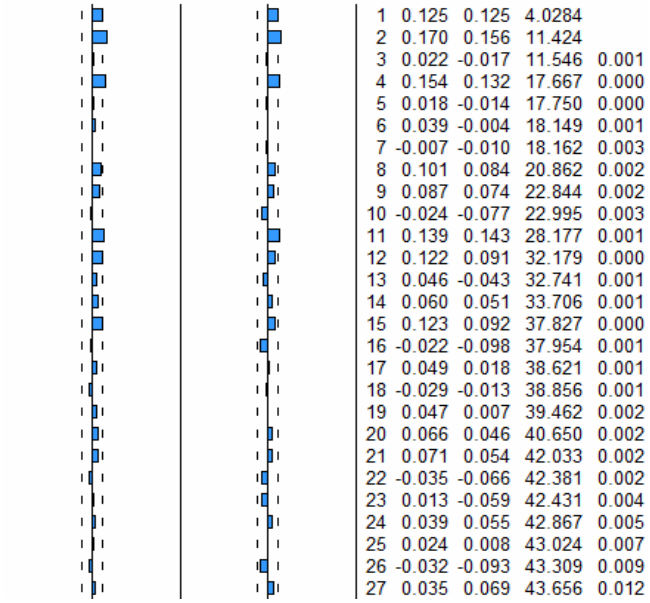
Sample: 1947:3 2010:3
Included observations: 253
Q-statistic probabilities adjusted for 2 ARMA term(s)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.011	-0.011	0.0289	
		2	0.089	0.089	2.0836	
		3	-0.064	-0.063	3.1501	0.076
		4	-0.068	-0.078	4.3537	0.113
		5	-0.131	-0.123	8.8242	0.032
		6	-0.005	0.001	8.8321	0.065
		7	-0.036	-0.023	9.1683	0.103
		8	-0.038	-0.061	9.5468	0.145
		9	0.079	0.066	11.215	0.130
		10	0.060	0.054	12.179	0.143
		11	0.079	0.060	13.824	0.129
		12	-0.128	-0.148	18.179	0.052
		13	-0.062	-0.079	19.205	0.058
		14	-0.031	0.025	19.471	0.078
		15	-0.090	-0.076	21.645	0.061
		16	0.072	0.064	23.038	0.060
		17	0.025	0.010	23.203	0.080
		18	0.064	0.039	24.323	0.083
		19	0.018	0.003	24.411	0.109
		20	0.087	0.038	26.507	0.089
		21	-0.107	-0.086	29.674	0.056
		22	-0.003	0.004	29.677	0.075
		23	-0.086	-0.029	31.745	0.062
		24	-0.018	-0.010	31.841	0.080
		25	0.040	0.048	32.292	0.094
		26	-0.017	-0.043	32.372	0.118
		27	0.038	-0.009	32.785	0.137
		28	0.053	0.051	33.580	0.146
		29	0.081	0.073	35.469	0.127
		30	-0.141	-0.151	41.257	0.051

Table 2c

ARIMA model residuals correlogram

Sample: 1947:3 2010:3
Included observations: 253
Q-statistic probabilities adjusted for 2 ARMA term(s)



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.125	0.125	4.0284	
		2	0.170	0.156	11.424	
		3	0.022	-0.017	11.546	0.001
		4	0.154	0.132	17.667	0.000
		5	0.018	-0.014	17.750	0.000
		6	0.039	-0.004	18.149	0.001
		7	-0.007	-0.010	18.162	0.003
		8	0.101	0.084	20.862	0.002
		9	0.087	0.074	22.844	0.002
		10	-0.024	-0.077	22.995	0.003
		11	0.139	0.143	28.177	0.001
		12	0.122	0.091	32.179	0.000
		13	0.046	-0.043	32.741	0.001
		14	0.060	0.051	33.706	0.001
		15	0.123	0.092	37.827	0.000
		16	-0.022	-0.098	37.954	0.001
		17	0.049	0.018	38.621	0.001
		18	-0.029	-0.013	38.856	0.001
		19	0.047	0.007	39.462	0.002
		20	0.066	0.046	40.650	0.002
		21	0.071	0.054	42.033	0.002
		22	-0.035	-0.066	42.381	0.002
		23	0.013	-0.059	42.431	0.004
		24	0.039	0.055	42.867	0.005
		25	0.024	0.008	43.024	0.007
		26	-0.032	-0.093	43.309	0.009
		27	0.035	0.069	43.656	0.012

- *residuals series homoschedasticity*: the phenomenon is not present at residuals series correlogram level;
- *residuals series distribution*: Jarque - Berra statistic value suggests a normal distribution in terms of asymmetry and flattening.

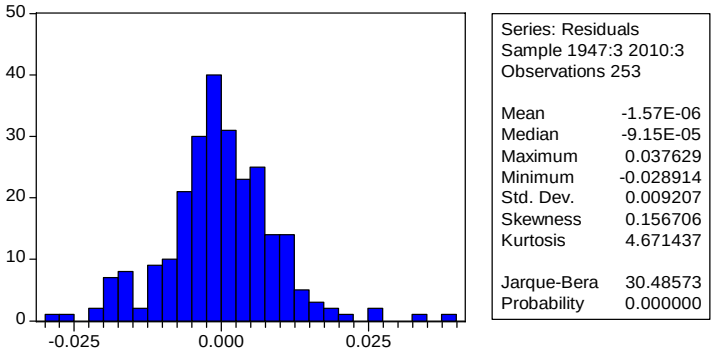


Figure 9. *Jarque-Berra test for Eq3*

Analysed Y_t time series, by initially nonstationary, was transformed into a stationary after applying two transformation: logarithms and first order difference. Using Box-Jenkins methodology we obtained an ARIMA (1,1,1) model. Model validity was justified on the basis of adjusted R-square, F test, Akaike and Schwartz indicators, statistical tests and forecasting.

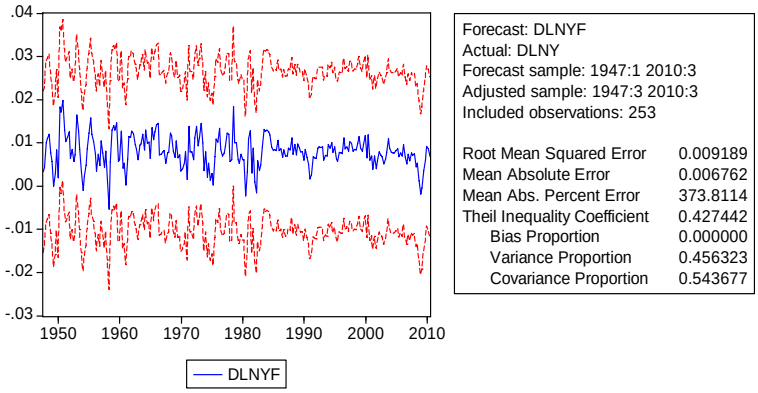


Figure 10. *Forecast Eq3*

Taking into account the loss function value (0.009189), time series prediction is considered accurate for 5 percent significance level and ARIMA (1,1,1) model.

Since R^2 value is very low, 13.9%, we can not successfully use the previous values of the series in order to make predictions with a high degree of accuracy.

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Impact of Institutional Credit on Agricultural Output: A Case Study of Pakistan

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Abstract. *This paper looks at the role of credit to agricultural sector in Pakistan. It begins with an analysis of credit as indirect input to agricultural sector. It helps the farmers to buy modern and expensive inputs such as tractor, tubewel, seeds, fertilizers etc. The study covers the period from 1974 to 2008. The empirical findings show that there is a significant role of credit in agriculture sector.*

Keywords: Taccavi loans; farm mechanization; stationarity; cointegration; Granger causality.

JEL Codes: G32, Q14.
REL Codes: 11E, 15B.

Agriculture sector has been predominant sector in Pakistan since independence. Agricultural output has been key source of growth in Pakistan's Gross Domestic Product (GDP) which grew about 3.6 percent a year for 25 years. The rate of economic growth in UDCs has been largely a function of the rate of growth in agriculture, which on average contributes nearly 50 percent towards their GDP (Afzal, 2004). In Pakistan's history, share of agricultural sector to GDP was 60 percent in 1949-1950 that decreased to 30 percent in 1978-1979 and further to 20 percent in 2006-2007. But it is still the largest single component of total GDP. It absorbs nearly 43.1 percent of employed labour force. Agriculture sector has grown at an average rate of 4.1 percent per annum since 2002-2003 and experienced continuous variations from 6.5 percent to 1.1 percent from 2002-2003 to 2007-2008 as given in Table 1 (Ministry of Finance Division, 2009).

Agriculture sector has been also the great source of export earnings. Most of the economists are of the opinion that agriculture growth should be pursued within the framework of comprehensive national plan and should be integrated with the growth of other sectors. Agriculture sector is major source of food requirements of 67.5 percent rural population and 32.5 percent urban population besides provision of raw material to the industrial sector.

Table 1

Agriculture growth rate

Years	Growth (percent)	Years	Growth (percent)	Years	Growth (percent)
1999-2000	6.1	2002-2003	4.1	2005-2006	6.3
2000-2001	-2.2	2003-2004	2.4	2006-2007	4.1
2001-2002	0.1	2004-2005	6.5	2007-2008	1.1

Source: Federal Bureau of Statistics.

The growth of agriculture sector in Pakistan always was low compared to developed economies. This growth has been the major component of the growth of industrial sector also. In USA, agriculture growth provided the necessary ignition to industrial development in the early period and agriculture was not sidelined as the industrial development picked up speed and momentum.

Therefore, this growth had required the use of chemical fertilizers, high yielding varieties of seeds, better irrigation, and mechanical equipments, which in turns had required the credit availability to the farmers.

The farmers in the use of modern methods of production, have to face the financial constraints in order to purchase these inputs. Agriculture credit, both by Agricultural Development Bank of Pakistan (ADBP) and commercial banks, expanded over the decade 1400 percent and 460 percent, respectively. Mechanization picked up great momentum as cumulative number of imported tractors increased by 462 percent. Pest control measures were substantially

strengthened as it was obvious from the import of pesticides which was reported increased more than 135 percent. Fertilizer consumption increased by 128 percent over the decade. Area irrigated by tubewell water increased from 2.56 million hectares in 1991 to 3.82 million hectares in 2007-2008 (Ministry of Finance Division, 2008).

1.1. Importance of credit

Small farmers, large farmers and non-farm population in agriculture sector all suffer from the problem of lacking in capital. After green revolution, and technological changes in this sector, the requirement of credit has increased to buy modern inputs. Large farmers also need the credit for the lumpy investment in this sector. Small farmers usually face cumbersome procedure and collateral problems in availing credit. These impediments had hardly hit the tenants and share croppers who did not own land. Other problems like providing credit to targeted farmers did not increase the number of farmers benefiting from this facility

Despite these problems, the role for financial institutions has been significant and emerged in the wake of technological changes in agriculture sector. In the past subsidized interest rate policy and share reserved for the poor farmers remained ineffective due to financial unsustainability in the loans portfolios. State Bank of Pakistan has introduced banking reforms and revised policies from time to time. Mandatory credit targets by Federal Bank for Cooperatives and by commercial banks were fixed for small farmers. Agriculture Development Bank of Pakistan established in 1961 has been playing its role to carter the need of poor farmers and non-farmers. Under the direction of government ADBP introduced special credit schemes, supervised Agricultural Credit System, and five loan windows. These loan windows provided Development Loans, Production Loans, Cottage Industry Loans, Agri-business Loans, and Off-farm Income Generating Loans. State Bank policy for giving subsidy on agriculture loans has been successful in the view of enabling the farmers to buy modern inputs and machinery and at the same time has been impediment in the efforts of Cooperative Societies and ADBP to mobilize deposits from their customers.

1.2. Impact of agricultural credit on production

In Pakistan not much work has been done in past to see the impact of credit on agricultural output. Some of the major studies in this regard done by Malik et al. (1985), Zuberi (1989), Sarfraz and Akhtar (1992), Sarfraz (1995), Iqbal et al. (2003), Afzal (2004).

The role of credit in agriculture sector has been significant. In modern agriculture, farming has become now complex and needs careful planning to achieve success, i.e. agriculture is no more a mode of life rather it has changed into commercial farming. Transformation of traditional agriculture sector to modern commercialization farming needs credit availability. Though there is a significant increase in borrowing from formal sources from 1985 onwards when mark-up free loans were made available to farmers. Rural credit reaches few rural households, and formal sources provide credit to only a small proportion of rural households. Only 32 percent of all rural households take loans, of these a mere 10 percent borrowing is from institutional sources. Not surprisingly, there is a positive correlation between wealth and access to source of credit. Richer households in the rural areas have better access to institutional sources, which are also cheaper, while poor households depend primarily on more expensive, non institutional credit.

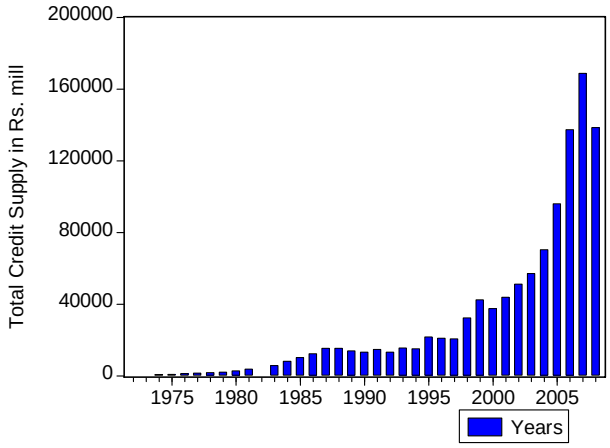

Figure 1. *Total credit supply by all institutions*

The share of ZTBL in supply of total agricultural credit by institutions increased and was 29.9 percent during (July- March) 2008-2009. While the share of other institutions in total credit disbursement reduced as compared to ZTBL. The performance of commercial banks, however, in providing credit has surpassed the share of ZTBL was 48.9 percent of the total credit disbursed during July-March 2008-2009 (Ministry of Finance Division, 2009).

It was also found no consistency in facilitating short-term credit from 1985 to 2005 as well as in case of medium term credit. However, long term credit facility given to farmers has shown consistently declining trend in percentage terms from 74.4 in year 1983-1984 to 24.2 in year 2003. Further its

share in supply of total agricultural credit by institutions increased and was 29.9 percent in July-March 2008-2009 (Ministry of Finance Division, 2009). The reason behind this declining percentage from the year 1983-1984 to 2008-1909 is to focus more on targeted loans to small farmers.

Tacccavi loans are provided through the Provincial Revenue Department of the Government. Provision of these loans is in the hands of provinces. In Punjab it grew at the rate of 41 percent from 1975-1976 to 2007-2008. But the situation for the rest of the provinces is entirely different. In Sindh loans are non-existent since 1993-1994. In NWFP, it was provided up till 1978-1979. In Balochistan, it has been showing non-continuous flow. The overall situation is showing declining trend from 1975-1976 till now. This kind of loans depends upon the support of federal government to the provincial governments (Ministry of Finance Division of Pakistan, 2009).

Sarwar et al. (1985) studied that there were two sources of the credit or cash for farmers, i.e. institutional and non-institutional. The non-institutional source was neither adequate nor reliable for the cash needs of the farmers. Other one source that is institutional credit that operates through its three major institutions, namely ADBP, commercial banks, and cooperatives. The credit advanced through these institutions increased since 1970s and the number of beneficiaries had also been reported to be growing till 1984-1985 but study shown its dissatisfaction regarding the rightness of these loan operations. Malik et al. (1989) studied the significance of institutional source of credit, which increased their credit facilities to the small farmers especially the credit from the ADBP, commercial banks, and cooperatives. While the non-institutional credit showed downward trend, especially loans from relatives and friends. Despite all the facts the results in this study showed, very little access of credit for small farmers. Khan et al. (1990) found that small farmers in Pakistan are 74 percent of the total number of farmers but the area they possess is only 34 percent of the total cultivable land. Malik et al. (1992) studied the disbursement of credit for improved seeds, water and tractors for the period of 1971 to 1987 and found these inputs grew at rates ranging from 3 percent to 15 percent per annum. The performance of disbursement of credit has been impressive that grew at the rate of 28 percent. This study also found the determinants of the probability of access to institutional credit.

Zuberi (1989) studied and estimated the production function for the agriculture sector and concluded that the impact of institutional credit comes through the financing of the seed and fertilizers. The role of financing fixed investment was insignificant. Shearer et al. (1990) pointed out that the type of farm has tended to emerge the liberalized agriculture sectors of Latin America is the capitalized family farm, large enough to overcome capital constraints but

small enough to have efficient labour supervision. Qureshi and Shah (1992) observed that the institutional credit affects agricultural output also through financing of capital investment. They found that the responsiveness of agriculture output is larger to institutional credit than that of output to fertilizer. Sarfraz and Akhtar (1992) attempted to review farm credit policy in Pakistan in relation to its impact on agricultural growth. This study found that credit is not significantly related to output but indirectly through buying inputs credit is impacting on output. This study also focused the role of commercial banks in providing loans to farmers. Udry (1994) concluded in the study the market imperfection and its failure in the agriculture sector regarding availability of credit to the farmers. This study analyzed the households in Northern Nigeria borrow more when they face an adverse shock and they lend more when they attain some positive shock. These two models of this paper analyzed Walrasian competitive model and, in second, imperfect market situation in rural credit market. Both models focused on the significance of credit payments to a farmers but a Pareto efficient risk-pooling equilibrium was not observed. Ebrahim (2000) focused the role of agriculture cooperatives in Indian's economic development as a means of encouraging large scale agriculture production while enhancing community cooperation and equity. Khandker and Faruquee (2002) described the character of cost effectiveness in providing of farm credit provided by Agriculture Development Bank of Pakistan. Dirk (2002) analyzed one of the bottlenecks of successful transformation in many sector, and particularly the agricultural sector in Central European post-socialist countries has been and continues to be the underdevelopment of the financial sector (OECD, 2001, Rother, 1999, World Bank, 1995). Now the phase of large macroeconomic changes is followed by one of adjustment and consolidation in the micro economic sphere, banks with their financial and governance potential could play a vital role in reorganizing the agricultural sector towards a long-term viable structure. Iqbal et al. (2003) used regression analysis approach with Cobb-Douglas production function to estimate the impact of institutional credit on agriculture production in Pakistan. The study suggested the growth of institutional credit and this credit especially should be provided to small farmers.

Sidhu and Vatta (2008) concluded that first the demand for agricultural credit in each state/region be assessed, depending on crop patterns, current inputs and capital requirements in relation to targeted output growth-rate. Waqar et al. (2008) attempted to focus on the constraints of agricultural credit and borrowing behavior of farmers in rural Punjab. This study found that despite the introduction of various agricultural credit programmes through institutional sources, the impact of credit polices has been limited.

2. Model, data and estimation

This study used annual data for the period 1972 to 2008. All the data were obtained from Ministry of Finance Division (2008), Statistical year Book of Pakistan (2008), Agriculture Statistics of Pakistan (2008), and World Development Indicators (2007). Following Iqbal et al. (2003) Aryectey (1997) and Mpuga (2004) attempted to characterize the rural financial markets, as formal and informal. Our objective is to study the impact of the credit on agricultural value added.

2.1. Variables of study

Y_t = Agricultural out put (value added) measured in terms of million rupees;
L_t = Cropped land in million hectares;
La_t = Labour force in million;
Cr_t = Credit disbursement from all institutions in million rupees;
W_t = Water availability in million acre feet;
D_t = Dummy variable for bad years (dummy=1 for years 1974-1975, 1983-1984, 1992-1993, 2000-2001; Else=0).

2.2. Specification of model

Conventionally, agricultural output function depends upon the inputs like land, labour, capital and quantities of other inputs such as water, fertilizer, pesticides etc. However, in this study agricultural output (value added) is used as dependent variable and output is assumed to be a function of availability of credit, labour force, cropped area, water and all those inputs which are purchased with the help of credit such as seeds, fertilizers, tractors and tubewells. But, instead of taking seeds, fertilizers, tractors and tubewells, only credit was taken as this is used to buy all these inputs. Based on the above discussion the model showing the impact of institutional credit on agricultural output has been developed as:

$$Y_t = f(L_t, La_t, Cr_t, W_{t,t}, D_t) + \mu_t \ldots \quad (1)$$
$$t = 1,2,3\ldots\ldots\ldots$$

In the above model, agricultural output was used as a dependent variable and it is assumed to be the function of cropped area, labour, agricultural credit, water, and dummy variable. While other inputs like improved seeds, fertilizers, tractors, and tubewells that may be purchased by using credit money were

dropped and agricultural credit was used as one of the explanatory variables. Agricultural credit, in fact, indirectly affects the agricultural output through purchasing these inputs. Therefore, this study has included credit as an explanatory variable in the model on the argument of Carter (1989) and Iqbal *et al.* (2003) and Afzal (2005). This credit affects the performance of agricultural output in these ways:

2.3. Methodology

Our study is based on time series data. Normally time series data have the problem of non stationarity. There are two approaches to check the problem of stationarity, i.e. traditional and modern approaches. In traditional approach correlogram is used to check the stationarity of data. In modern approach Augmented Dicky Fuller test (ADF) and Phillips Perron test (PP) are used. Since credit is being disbursed in buying the expensive inputs like tractors, tube wells, seeds, and fertilizers therefore; it was better justified to just see the long run impact and causality of credit, labour, cropped area and water with agriculture output.

2.4. Unit root test

This can be done by using the Augmented Dickey-Fuller (ADF) test for the presence of unit roots under the alternative hypothesis that the time series in question is stationary around the following specifications. A first specification includes the intercept but excludes the trend term. The second specification includes both the trend term and constant term.

ADF test for unit root is based on following regression equations.

At constant

$$(1\text{-}L)X_t=\alpha + \beta X_{t\text{-}1} + \sum_{i=1}^{k} \theta_i (1\text{-}L)x_{t\text{-}1} + \acute{\varepsilon}_t \ldots \quad (2)$$

At constant and trend

$$(1\text{-}L)X_t=\alpha + \beta X_{t\text{-}1} + \gamma T + \sum_{i=1}^{k} \theta_i (1\text{-}L)x_{t\text{-}1} + \acute{\varepsilon}_t \ldots \quad (3)$$

where>

L is a lag operator, t denotes time trend, and $\acute{\varepsilon}_t$ is a white noise. For this purpose Schwartz criterion was used to choose the number of optimal lags (k). The null hypothesis is based on a test of $\beta = 0$; i.e. the variable has a unit root. In addition, the estimated results of a unit root through Phillips- Perron (pp) test are included.

H_o*: $\beta=0$; (Y_t is Non-Stationary) has a unit root*
H_a*: $\beta<0$; (Y_t is a Stationary) has not a unit root.*

Reject the null hypothesis if the t-statistic is less than the critical value in real terms. If null hypothesis cannot be rejected, it implies that the time series is non-stationary at the level and therefore it requires taking first or higher order of differencing of the level data to establish stationary. The optimal lag length is also required to insure the residuals not to be correlated in the ADF regression.

2.5. ARDL model specification

There are several methods available to test for the existence of the long run equilibrium relationship among time series variables. The cointegration approach used by (Engle, Granger, 1987) to test the long run relationship, fully modified OLS procedure of (Phillips, Hansen's, 1990) maximum likelihood based on Johansen-Juselius (1990). This approach is used when variables in the model are integrated of same order and further extended by Pesaran. This test has a problem of low power and is not good for small sample. Therefore, the ARDL was approached by Pesaran and Shin (1990) and further extended by Pesaran et al. (2001). This is used for multivariate case, for several reasons. Firstly, the bounds testing procedure is simple as opposed to other multivariate cointegration techniques such as proposed by Johansen and Juselius (1990). The ARDL approach which requires the dependent variable or regressor to be integrated at I(1) is advantageous because the explanatory variables or regressands can either be purely integrated at I(1) or I(0) or a mix of both. Secondly, the bounds testing procedure does not require the pre-testing of the variables included in the model for unit roots unlike other techniques such as the Johansen approach. Thirdly, the test is relatively more efficient in small or finite sample data sizes as is the case in this study. The procedure will, however, crash in the presence of I(2) series. Following Pesaran et al. (2001), as summarised in Choong et al. (2005), we apply the bounds test procedure by modeling the long-run equation (4) as a general vector autoregressive (VAR) model of order *p, in* Z_t:

$$z_t = c_o + \alpha \times T + \sum_{\iota=1}^{p} \beta\, i \times zt_{-i} + \varepsilon_t \,,\ T = 1, 2\ldots\ldots n \ \ldots \qquad (4)$$

with c_o represents intercepts, and α denotes $(p+1)$-vector of trend coefficients. Pesaran et al**.** (2001) further derived the following vector equilibrium correction model (VECM) corresponding to (4).

$$(1\text{-L})z_t = c_o + \alpha \times T + \beta_i \times z_{t-1} + \sum_{i=1}^{p-1} \gamma_i (1\text{-L}) \times z_{t-i} + \varepsilon_t , \ldots \quad (5)$$

$$T = 1, 2\ldots, \ldots n$$

where (p) is the order of autoregressive lags (n), (1-L) =Δ is a difference operator, (k +1)x(k+1)-matrices $\beta = I_{k+1} + \sum_{\iota=1}^{p-1} \psi_i$ and $\gamma_i = - \sum_{j=\iota+1}^{\rho-1} \psi_j$, $i=1,2\ldots, \ldots$ p-1 and contains the long run multipliers and short run dynamics coefficients of VECM. Z_t is the vector of variables Y_t, and X_t respectively. y_t is an I(1) dependent variable defined as Y_t and $X_t = [L_{t,}, La_t, Cr_t, W_t]$. In model vector matrix of forcing I(0) and (1) regressors as already defined with multivariate identically and independently *(i.i.d)* zero mean error vector $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})$ and a homoskedastic process.

3. Result and discussion

The DF/ADF (Dickey Fuller) and (Augmented Dickey Fuller) DF/ADF unit root test are employed to test the stationarity of all variables in the models. Phillips and Perron (1988) have suggested a nonparametric test as an alternative to the ADF test. The aim of this is to consider autoregressive and/or hetroskedastic error terms in relation. The test statistic for the hypotheses ρ = 1 is, however, rather adjusted by a non-parametric estimate of the variance of the estimated parametric ρ that takes the autocorrelation of the residual into account.

Table 2

DF/ADF (At level)

Variables	Constant		Constant & trend	
$\ln Cr_t$	-3.6394***	(0)	-5.3099***	(0)
$\ln L_t$	-2.40566	(1)	-2.2217	(1)
$\ln Y_t$	-1.22890	(1)	-5.09905***	(1)
$\ln La_t$	-4.20905***	(0)	-0.743715	(0)
$\ln W_t$	-0.1856	(0)	-1.725371	(0)

Source: Author's calculations.

Notes: The null hypothesis is that series is non-stationarity, or contains a unit root. The rejection of null hypothesis for DF/ADF test is based on the Mackinnon critical values and numbers in parentheses indicate number of lags (k) based on Schwarz information criterion (SIC).

*** Indicates the rejection of null hypothesis of non-stationary at 1%, 5%, 10% level of significance.

** Indicates the rejection of null hypothesis of non-stationary at 5%, 10% level of significance.

* Indicates the rejection of null hypothesis of non-stationary at 10% level of significance.

Table 3

Dickey Fuller/Augmented Dickey Fuller (At first difference)

Variables	Constant	Constant & trend
$lnCr_t$	-4.64243*** (0)	-4.56701*** (0)
lnL_t	-9.90560*** (0)	-10.3396*** (0)
lnY_t	-9.31607*** (0)	-9.20534*** (0)
$lnLa_t$	-3.57576** (0)	-4.4185*** (0)
lnW_t	-5.40814*** (0)	-5.444206*** (0)

Source: Author's calculations.

Notes: The null hypothesis is that series is non-stationarity, or contains a unit root. The rejection of null hypothesis for DF/ADF test is based on the Mackinnon critical values and numbers in parentheses indicate number of lags (k) based on Schwarz information criterion (SIC).

*** Indicates the rejection of null hypothesis of non-stationary at 1%, 5%, 10% level of significance.

Table 4

Phillips Perron (At level)

Variables	Constant	Constant & trend
$lnCr_t$	-4.44023***(2)	-4.9535***(3)
lnL_t	-2.29203* (0)	-4.9462***(3)
lnY_t	4.38518*** (2)	-6.5040***(8)
$lnLa_t$	-4.2523*** (5)	-0.65904 (6)
lnW_t	.394826 (6)	-1.75552 (3)

Source: Author's calculations.

*** Indicates the rejection of null hypothesis of non-stationary at 1%, 5%, 10% level of significance.

* Indicates the rejection of null hypothesis of non-stationary at 10% level of significance.

Table 5

Phillips Perron (At first difference)

Variables	Constant	Constant & trend
$lnCr_t$	-4.43760*** (0)	-4.6945*** (1)
lnL_t	-17.812*** (20)	-28.303*** (29)
lnY_t	31.5291*** (29)	-30.38 *** (29)
$lnLa_t$	-3.5737** (0)	-4.3831*** (5)
lnW_t	-5.389787** (6)	-5.570174*** (8)

Source: Author's calculation.

*** Indicates the rejection of null hypothesis of non-stationary at 1%, 5%, 10% level of significance.

** Indicates the rejection of null hypothesis of non-stationary at 5%, 10% level of significance.

3.1. Cointegration results

The study was aimed to analyse the impact of credit on agricultural out put. To this end, the study of the relationship among time series is essential in capturing the true impact. The cointegration is related with long run equilibrium between the two or more than two variables. The economic interpretation is that there should be link between two or more than two variables in the long run, even though series of observation of variables may deviate from the equilibrium. But they will move towards equilibrium in the long run (Harris, Sollis, 2003).

There are many approaches to conduct cointegration tests like Engle-Granger (1987), maximum likelihood based Johansen (1991, 1995) and Johansen –Juselius (1990) test.

By applying unit root test, we already had drawn the conclusion of the stationarity of variables on level and first difference. This is the justification of applying ARDL approach to cointegration, apart from this due to low power and other problems associated with Engle-Granger (1990), Johansen-Juselius (1990). The hypothesis of this study can be examined using F-statistic. The upper and lower bonds value for F-statistic in the model depends upon whether it contains trend or intercept or both or any one of them as specified by Pesaran et al. (2001). Moreover, whether they are taken as restricted intercept and trend or any one of them means that deviation of intercept and trend from its mean or unrestricted intercept and trend or any one of them means that no deviation of intercept and trend from its mean.

In this study, we have relatively small sample size of 37 observations with their critical values that deviates from the critical values reported in Pesaran et al. (2001). In the first step, the study calculated exact critical bounds values according to our sample sizes with seven regressors, for the F-statistic. In the second step study employed the model with an intercept and trend, which is the case (5) in Pesaran et al. (2001). If our calculated F-statistic falls outside the critical bounds, a conclusive decision can be made regarding cointegration. If calculated F-statistic is higher than upper bound of the critical values then the null hypotheses of no cointegration is rejected. If the calculated F-statistic is lower than the lower bound then null hypotheses of no cointegration is not rejected. If calculated F-statistic falls within upper and lower bound then it is inconclusive.

Table 6

Unrestricted intercept and unrestricted trend

VARIABLES (when taken as a dependent)	F-Statistics	At 0.100		At 0.050		At 0.010	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
$dlnY_t$	7.19***	2.38	3.45	2.69	3.83	3.34	4.63
dLL_t	------	2.38	3.45	2.69	3.83	3.34	4.63
$dlnCr_t$	2.313	2.38	3.45	2.69	3.83	3.34	4.63
$dlnLa_t$	3.77**	2.38	3.45	2.69	3.83	3.34	4.63
$dlnWa_t$	4.406***	2.38	3.45	2.69	3.83	3.34	4.63

Source: Author's calculation.

** Means at 5%, 10% significant levels reject the null hypotheses of no cointegration.

*** Means at 1%, 5%, 10% significant level reject the null hypotheses of no cointegration.

The above Table 6 depicts the (Wald) F-statistic values to consider whether there is long run relationship or not through cointegration approach. Among the variables, when agricultural value added, cropped area and labour were shown as a dependent variable then their relative F-statistic values were FY_t =7.19, Fla_t=3.77 and FWa_t =4.406, respectively. From these results it is clear that LY_t is a significant as its F-statistic values crosses the upper bound value at 5% and 10%. This shows the long run relationship is found and witnessed the cointegration when agricultural value added was a dependent variable. While labour and water also have cointegration as their F-Statistic crossed the upper bound and significant at 1%, 5% and 10%, while the F-Statistic for dLL_t is undefined due to its zero lag. On the other hand FCr_t= 2.313 falls with in upper and lower bond which shows no cointegration.

Table 7

Estimated long run coefficients using the ARDL approach ARDL (1,0,1,3,2) selected based on Schwartz Bayesian criterion (Dependent variable is $dlnY_t$)

Regressor	Coefficient	Standard Error	T-Ratio	[Prob]
$dlnL_t$	0.23386***	0.13420	1.7426	[0.000]
$dlnCr_t$	0.1243	0.14430	0.855	[0.480]
$dlnLa_t$	1.288***	0.2166	5.945	[0.000]
$dlnW_t$	0.87795***	0.14893	5.8962	[0.000]
C	2.1156***	0.2457	8.6073	[0.002]
D_t	-0.20688**	0.083882	-2.4663	[0.024]
T	0.081229**	0.034271	2.3702	[0.029]
R-Square 0.98062	Adjusted R Squared 0.96339		DW-statistic 2.0023	

Source: Author's calculation.

Note: *, ** and *** denote rejection of the null hypothesis of insignificance at the 0.10, 0.05 and 0.01 level, respectively.

Table 7 presents the results for long-run coefficient estimated using the ARDL estimator. It is evident that land area (cropped area) is highly significant and showing to enhance the agricultural value added. The land as a basic input shows its coefficient 0.23386; this means 1% increase in cropped area will enhance the output almost by 0.23%. The agricultural credit is showing right positive relation with agricultural output as it is used to buy various inputs but indirectly affects the output. The credit is statistically insignificant with coefficient of 0.12431. This means 1% increase in credit will increase the agricultural output almost by 0.12%. The empirical results in this study are contradicted with the results carried out in most of the past studies such as Iqbal et al. (2003), Afzal (2005). Most of these studies in the past used OLS regression approach but this study followed ARDL approach to cointegration in order to estimate the short and long-run relationship in the model with desired variables. OLS regression approach gives spurious results in time series analysis because of stationarity problem in data. Therefore in the past studies of OLS regression approach results about the significance of credit were not much reliable. In this study the insignificant coefficient of credit is the result of many implications attached with the constraints and disbursement of this credit on the part of the poor farmers. These were discussed in detail in the next chapter. Labour in agricultural sector has a significant role as t-statistic is highly significant and the coefficient of labour shows that on average 1% increase in labour will increase the output by 1.2%. The significant and positive coefficient of water 0.87 shows that on average 1% increase in water increases the output by 0.87%. The negative coefficient of dummy variable shows that natural epidemics and bad weather conditions decreases output. In this model R square is 0.98 which explains that 0.98 percent variation in agricultural output is due to independent variables.

Table 8

Error correction representation for the selected ARDL model ARDL (1,0,1,3,2) selected based on Schwartz Bayesian criterion (Dependent variable is $dlnY_t$)

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
$dlnL_t$	0.058756*	0.038051	1.867[.0175]
$dlnCr_t$	0.015305*	0.00893	1.7138[.099]
$dlnCr_{t-1}$	0.01325**	0.00607	2.1822[.039]
$dlnLa_t$	1.3397***	0.35875	3.7343[.009]
$dlnW_t$	0.10781*	0.05555	1.9406[.064]
$dlnW_{t-1}$	0.28322***	0.06009	4.7129[.000]
$dlnW_{t-2}$	0.071630	0.04680	1.5303[.139]
C	0.53153***	0.10821	4.912[.000]
D_t	0.26353**	.096154	2.7408[.012]
T	-0.10347	.045062	-2.2962[.032]
ecm(-1)	-1.1539	.11523	-10.0147[.000]

Source: Author's calculation.

Note: *, ** and *** denote rejection of the null hypothesis of insignificance at the 0.10, 0.05 and 0.01 level respectively.

When conitegration is found in the long run equations through F-Statistic, then we find short-run analysis through error correction term Bannerjee et al. (1998). The coefficient of ECT_{t-1} measures the speed of adjustment of the model back to long-run equilibrium after disequilibrium which occurs due to shocks. The estimated coefficient of ECT_{t-1} (-1.1539) is highly significant and correct negative sign indicates the convergence or movement back to the equilibrium within a year Bannerjee et al. (1998). This implies that time period of adjustment is approximately nine months 1/1.1539 =0.86. The estimated coefficient of ECT_{t-1} (-1.1539) is highly significant also shows that cointegration is found in variables i.e. value added, labour, and water.

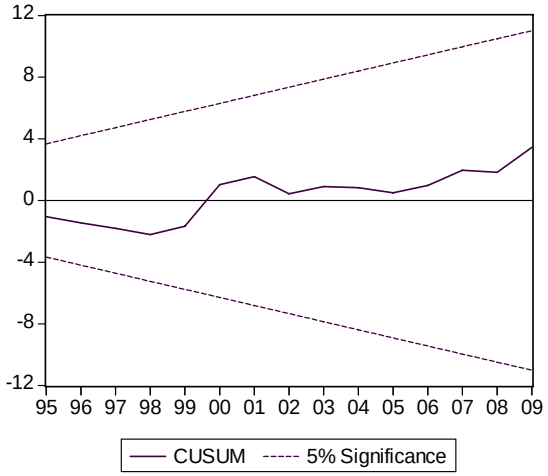

Figure 2. *CUSUM at 5% significance*

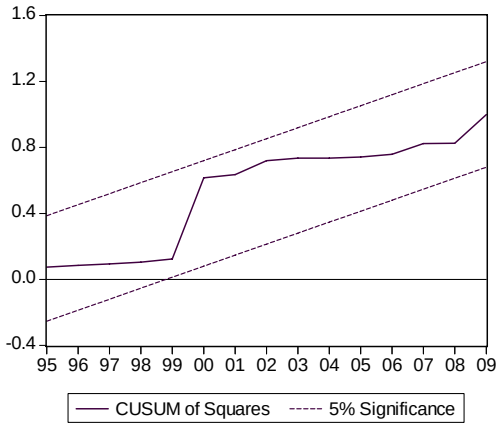

Figure 3. *CUSUM of SQUARE at 5% significance*

The structural stability of the equations is observed through the cumulative sum (CUSUM) and cumulative sum of squares test on recursive residuals. The diagonostic tests detect systematic changes in the regression coefficients as applied. Whereas the latter CUSUM and CUSUMQ detect sudden changes from the constancy of the regression coefficients. The results in Figures 2 and 3, show that the test statistics are within 5% confidence interval band. This suggests that estimated model is stable over time.

In the next step study analysis the impacts on agricultural output of those inputs which are bought by credit e.g. tubewells, tractors, fertilizers and seeds. This is represented in model form as

$$\ln Y_t = \beta_0 + \beta_1 \times \ln Tw_t + \beta_2 \times \ln Tr_t + \beta_3 \times lnSd_t + \beta_4 \times \ln Fr_t + \mu_{1t} \ldots \quad (6)$$

The objective of this model is to check that which variable has a greater impact on agricultural output as all these are bought against credit. The results of this estimation are given in the Table 9.

Table 9

When $\ln Y_t$ is dependent variable

Variables	Coefficient	Std. Error	t-Statistic	Prob.
$\ln Tr_t$	0.074646***	0.0167713	4.450841	0.0001
$\ln Tw_t$	0.018291***	0.245126	0.074618	0.0034
$\ln Sd_t$	0.702684***	0.238666	2.944218	0.0059
$\ln Fr_t$	0.015174	0.233262	0.065053	0.9485

Source: Author's calculation.

Note: *, ** and *** means 10%, 5% and 1% level of significance respectively.

Table 10

Significance of model

R-Squared	Adj R-Squared	Durbin-watson
0.86	0.85	1.88202

From Table 9 it is obvious that tractors, tubewells and seeds are showing their significant impact on agricultural output. R-squared value is 0.85, which means 85 percent variation in the agricultural output is due to these variables. The coefficient of tractor show that one percent increase in tractor will lead to increase in output by 0.074 percent in million rupees and one percent increase in tubewell will increase the output by 0.018 percent in million rupees. These all inputs are bought by credit and showing significant impact on agricultural output. Therefore, study requires checking the causality between all these inputs and credit. For this Granger causality based on Toda Yamamoto (1995) was used. A new method has proposed by Toda and Yamamoto (1995), for causal

inference based on augmented level VAR with integrated and cointegrated processes. The advantage of using this procedure is that it is not necessary to pretest the variables for the integration and cointegration properties and therefore avoids the possible pretest biases.

This study requires two test procedures. First step includes determination of the lag length (k) and the maximum order of integration (d) of the variables in the system. Schwartz's Bayesian Information Criterion (BIC) is used to determine the appropriate lag structure of the VAR. Given VAR (k) selected, and the order of integration d(max) is determined, a levels VAR can then be estimated with a total of k+d(max) lags. In the second step Wald statistic is applied to the first k VAR coefficient matrix (but not all lagged coefficients) to make Granger causal inference.

Toda and Yamamoto (1995) augmented Granger causality test by estimating a two equation system using the Seemingly Unrelated Regressions (SUR) technique. Rambaldi and Doran (1996) showed that the Wald test improves efficiency when SUR models are used in the estimation. So, the model can be specified as follows:

$$Y_t = \alpha_1 + \sum_{i=1}^{k+d} \gamma_{1i} Y_{t-i} + \sum_{t-i}^{k+d} \gamma_{2i} X_{t-i} + \varepsilon_{yt} \ldots \quad (7)$$

$$X_t = \alpha_2 + \sum_{i=1}^{k+d} \delta_{1i} Y_{t-i} + \sum_{t-i}^{k+d} \delta_{2i} X_{t-i} + \varepsilon_{xt} \ldots \quad (8)$$

Where

k = Optimal lag order of VAR;

d = Maximal order of integration of the series in the system;

ε_{yt} and ε_{xt} are error terms that are assumed to be white noise.

The results of Granger based Toda Yamamoto are given in the Table 11.

Table 11

Causality Results

Dependent variable	Independent variable	Chi-sq	df	Prob
$lnTw_t$**	$lnCr_t$	7.2040	3	0.022
$lnTr_t$*	$lnCr_t$	3.1907	3	0.075
$lnSd_t$	$lnCr_t$	0.6245	3	0.890
$lnFr_t$**	$lnCr_t$	9.5916	3	0.022

Source: author's calculation.

**,* Means at 5%, 10% significant level and 10% significane level.

Results in the Table 11 show that tubewells, and fertilizers have strong causality with credit at 5% and 10% level of significance, while tractor has causality at 10% level of significance. Tractors and tubewells both have also greater impact on agricultural output, therefore credit also play its indirect role to enhance agricultural output as it has strong causality with tubewells, fertilizers and tractor. While rests of the variables that have no causality were excluded from table in order to summarize it.

4. Conclusion

This study investigated the positive and significant role of credit when it is used indirectly. The study also shows that long run coefficient of cropped area is highly significant because the land is a basic input to agricultural sector. This shows as the intensity ratio of land increases it increases the output of this sector. The empirical results show in the Table 11 that directly credit has positive relation with agricultural output but has insignificant impact of credit on agricultural output and, practically, there is no sense of the direct use of credit. Credit always helps to buy various inputs for this sector, therefore it has indirect role.

The role of institutional credit is more important as it is a source of providing different agricultural inputs which has strong impact on productivity. Our study suggested that agricultural output is enhanced via three inputs tractors, tubewells, and seeds. While credit plays important role in providing tractors and tubewells to this sector. The study also shows that long run coefficient of cropped area is highly significant because the land is a basic input to agricultural sector. This shows as the intensity ratio of land increases it increases the output of this sector. The coefficients of labour and water are also highly significant and positive. These results are consistent with the previous studies.

5. Policy recommendations

On the basis of above study it can be concluded that agriculture credit itself cannot play any direct role in enhancing the output rather indirectly helps in the growth of this sector through buying various modern inputs. Therefore, following policies are suggested.

- The base of agriculture credit should be enhanced to the large proportion of rural population; especially small farmers should be focused by commercial banks.

- Credit is like a capital input but this is used indirectly in agriculture sector. Therefore, it is suggested to increase its supply when land, water labour is increased, there will be rising demand for the use of machinery, seeds and fertilizers which can only be bought by credit.
- This is found that credit was given to either targeted groups or constraints for the poor farmers have been impediment in the way of its effective role. On these bases, study recommends to focus small farmers and to make easier conditions to avail credit from financial institutions.
- The supervised credit schemes by financial institutions provided credit to the small farmers in limited quantity as it was discussed in under the head of credit disbursed by size of holding. Therefore subsidized credit should be given more to the small size holding.
- To make the loan more productive special instructions and supervision should be carried out by loan issuing authorities.
- As study found that tubewell and tractor play their important role in enhancing agricultural output, therefore special loans should given to the farmers to buy these inputs or it should be directly given to the farmers on easy installments.

For the sustainable growth of agricultural sector as it contributes major proportion in total GDP of Pakistan, the credit must be link with the supply of and its disbursement for agricultural inputs. Credit itself cannot affect productivity, rather through the provisions of modern inputs.

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The Management of Waste Containing Asbestos in Romania and the European Union

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Abstract. *The complex problem of waste management caused it to be claimed by an increasing number of disciplines in the last period, coming to the conclusion that many times such an inter- and pluri-disciplinary effort is necessary in order to reach to the expected results. Romania has a significant quantity of asbestos content wastes, as a consequence of the fact that no recycling technologies apply to them, the applicability rate being very low also at international level. The polybest is the solution offered for recycling and recovery of asbocement through a processing technology ensuring the neutralization of the noxious factors.*

Keywords: wastes; asbestos; management of waste containing astestos; inertization technologies; polybest.

JEL Codes: Q53, Q56.
REL Codes: 15B, 15C.

1. Introduction

Following the studies which proved the noxious effects of asbestos on human health, several member states of the European Union implemented their procedures giving priority to the withdrawal from usage of the asbestos containing materials.

Asbestos as filling/reinforcement material has the role to improve the physical – chemical properties and the workability of the polymeric material. Its performances are comparable with those of other fibrous materials, such as glass and carbon. As an effect of these characteristics, asbestos and the composite materials with asbestos filling/reinforcement were intensely used mainly for sealing and thermal, fire, mechanical, noise insulations etc. Until the beginning of the '90s, asbestos cement held a major place in the production of asbestos reinforced composites. The asbestos reinforced polymeric composites held a more modest place due to the preference – even since that time – for glass fibers.

Asbestos is a forbidden material at this moment, the Government Decision no. 124/2003 regarding the prevention, reduction and control of environment pollution with asbestos, stipulating that "for the purpose of protecting the public health and environment safety, from January 1st 2007 all selling activities and use of asbestos and asbestos containing products are forbidden". Both the Romanian law, respectively the GD no. 124 / 2003 regarding the prevention, reduction and control of environment pollution with asbestos, updated, as well as the European Directive no. 87/217/EEC regarding the prevention and reduction of environment pollution caused by asbestos, provide that asbestos can no longer be produced, sold or handled.

2. The management of wastes containing asbestos in Romania

Regarding the management of wastes containing asbestos, at national level there are only two area storage facilities for hazardous wastes supplying services for third parties, including for the asbestos containing wastes. These cover complex wastes management activities, which include takeover, transport, temporary or final storage, processing, etc. The asbestos containing wastes management operations are performed according to the REACH norms (European Community Regulation on Chemicals and their Safe Use), as follows:

a) Performance of preparing works:

- The takeover of the location which is going to be cleared of pollution (this will be done by a mixed commission made up of the representatives of the beneficiary and those of the contractor, based on protocol);
- The development of the dressing room areas for the personnel, by installing the dressing rooms of developed container type;
- The development of a warehouse for protection equipments of the

personnel, environment protection materials, working equipments, packages, intervention materials, decontamination materials;
- The provision of electric power sources by the installation of an electric panel for supply, necessary for the lighting and heating of the mobile dressing rooms, for the operation of the decontamination equipments;
- The isolation of the working area by the installation of the delimitation fence for the access of the persons and transport equipments;
- Developing the wastes storage area on types of wastes, in the form of a platform, delimited and equipped in order to avoid the soil contamination with dangerous wastes.

b) Performance of dismantling and collection works:
- Protection of soil against contamination with dangerous wastes, by the installation of a protection film;
- Installation of stairs, platforms and scaffolding in the working area;
- Installation of the dangerous waste collection container in the working area, at the base of the roof;
- Performance of successive dismantling operations of asbestos cement. The dismantling operations are made from the ridge (top) of the roof towards the base, on well delimitated areas, so that the wastes reach, by falling from the inclined plan of the roof, directly into the collection container;
- Collection of wastes in separate containers, on each type of waste;
- Recovery of wastes which will fall outside the collection containers, on the areas protected with film;
- Aspiration of the layer of bitumen coated cardboard with professional aspirators for the purpose of collecting the asbestos cement dust remained after the completion of the installation of the asbocement, in the working area of the roof;
- The completion for each building of the dismantling and collection operations of the entire quantity of asbocement, with the cleaning of the entire roof and of the working area around the asbocement wastes and powders building and their taking over in closed containers;
- The continuous taking over of the wastes stored in tightly closed containers, from the working area, immediately after filling them, these being transported to the processing points for elimination;
- The packing of the asbocement wastes into bag type, tight recipients, or into tightly sealed film.

The transport is made under the supervision of an ADR authorized safety advisor (for the road transport of dangerous goods) from the part of the transporter, in order to check the observance of the provisions of the specific law regarding the transport of dangerous substances and the assurance of a

corresponding way of action in emergency situations. The transport from the beneficiary is made with specialized and authorized vehicles, having transport licenses, equipped with ARD kits and intervention means in case of accidental pollution, driven by ADR authorized drivers and accompanied by an ADR authorized safety advisor. In order to make the transports, all the provisions included in the GD no. 1061/2008 regarding the transport of dangerous and non-dangerous wastes on Romanian territory (Delivery note, other necessary documents such as Safety Data Sheets, Security Data Sheets etc.) have to be observed. In this respect, the County Inspectorate for Emergency Situations at local level will be informed, and the latter will establish the covered routes.

c) Final storage of wastes containing asbestos:

This operation is made according to the Implementation Plan of Directive 99/31/CE regarding the storage of wastes. The wastes containing asbestos are treated and stored in separate cells of the dangerous wastes storage facilities. The elimination in fact involves the storage in the form of ultimate waste, respectively the packing into bag type flexible recipients of 1 m^3, waterproof, that are stored in a specially developed asbestos cell, after which, this is covered with a layer of inert material. The ultimate waste has to fulfill compulsorily the following criteria:

- To be found on the list of wastes accepted for storage in the respective storage facility, according to the environment authorization;
- To be accompanied by the necessary documents and to observe the acceptance criteria.

All the results of the acceptance checks are recorded in the operation log (in electronic or written form). If following the acceptance check it results that all the acceptance requirements are not observed, the operator directs the transport of wastes to the storage area.

The visual check is repeated also at unloading the wastes. If following the visual check any doubts appear regarding the observance of the storage requirements or if it is found that there are differences between the accompanying documents and the supplied wastes, then a check is made, the analyzed parameters being established according to the type and aspect of the wastes. In the cases in which check analyses are made, control samples will also be taken which have to be kept for at least one month.

If the wastes are not accepted at storage, the operator of the storage facility immediately informs the generator and the Environment Protection Agency, the transport being isolated and kept in the safety area. All these cases are recorded in the operating log of the storage facility. If the supplied wastes are not according to the data from the accompanying documents, however they are within the acceptance requirements and are accepted for storage, then this will also be mentioned in the operating log and the generator of the wastes as well as the Environment Protection Agency are notified.

3. Technologies of recycling and inertization wastes containing asbestos. The polybest

Due to the toxicity of asbestos and the difficulties met in the management of asbestos content wastes, as well as in the light of the national and international law referring to these problems, many scientific collectives and industrial companies focused their attention on discovering new technologies for making these wastes inert.

The methods for rendering them inert studied so far can be divided into two large categories: *thermal methods and chemical methods*, or combinations of them, and involve chemical and crystalline changes of the different asbestos forms investigated

Following the research made, included in a PhD degree thesis, the author found that the legislation regulating this field (both the national one and the community one) can be subject to changes.

Thus, the main amendment that might be brought to the normative acts in force takes into account two operational issues in the opinion of the author.

The first operational aspect refers to the possibility of handling, breaking, shredding and grinding the historical products containing asbestos which, if operated, handled and processed without human presence (with robots or mechanized processing lines) can be exonerated from the provisions of the current legislation of the European Parliament.

The designing of the operation schemes that described the production of polybest (a safe material from the point of view of toxicity, chemically stable and efficient from an economical point of view for some uses, obtained by an experimental recycling model of the asbocement wastes and of the polymeric wastes in the form of composites with polymeric matrix) and the rendering inert of asbestos were developed exactly in this manner, thus eliminating the risk of exposure to asbestos during the performance of the processes. The ecological material is prepared for entering into the production of plastics and offers the guarantee of safe and long lasting use.

The second operational aspect refers to the inertization of the raw asbestos, with toxic potential, by encapsulating it into polymeric mass, hypothesis in which, at the beginning of the process of obtaining the composite material, the asbestos shaped fraction is included in the category of dangerous substances, and in the final product this is inert and safe for human health, as proved by the tests performed, certified by the determinations of the National Institute of Public Health. Following the tests performed it was proved that Polybest, should it be kept in the most severe conditions of bad weather, would generate an amount of wear residuals of 100 mm^3, in a period of time between five and 71 years, according to the type of polymer in which it was encapsulated. It has to be mentioned that within the tests

made extreme natural atmospheric conditions were simulated, of high intensity and with continuous temporal dynamics, such an abrasion force being extremely unlikely in natural weather conditions, even in the event of occurrence of extreme events – earthquakes, atmospheric turbulences, abundant precipitations. Even in these circumstances, the asbestos wastes have to be manipulated in conditions of complete isolation.

Conclusions

Finding alternatives at storing asbestos cement wastes, which is currently the only sustainable option from an economical point of view, of elimination, has to represent a priority for the European countries, so much the more as the central element of Directive 2008/98/EC regarding wastes is represented by the recycling operation.

Thus, the author considers that the results reported at experimental level regarding the lack of toxicity of the product obtained following the thermal inertization of asbocement or its embedding into the polymeric mass could represent the starting point in the discussions regarding flexibility and adaption of the European and national legal provisions creating the general frame of the asbestos content wastes management.

The manufacturing of Polybest opens the way towards reusing the products containing asbocement in more complex domestic and industrial applications than those existing so far. If, for the moment, the author considers the recycling in products such as snow screens, the exterior fences blades, road pillars etc, in the future the range of these uses can be extended.

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Technological Innovation: Concept, Process, Typology and Implications in the Economy

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Abstract. *Growing interest worldwide to boost innovation in business sector activities, especially the technology, is intended to maintain or increase national economic competitiveness, inclusively as an effect of awareness concerning the effects resulting from economic activity on consumption of resources and environment, which requires design of new patterns of production and consumption. In this paper we review the most important contributions in the literature in terms of the implications of technological innovation in the economy, at the micro- and macroeconomic level, viewing the organization's ability to generate new ideas in support of increasing production, employment and environmental protection, starting from the concepts of innovation, innovation process and, respectively, from the innovation typology analysis.*

Keywords: technological innovation; innovation process; eco-innovation; research and development; economic development.

JEL Code: O33.
REL Code: 18D.

1. Introduction

Which are the implications of innovation in economic and social life? The answer to this question, as one can argue, is based on the meaning of the term innovation. A widespread perception on innovation is one that refers to advanced technology solutions offered by using the latest knowledge. Such innovations are mainly considered to be the result of highly skilled workforce and businesses activity with significant research and development intensity, having close linkages to the most important centers of excellence in the scientific world. The significance of innovation is, however, broader and includes innovations that are not achieved within high-tech industry mentioned above. From this last perspective, innovations do not include only new products or processes, but also cover the improved ones resulted from the so-called low-tech sectors, which may have cumulative economic and social effects as important.

Growing interest worldwide to boost innovative activity of enterprises, especially technological innovation, is intended to maintain or enhance the competitiveness of national economies, but also is a result of awareness of the effects on consumption of resources and environment impact resulted from economic activity, which requires design of new patterns of production and consumption. In this paper, we discuss the ways in which technological innovation contributes to economic development. In the context of this analysis, we look to sustainable development of organizations as a result of their ability to generate new ideas in support of increasing production, employment and environmental protection. Therefore, section 2 is allocated to the concept of technological innovation and innovation process, taking into account attributes recently incorporated into the symbolic reflecting the impact of different types of innovations obtainable on the economic and social life. Since the implications of different types of technological innovation in the economy still comprise a controversial topic in the literature, especially in the empirical one, we consider first to analyze the types of innovations in section 3, from different points of view. In section 4 we outline the theoretical and empirical existing framework regarding the incidence of technological innovation in the economy by reviewing the most important contributions to literature and section 5 concludes.

2. Technological innovation concept and innovation process

The Schumpeterian point of view approaches economic development as a qualitative changes process, as consequences of innovation. Thus, J. Schumpeter addresses innovation as a function of entrepreneurial activity, in which “new

combinations" of existing resources occur. The definition offered by Schumpeter in the *Theory of Economic Development* (1934) is continuing to be referential in associating "new combinations" of production factors of new products and services, introducing new production processes, marketing and business organization.

In principle, the literature operates with distinguishing invention from innovation. For example, F. Malerba (1997) defines *invention* as a new idea, a new scientific discovery or a technological newness (which has not been implemented and diffused), while *innovation* refers to a tradable application of an invention, as a result of invention integration into economic and social practice. Innovation is regarded, therefore, being a result of a process that starts with an idea genesis and continues with its materialization. In the same Schumpeterian context, Oslo Manual (2005) defines innovation to be an activity that produces new or significantly improved goods (products or services), processes, marketing methods or business organization. In this framework, according to Frascati Manual (OECD, 2002), technological innovations comprise new or significantly modified technological products and processes, where *technological* novelty emerges, unlike improvements, from their performance characteristics.

Consequent to afferent processes interrelations, dissociating invention from innovation is not always possible, especially for technological innovation. Nevertheless, the fact that there may be differences even of some decades between the occurrence of innovation and of invention, which reflects different demands of coming over upon an idea and its implementation into practice is known, including due to fact that certain conditions are not fulfilled for diffusing (still insufficient demand, production impossible consequent to lack of input or production complementary factors that are not available yet). In addition, an invention implementation might need, in its turn, supplementary inventions and innovations for the innovation process success.

As K. Pavin (1987, p. 9) notes, "most technologies are complex and are cumulative. They are specific for companies at whose level technologic activity predominantly occurs". While inventions may result from different economic and social environments, innovations are mainly a result of the firm's activity. To be capable to utilize an invention and turn it into innovation, the firm should efficiently combine information, human, financial and material resources and existence of a functional distribution system is needed. From such perspective, the inventor's role differs from that of innovator's (person or organization unit responsible for required factors combination, in Schumpeterian vision named "entrepreneur").

Difficulty to differentiate between invention and innovation also comes from the innovation process continuity, as S.L. Kline and N. Rosenberg (1986, p. 283) were to note: "it is a serious mistake to treat an innovation as if it were a well-defined, homogenous thing that could be identified as entering the economy at a precise date – or becoming available at a precise point of time. The fact is that most important innovations go through drastic changes in their lifetimes – changes that may and often do, totally transform their economic significance. The subsequent improvements in an invention after its first introduction may be vastly more important, economically, than the initial availability of the invention in its original form". Hence, invention can be often an outcome of a long process in which numerous interrelated innovation processes are involved.

Innovation processes do not show the same characteristics regarding financial resources engaged and obtainable outcomes, but present differentiations at the enterprise level according to the innovation type, firm's size or its strategy and experience in innovation area. Diversity of innovative processes generates difficulties in analyzing costs and results of innovation activities by using micro-aggregated data. Therefore, the study of innovative activity of companies is focused on the innovation facilitators and their effects in terms of business competitive advantages obtainable by sector or economy as a whole. Nevertheless, we depict some common features of innovation processes:

- they imply exploring opportunities for achieving new/improved goods (products and services) based upon technical knowledge as well as the market demand change or a combination of the two. Investment efforts of technological innovation predominantly correspond to "development and production engineering, in which knowledge is accumulated by experience in production, learning by using and learning by doing (Pavitt, 1987, p. 9);
- it is impossible an accurate prevision of costs and performances involved in the innovation process mainly based on research and development and the users' reaction to the new artifacts.

Difficulties in analyzing of innovation business activity are due, in our opinion, to the fact that innovation is not a linear process consisting of sequential, time and conceptual-distinctive stages that define unidirectional causalities. Innovation is based on the use of previously acquired knowledge, on the results of new technologies, on the technological development or on the new combinations of existing technology. However, the "linear model" (Figure 1) – while it does not depict all possible connections between the stages of innovation process and, respectively, by reconsidering the earliest ones by the

enterprise which, in turn, can lead to new innovations – is useful in comprehending innovation process in acceptance of dependence unfolding of each stage according to preceding one finalization.

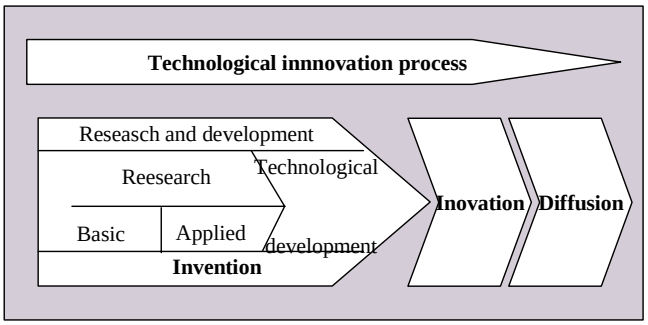


Figure 1. *Technological innovation process*

Knowledge emerged from theoretical and experimental activity in terms of fundamental or applicative aspects of phenomena, as well as the use of knowledge gained as a result of practical experience form the first stage of the innovation process, followed by the translation of knowledge into artifacts, production and diffusion. Since the implementation of the other stages depends on the achievements of research stage, its importance becoming obvious.

Not all companies, however, adopt an innovation mode based on research and development within their structures defined according to Frascati Manual as "systematic and creative activities, initiated to increase the volume of knowledge" (OECD, 2002, p. 30). R&D is only the tip of technological development and innovation process and, in addition to research and development, it requires acquisition, integration into practice and the use of technological skills to high levels of complexity, productivity and quality, but also designing, engineering and managerial abilities for acquisition of technology and to ensure a continuous flow of improvements and generate innovations. R&D is more relevant for firms near the technological frontier or at the frontier. Technology acquisition and the use of skills, on the other hand, are more relevant for firms that assimilate technology to create improved technologies.

Companies innovate consequently to demand on the market and, in principle, innovation process begins with reviewing and combining all existing knowledge, which supposes inclusively appealing to innovation users and the use of information as important innovation sources. Opening to new ideas and innovative solutions is essential, especially in the early stages of the process,

allowing decision-making through ideas, knowledge and skills combination and congealing them in different ways leads to more complex innovations.

In fact, the innovation process depends essentially on external conditions; designing of new technologies results from interactions with customers, suppliers, competitors and various other public and private organizations. This explains why clusters, competition and other business linkages are so important for the process of technological development. In this context, innovation seen as a system, in terms of spatial, at the regional or national level, allows understanding and analysis of these interactions, with impact on innovation propensity and performance of innovation activity.

However, technological competitiveness resulted from innovation based on in-house R&D activity is an economic development moving force. An innovative company will achieve a high profit rate, giving a signal to other companies, including imitators who, if they have market entrance conditions, will pursue to share profit, resulting in diminishing initial innovator advantage. Such imitators ”spreading” at the industrial or sector level tackle technologic development in a time interval, after which emerged effects from new technologies upon growth will slow down. Taking this idea of Marxist origin, Schumpeter was to note the importance of innovations diffusion, arguing that imitators can be successful if they improve the original innovation, that is, if they become themselves innovators. In this framework, it becomes obvious that the technology acquisition cannot be simply assimilated with purchasing from suppliers. Companies must have the ability to identify the appropriate technologies they need, to assess technological options for using or their modification and, last but by no means to least, to integrate new technologies into production processes. With other words, companies that practice this type of innovation must have skills to purchase and use new or substantially improved technologies.

In fact, innovations tend to facilitate achieving other innovations in close fields. In this way, *innovation-diffusion* is a creative process, in which innovation becomes input in other innovation processes without being a passive process, but an adaptive one. Systemic interdependence between original and induced innovator also implies the fact that innovation processes tend to concentrate in certain sectors resulting their development (Schumpeter, pp. 200-201). Schumpeter regarded this dynamic, explaining thus “business cycles” length and “long waves” in the economy.

In this framework, Vernon R. (1966) observes that industrial development is driven by product innovation, induced by product competition on the market. Over time, however, the products are affected by obsolescence, fact supposed to be accompanied by a higher accent on process innovation as a consequence of

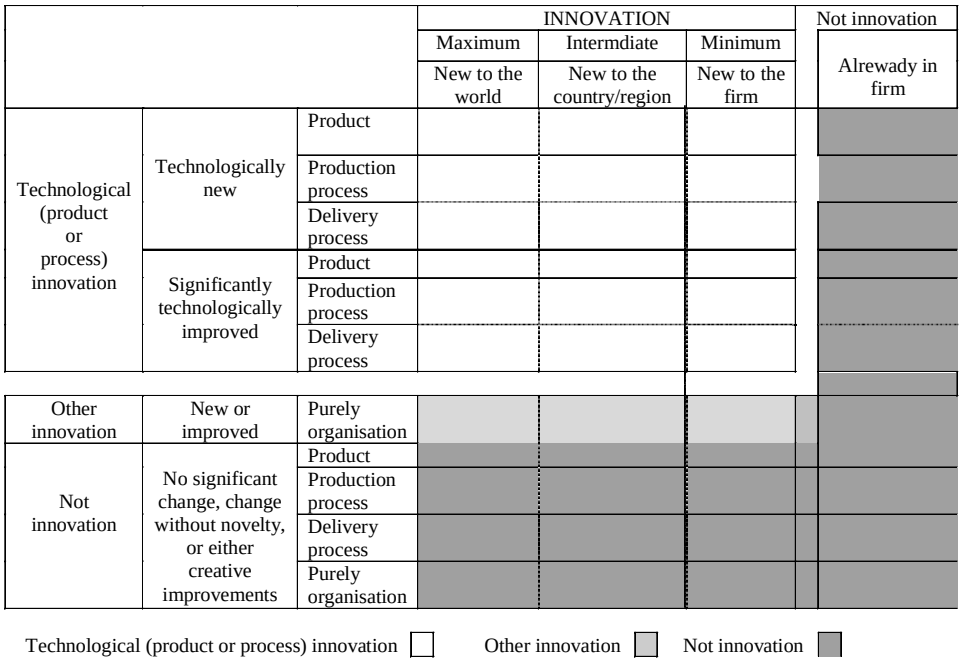
market competition in reducing costs. It was argued that these changes of competitive conditions may favor the transfer of technology associated with foreign capital flows as foreign direct investments, from one innovative country to countries with marketing potential. In this context, the "absorption capacity", namely the ability to recognize, assimilate and exploit new information becomes essential in the transfer of technology being, however, a function of research and development expenditure previously made by firms, which increase their capacity to exploit opportunities arising from external relations (Cohen, Levinthal, 1990).

3. Innovation typology

Schumpeter (1934) distinguished five innovation types: new produces, new production methods, exploitation of new markets, new ways to offer products on the market and new ways of business organization. In his turn, J. Schmookler (1966) differentiated "technological product" from "technological production" by defining the first innovation type in terms of how to create or improve products, and the last concerns how to produce them, and Pavitt (1987, p. 9) notes that "technologies are specific to product and process innovation".

Similarly, "product innovation" and "process innovation" terms were used later in Oslo Manual (2005) as types of technological innovations. In this sense, *product technological innovation* is the result of producing and commercialization of new goods (products or services) or with improved performance characteristics, while *process technological innovation* corresponds to the implementation or adoption of a new or improved production process. We can admit that most innovative companies introduce both types of innovations in the same time, aiming price competitiveness (especially through process innovation) or technological competitiveness (associated with product innovation).

By definition, all innovations must contain a certain novelty degree, whether they are technological (product or process) or non-technological (marketing and organizational). The novelty distinguishes goods or processes as innovations and non-innovations. In Figure 2 we present the degree of novelty of goods (products or services) and processes recognized by the Oslo Manual in defining innovation and also the innovation typology.



Source: OECD (1996, p. 36).

Figure 2. *Innovation typology*

Products/services and processes may be "new to firm" or "new to market" (at the regional/country or global level). The products or processes degree of novelty is a useful tool in calculation of innovational output indicators that incorporate data on the enterprise local, national or international market. Also, the proportion of turnover from new to firm or new to market products of total business turnover allows industrial or international comparisons. However, if one considers that the new to firm products refers to the less developed firm's market, incorporating innovations already available on other markets, comparing the levels of this indicator may lead to an inadequate appreciation of the innovation performance of enterprises. We consider, therefore, that the products or processes novelty can be highlighted more appropriate if we take into account turnover from new to firm's market innovations that correspond also to new to international market innovations. In this framework, we assume that firms that operate on international markets introduce products or processes with a higher degree of novelty than those that activate on the local or national level. Such a synthetic indicator of innovation output based on the enterprise market allows also, in our opinion, the indicator comparability for different states or regions.

Novelty, as a result of innovative activities, has significance in analyzing innovation modes of enterprises. A question regarding different context of introducing innovations appears. If, for example, an agent A introduces an innovation for the first time and another agent B introduces the same innovation on the market later, are both to be characterized as innovators? Following Schumpeter, the term "innovator" should be reserved for agent A, while B is an "imitator". We could argue, however, that agent B can be regarded also as being innovative, by introducing innovation in a new context for the first time if we look novelty as Oslo Manual defines it, but admitting an "active imitation" process, where products are made by modifying or improving existing ones. In fact, as Kline and Rosenberg (1986) note, many innovation processes with economic significance unfold after products or processes diffusion. Introducing new products of processes into a certain context considerably simplifies the adaptation process of (incremental) innovation, facilitating increasing productivity and maintaining competitiveness.

Another similar approach of innovation typology from novelty viewpoint refers to "incremental" ("marginal") innovations, as a result of continuous improvements to products and processes, or "radical" innovations based on new concepts, leading to "technological revolutions" and to a considerable economic impact. Schumpeter considered innovation inclusively from this perspective, seen to be more important. We believe, however, that the economic and social impact of cumulative incremental innovations can be at least as important if one considers that the benefits realization from radical innovation requires incremental improvements.

A special attention is given, however, to radical innovation in terms of its contribution to environmental performance. Many countries consider *eco-innovation* as an important factor in solving contemporary challenges, including climatic ones, energy and natural resource security. In the same time, firms regard *eco-innovation* as a potential source of competitive advantage on the market of industrial goods and services.

Eco-innovation is a new term, referring to more favorable environmental impact exercised through production processes or by the use of goods. The term was for the first time used by C. Fussler and P. James in 1996 (in *Eco-Driving Innovation*), referring to "new products and processes which provide customer and business value but significantly decrease environmental impacts", closely linked to a variety of related terms as "environmental innovation", "innovation for sustainable development" or "sustainable innovation". In the same time, eco-innovation is associated with different concepts such as eco-efficiency (increasing production of goods and services under natural resources and energy low consuming conditions), with "cleaner" production (as strategic

activity to reduce pollution and continuous waste of resources) and eco-design (redesigning products and processes to reduce environmental impact during life cycles).

Nevertheless, defining eco-innovation was not lacking difficulties for the fact that products supposed to be friendly to environment may determine, by their excessive usage, a growth of resources consumption, recording "rebound effect". Consequently, in defining eco- innovation European Commission (Project MEI, 2005) includes all innovation forms that diminish the impact upon environment and/or optimize resource consumption face to relevant alternatives during activities life cycles. Thereby, eco-innovation (i) reduces environmental risks, pollution and resources consumption; (ii) refers to goods (products and services), manufacturing processes or business models; (iii) includes, with no limitations, the green technologies and without limiting at these ones and without an environmental origin or contain technological components; (iv) may be radical and systemic (by replacing polluting materials with the friendly to environment ones) or incremental (by a lower consumption of resources when using products).

In the light of the same features, eco-innovation includes "the creation or implementation of goods (products or services), processes, marketing or organizational methods that – with or no intention – result to environmental improvements face to relevant alternatives" (OECD, 2009, p. 9). However, according to Oslo Manual, firms can eco-innnovate/innovate, also through acquiring cleaner technologies and their implementation in production.

Technological eco-innovations correspond to products or processes incorporating technological progress that contribute to improving environmental conditions and can be analyzed using their mechanisms and impact they create. Thus, in terms of *mechanisms*, technological eco-innovations are: (i) small and gradual changes brought to products or processes; (ii) re-designing, by operating significant changes brought to the existing products or processes; (iii) introducing alternatives (products or processes) with the same functional characteristics but which operate as replacements of existing products; (iv) creating, designing and introducing of completely new products or processes. In principle, the environmental benefits of new products or production processes or existing alternatives are superior to those resulting from modification or re-designing of existing ones. In its turn, the i*mpact* of technological eco-innovations may be curative, by the use of technologies that allow polluting material elimination already released into the environment or a preventive one.

We admit that "in general, advanced technologies tend to be focused mainly on eco-innovation efforts. This is a typical feature associated with new

products or processes, with modifying or re-designing their main mechanisms" (OECD, 2009, p. 16). In the same framework, we adhere to the opinion that "often, economic investments and environmental protection "go hand in hand", such convergence being the ideal situation" (Zaman, Zenovic, 2007, p. 137).

4. Technological innovation implications in the economy

Innovative capacity is a key determinant of economic competitiveness of nations. In the same time, innovation – the engine of economic progress and welfare – is an instrument to solve current global challenges related to environment and health domain. We treat here sustainable development of organizations as the result of their ability to generate new ideas in supporting increasing production, employment and environmental protection.

The implications of innovation in production growth has attracted the interest of economists, at least since Adam Smith (1776), not only by productivity gains from specialization through labor division, technological improvements brought to processes and capital goods but, recognizing the role exercised by R&D activities or technology transfer in the economy. Technological progress was introduced later by R. Solow in 1957 in the production growth models. In the early neoclassical models, production, Q, is expressed in terms of factors that lead to its obtaining, physical capital, K, and labor, L, without including technological progress:

$$Q = f(K, L) \quad (1)$$

Solow, however, observed that not only physical capital and labor factor have bearing on the size of production, another factor, A, technological progress determines also capital and labor productivity growth, so its inclusion as a separate factor, A, follows:

$$Q = A\, f(K, L) \quad (2)$$

However, technological progress has been admitted to be exogenous until P. Romer (1986) approached it as a result of explicit input in innovation processes: research and development expenses, R&D, and highly skilled human capital, HC, according to the following expression:

$$Q = A\, f(R\&D, HC) \quad (3)$$

Most empirical research has been allotted to relation between production, Q, and factors R&D and HC that may be substituted by technological progress, like in the expression below:

$$Q = f(K, L, R\&D, HC) \quad (4)$$

The expression (4) is used in empirical analysis to estimate the impact of research investment on the total factor productivity growth accepting that research and development activities are a source of innovation. In using the

above expression, however, sources of knowledge leading to innovation must be taken into account, that may come not only as a result of research expenditures financed from enterprises resources, but also those from the government support, collaboration contracts with other companies or technology acquisitions. We consider also that the expression (4) can be used in assessing the performance of innovation activities focused on research and development; for an innovation mode based on imported knowledge (through information and technology), inclusively as a result of foreign direct investment, it should incorporate these factors in the model in predicting output growth.

Industrial dynamics models are based on expression (4) in explaining long-term development variations, using arguments of Schumpeterian origin: (i) technological competition is the main form of market competition; (ii) innovation and "new combinations" of resources determine new business opportunities and changing. For instance, V. Posner (1961) explains the difference of economic development rate between countries as being due to technological progress resulted from two sources: from innovation that generates these differences, and from imitation that tends to decrease them. His work was the basis for subsequent contributions in identifying the "technological gap" from so-called "north-south" approaches to explain differences in economic development of states, arguing the need for sustained efforts towards innovation in order to be maintained their competitiveness in the global hierarchy. Fagerberg is situated on the same position in reference to the technological gap and income reduction among states, which may be possible both through imitation, but especially involving innovation, identifying three factors affecting economic development rate of countries: innovation (based on research and development), imitation and technology diffusion efforts. The analysis suggests that reducing disparities between states becomes possible mainly through innovation, representing the most important factor in explaining differences in growth between countries (Fagerberg, 1996).

If innovation is seen to be a major determinant of production growth, a lively debate in the literature concerns the effects of technological innovation on employment. Thus, product innovation is considered to present effects in terms of improving the quality and variety of products, creating demand on the new markets, leading to production and income growth and to employment; also, new products reduce cost as a consequence of process innovation (Pianta, 2000). Process innovation – associated with reducing costs (capital and labor) – may determine total factor productivity growth as product innovation does but, inclusively through reducing employment and lowering prices (Fagerberg et al., 2006). It is argued also that, as long as process innovation leads to increasing

products quality or lowering prices, increased demand may determine employment. According to some authors, the consequences in terms of employment tend to be positive in machinery production sectors or negative (when demand compensation is not enough) in industries that made new investments (Edquist, Hommen, McKelvey, 2001).

Other studies show that companies with innovative activity mainly technological (product and process) recorded a higher profit growth rate than other firms, so that the impact on employment is positive, regardless of industry, size or other characteristics of firms (Van Reenen, 1997). However, enterprise-level studies can not capture whether the results of innovation, including enhancing employment, are not recorded to the detriment of competitors or the net effect on the aggregate industry level. Industry level analysis can better meet the requirements for assessing direct and indirect effects of innovation (in terms of changes of output or employment, which firms with more intense innovative activity are in a competitive advantage over the firms less engaged in innovation) and the indicator dynamics as a result of lowering prices driven by innovation activity. This creates the possibility of comparing innovation indicators that may reflect the demand dynamics across sectors, allowing international comparisons.

Addressed differently, by types of technological innovation, it is shown that the impact of product innovation on employment is positive in industry (especially in manufacturing and services), while process innovation is associated with jobs losses. The total effect of innovation related efforts varies from one period or one country to another but, in general, increasing demand stimulates innovation in industry, particularly product innovation, with positive impact on employment (Pianta, 2006). Other empirical studies based on questionnaires showed also that, in Europe, employment was affected by the dynamics of demand and by the type of technological innovation and, in the same time, a higher R&D intensity showed an adversely impact on employment, suggesting replacing labor with machineries to be predominant. In the context of a modest industrial development in Europe in the 1990s, countries with emphasis on process innovation have registered a negative impact on employment. This effect was due to the fact that increasing international competition has led some countries in restructuring processes and process innovations, resulting labor cost reduction effects, while product innovation had a positive impact on output and employment (Antonucci, Pianta, 2002).

A more comprehensive image of innovation incidence on employment may be provided by the macroeconomic framework, which integrates all the indirect effects of technological change on employment. Such an approach is concerned, typically, about the “compensation mechanisms”, the most

important being by reducing prices, usually associated with introducing of new technologies. According to the "compensation theory" (named in this way by K. Marx in *Capital*, 1961), market forces should offset the initial impact resulted in the reduction of jobs through process innovation. Hence, it may be distinguished the following compensation mechanisms:

- "via reducing prices"; if process innovations determine jobs losses, they lead, on the other hand, to reducing the unit costs of production on an efficient market. The latter stimulates products demand, leading to increasing production and employment. The result is conditioned, however, by the decisions of firms to transfer the productivity gains in lower prices as results of innovation (Sylos, 1969);
- "via new equipment" in acceptance that if process innovations release labor in technology driven sectors they create other jobs in producing equipment sectors;
- "via new investments", framework in which additional profits registered as a result of innovation can be used to finance either new investments to increase production capacity and employment or replacement investments and labor savings;
- "via reducing wages" which is, typically, a neoclassical point of view. The initiation of technological unemployment contributes to decreasing wages that later result in increasing the capacity of firms to employ. This mechanism is based, however, on the assumption that that firms can perform any combination of capital and labor, efficient markets, flexible wages and employment;
- "via new products" resulting from product innovation, which is stimulatory for setting up of economic entities that can create new jobs.

Aggregate level studies performed by W. Baumol and E. Wolff (1998) on the US case, by analyzing five innovation indicators related to the unemployment structure and changes between 1950 to 1995, led to the conclusion that through innovation activity is recorded a higher "natural rate of unemployment" and longer periods of unemployment. R. Lavard and S. Nickell (1985), on the other hand, have shown that compensation mechanisms may reduce unemployment in the UK. In turn, M. Vivarelli (1995) developed a simultaneous equations model to test the compensation mechanisms in the US and Italy, finding that the price reduction is more efficient in determining employment growth in the US, but not in Italy. This approach was subsequently considered by R. Simonetti and K. Tancioni (2002), who developed a model for an open economy taking into account the UK and Italy cases, finding a differentiated impact of the compensation mechanism between the two countries.

While this approach is broadest, explaining the impact of technological change on employment in the national economy, the complexity of building such a model, problems encountered in specifying relations between variables and data availability constrains reduce its feasibility. Taken together, these studies show a differentiated impact of product innovation from process innovation on employment, depending on countries macroeconomic conditions and institutional factors. We conclude that, although the compensation mechanisms are functional, re-balancing mentioned above can not be ex-ante assumed, but we admit that the impact of innovation on employment is mostly, in general, a positive one.

Processes of efficient combination of human, material, financial, information resources and new value and welfare creation through innovation gain a growing interest, especially in recent years, in the context of finding irreversible reduction of natural resources potential as a result of human activity. In fact, many studies (since series of reports by *the Club of Rome*) "showed that our optimization criteria are inconsistent with economic growth based on natural resources" (Dinga, 2009, p. 40). It also shown that the processes of industrial processing and the use of goods, including in households were responsible for one third of the natural resources and energy consumption and carbon dioxide emissions achieved globally by the year 2004 (OECD, 2009), which imposed a reconsideration of manufacturing processes and producing new products more friendly to environment.

Environmental benefits through innovation and therefore to humanity require to reduce resource consumption and/or emissions of pollutants and thereby avoiding environmental damage, maintaining quality of life, access to natural resources of next generations and preservation of intergenerational economic potential. At the same time, manufacturing of new products or implementation of new friendly to environment processes in a given sector involves development of other sectors, leading to sustainable economic development. Thus, innovation is seen as the engine of sustainable development in the last decade.

So far, manufacturing industries have adopted different measures in this regard, inclusively under the regulation pressure, toward a greater responsibility of companies and home users regarding their impact on the environment. Also it can be highlighted the increasing interest of firms to voluntary improve business environmental performance, aiming to obtain profit from eco-innovation activities oriented on markets characterized by increasing demand. Gradual shift from pollution control to more effective integrated solutions

through eco-innovation can provide a relatively low environmental impact; however, positive effects can be obtained while growth rates of emissions and resource consumption are lower than production growth rate, and also decreasing in absolute terms.

5. Conclusions

Undoubtedly, the role of innovation in economic and social life results from the function of innovation regarding introducing newness and variety in the human activity. In the absence of innovation processes, the economy would enter a "stationary stage", characterized by modest growth or no growth. As a result, innovation is crucial for sustainable (long term) economic development.

The intensity of innovation is an explanatory factor of differences in economic performance between companies, regions and countries. Innovative organizations which record successes in innovation activities are prosperous at the expense of the more modest competitors involved in innovation. Catching-up the countries or regions situated in a innovation leaders position involves efforts to enhance innovative activity, both through research and development and diffusion in the manifested interest to increase production, employment and environmental protection, justifying the concern of many states in stimulating innovation.

Innovation capacity of enterprises is a function of their ability to develop coherent technological strategies, to acquire and absorb technologies, to form and exploit linkages with third parties and to develop other useful skills for innovation. From this perspective, at the highest level are firms that absorb cutting-edge technologies and innovate in high-tech industries and at the lowest level are firms without technological capacity. Non-R&D dimensions of technological development are, in particular, beneficial for enterprises that are not engaged in R&D, are far away from the technological frontier, and do not require cutting-edge R&D to improve their competitive position. For these firms, we believe that assistance in building skills related to acquisition and the use of technologies may be more relevant than additional public R&D funding. A different approach from this point of view requires eco-innovation domain, where radical innovations focused on R&D register the highest efficiency in the environmental protection and are based on R&D activities, in which higher costs are involved on a longer time horizon, increased uncertainty in obtaining incomes and low supply of financial resources.

The studies orientation on the input R&D costs at the enterprise level is due to the key role exercised by research and development as a source of invention in the "linear model" of innovation. Firms do not innovate, however,

in isolation but through a continuous interaction with the operating environment, so that "systemic model" allows a better understanding of the role played by the actors involved into innovation processes, the effects obtainable by government policy and possible options to increase the proportion of innovative enterprises of total enterprises.

The impact exercised by the different types of innovations and their determinants have received a particular attention in recent years. Studies in innovation activity, especially based on research and development at the enterprise level, have been intensified in the last two decades in analyzing innovation indicators, in order to be identified innovation modes and performance in different sectors that are indispensable for innovation policies. Emphasizing intensity and effects resulting from the diffusion of knowledge, also an essential aspect of innovation, for both R&D and non-R&D performing firms, has not been so widely debated. These include the acquisition of knowledge that does not require interaction with the source (purchase of capital goods or services, including the licensing of intellectual property) and the acquisition of knowledge that is available from the source (scientific publications or through attendance at trade fairs) or the acquisition of knowledge obtained directly from other entities through collaboration. However, increasing production, employment and environmental protection are the result both of R&D applications and diffusion of new technologies (R&D or non-R&D involved).

Acknowledgements

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