

**INNOVATION, ENTREPRENEURSHIP AND
PSYCHOLOGICAL TRAITS AS FACTORS
INFLUENCING PRODUCTIVITY**

Edited by

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From the Editors

Economic growth and development have been the object of thousands of studies for centuries. Researchers are seeking the best explanation of that phenomenon both for pure epistemic and decision making purposes. Different studies concentrate on various dimensions of the economic development process, in particular: time (universal and specific); area (general or for the whole economy); and entity (economy, branch or company). Economic development is often expressed in terms of productivity or general welfare (income, production). Recent decades abound in research, not only on the relation between economic development and its factors, but also on the exploration of the roots of development determinants themselves. The articles presented in this issue refer to three factors of economic growth (broadly defined as): innovation, entrepreneurship, and other psychological elements of human and social capital covering all dimensions mentioned earlier.

In the first article, the research program of modeling the Schumpeterian vision of innovative development in the Arrow-Debreu theory of general equilibrium is extended. Agnieszka Lipieta and Andrzej Malawski model the mechanisms of Schumpeterian evolution in the conceptual apparatus of Hurwicz's theory of economic mechanisms. The paper aims at the comparative analysis of two types of mechanisms distinguished within Schumpeterian evolution: the innovative evolution mechanism as well as the adopting mechanism. Due to both the formal conceptual apparatus of the general equilibrium theory and Hurwicz's approach to the problem of designing economic mechanisms, the paper takes the form of the axiomatic-deductive system of mathematical theorems interpreted in the language of economics.

In the next article, Anna Golejewska examines the innovativeness of enterprises in 69 Polish NUTS3 sub-regions in 2014. The analysis is based on unpublished regional data of the Polish Central Statistical Office covering the following variables: share of enterprises which have incurred outlays for innovative activities, share of enterprises implementing process or product innovations, share of companies collaborating in the field of innovation, and share of new or modernized products in total production sold in industrial companies. The analysis is focused on building rankings and cluster analysis of the NUTS3 regions. The research method applied by the Author is

composed of selected techniques of multidimensional comparative analysis, principal component analysis and the hierarchical Ward's method. The results show substantial differences among NUTS3 sub-regions with regard to the innovativeness of enterprises.

The focus of the next study is the innovativeness of a particular industry. Manuel González-López analyses the competitive and innovative trajectories followed by the canned fish industry in recent times. The article is based on four case studies from the Galician industry in Spain, which comprises the largest share of the European canned fish sector. At least four different innovation patterns are found in the industry. The first pattern is a conservative one where innovation is seen as a risk and therefore maintaining current routines is the chosen option. The second pattern has been defined as "large retailer-dominated" and is followed by companies that have signed exclusive agreements with large retailers, which increasingly determine most of their innovation activities. The third strategy is explained as "territory-orientated," since product innovation and incorporation of quality distinctions based on the territory are the main innovation drivers. The last distinguished type is an "ecological or nature-orientated" innovation strategy where meeting ecological normative requirements are the main innovation driver.

The last article regarding innovativeness is also focused on a specific industry, namely the Swedish agriculture industry. Jennie Cederholm Björklund states, that although research shows that sustainable business model innovation (SBMI) contributes to the creation of sustainable businesses and to the development of a sustainable society, Swedish agriculture has not been at the forefront in the use of SBMI. The purpose of the study is to examine the barriers to SBMI in Swedish agriculture, in order to understand why farmers seldom engage in SBMI. This qualitative study follows the Gioia methodology. The data for the analysis was acquired in semi-structured interviews with entrepreneurs at six family farms in Sweden. The paper makes a theoretical contribution to the research on SBMI with its focus on sustainable entrepreneurship in the Swedish agricultural industry. The paper concludes that the barriers to SBMI are external, internal, and contextual, where the internal are the largest and most challenging.

The next two articles relate to the other factor of economic development, specifically to entrepreneurship. In both cases, young people' (students') attitudes and behavior were examined.

Krzysztof Zięba and Jakub Golik present a brief overview of entrepreneurial self-efficacy (ESE) research and pose the question whether the ESE of Polish students can serve as an early predictor of their subsequent entrepreneurial activities, potentially leading them to nascent entrepreneurship. The research material was collected from SEAS (Survey on Entrepreneurial Attitudes of

Students) Project carried out at the Faculty of Management and Economics, Gdańsk University of Technology. The research sample was composed of 72 students. ESE was measured in a pre-post setting using a single item based on a five-point Likert scale. One of the research conclusions is that ESE manifested by students-beginners seems to influence their later entrepreneurial behavior in a statistically significant way - potentially making ESE a valuable early predictor of future entrepreneurial activities. In the concluding part, the study limitations are discussed and future study developments are indicated.

Students' perception of the level of an entrepreneur's structural, relational and cognitive social capital is the object of Paweł Ziemiański study. The research involved a group of 374 undergraduate business students from a Polish university as participants. It was found that participants assessed the level of an entrepreneur's social capital as relatively low. Due to the fact that social capital and its different dimensions serve different purposes in the process of venture creation, the obtained result can be considered alarming. It suggests that it is necessary to review and design activities facilitating the development of an entrepreneurial culture in Poland.

Two further studies are related to personal traits and their influence on working behavior and productivity. The purpose of the article of Muhammad Nawaz, Ghulam Abbas Bhatti, Ahmad Shahbaz and Ahmed Zeshan is twofold: to examine the relationship and impact of peer-relationship on organizational commitment by means of and without the moderating role of psychological capital and to examine the association of organizational culture and organizational commitment, similarly, by way of and without the moderating effect of psychological capital. This study is cross-sectional by nature in which data were collected from the operational staff of Pakistan railways. While investigating the moderating impact of psychological capital on the association of peer relationship and organizational commitment, it was found that psychological capital strengthens the relationship of peer relationship and organizational commitment; and also strengthens the relationship of organizational culture and organizational commitment as well.

The research topic of the last article is to examine the utility of the five-factor model of Costa and McCrae in the context of life insurance industry effectiveness, from both theoretical and practical perspectives. The research is based on the case study of the four largest life insurance companies 796 most effective agents. Results imply the existence of a positive correlation between the level of the selected personality trait intensities and the life insurance agent's sales efficiency. Moreover, levels of the personality traits of "openness to experience," "consciousness," "agreeableness" and "neuroticism" are the predictors of life insurance company effectiveness, and

there are fundamentals for induction to be appropriate for the whole retail financial sector human resources management system.

The Guest Editors of this publication would like to thank all of the authors for presenting their valuable research which constitutes an interesting representation of a contemporary approach to the sources of socio-economic development. At the same time, they would like to thank all the reviewers who have contributed to improving the articles for this quarterly issue of JEMI and to continuing the high standards of the magazine. We hope the articles presented here in this issue will prove to be compelling reading to scholars all over the world and inspire them on to further research on innovativeness, entrepreneurship and psychological traits affecting productivity.

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Comparative Analysis of Mechanisms of Schumpeterian Evolution

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Abstract

The paper extends the research program of modeling the Schumpeterian vision of innovative development in the framework of the Arrow-Debreu theory of general equilibrium. To study changes in the production sector, as well as in the whole economy, the concept of extension of the systems under study is introduced. It enables us to model the mechanisms of Schumpeterian evolution in the conceptual apparatus of Hurwicz's theory of economic mechanisms.

The paper is aimed at expanding our previous studies into two new directions. First, we establish the conditions sufficient for improving positions of various groups of agents such as producers, innovators, consumers, etc., under the price or qualitative mechanism regime. Second, to compare mechanisms of Schumpeterian evolution, we respect the logic of this process which is determined by innovative, as well as adaptive, equilibrium changes in the evolving economy under consideration. Consequently, we formulate two different criteria in our comparative analysis based, on the one hand, on the index of the distance between two innovative extensions of the given economic system and, on the other hand, on the increase in wealth of the given set of agents.

The motivations of innovators, and the reason for which innovations are adopted into the producers' and consumers' plans of action, are also precisely explained in the paper. The results of our theoretical research can be useful in economic analyses, among others, in the case of the lack of the sufficient access to statistical data.

Due to both the formal conceptual apparatus of the general equilibrium theory and Hurwicz's approach to the problem of designing economic mechanisms, the paper takes the form of an axiomatic deductive system of mathematical theorems interpreted in the language of economics.

Keywords: *Schumpeterian evolution, mechanisms, designing mechanisms, Debreu economy.*

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INTRODUCTION

Joseph Schumpeter distinguished two forms of economic life: the circular flow and economic development based on innovations (see Schumpeter, 1934). The circular flow resembles the “*blood circulation in a living organism*” and is interpreted as the stagnation of economic life. Economic development, driven by innovators, means a spontaneous and discontinuous change in the channels of the circular flow and usually implies the disturbance of equilibrium. During economic development, two tendencies in the production sphere are observed: innovation creation and the elimination of existing products or organizational structures and their replacement by new ones. Finally, it moves the system back to a new stationary state, where previous innovations have been absorbed in an equilibrated system. The analysis of mechanisms of economic evolution was at the core of Joseph Schumpeter’s interest.

The paper is aimed at expanding our previous studies into two new directions. First, we establish the conditions sufficient for improving positions of various groups of agents such as producers, innovators, consumers, etc., under the price or qualitative mechanism regime. Second, to compare mechanisms of Schumpeterian evolution, we respect the logic of this process which is determined by innovative, as well as adaptive, equilibrium changes in the evolving economy under consideration. Consequently, we suggest two different criteria in our comparative analysis based, on the one hand, on the index of the distance between two innovative extensions of the given economic system and, on the other hand, on the increase in wealth of the given set of agents.

Finally, it should be emphasized that from the methodological viewpoint we go beyond the perfect rationality paradigm in our modeling, because economic agents are not able to perform their optimal plans of actions in out-of-equilibrium states. To model such stages of evolutionary process, we define and analyze economic systems labeled as quasi-systems.

This paper consists of six parts. In the second part, the literature review is presented, while in the third part, the research method used in the paper is characterized. In the fourth part the basic model, namely the private ownership economy with almost all inactive agents, as well as various kinds of extensions of subsystems of the considered economy, and extensions of the economy as a whole, are defined. In the fourth part, the reader can also find the short characteristics of Hurwicz’s economic mechanisms as well as the comparative analysis of the innovative evolution and the adopting mechanisms, respectively. The fifth part is devoted to discussion, and the sixth part contains the conclusions. Due to the formal conceptual apparatus of the general equilibrium theory, as well as Hurwicz’s approach to the

problem of designing economic mechanisms, the paper takes the form of an axiomatic deductive system of mathematical theorems interpreted in the language of economics.

LITERATURE REVIEW

The paper extends the research program of modeling the Schumpeterian vision of innovative development in the Arrow-Debreu theory of general equilibrium (cf. Malawski, 2005, 2008; Malawski & Woerter, 2006; Ciałowicz & Malawski, 2011; Malawski, 2013). The core of this set-up is based on modeling the two fundamental forms of economic life distinguished by Schumpeter (1934), namely the circular flow and economic development by specific extensions of the production and consumption systems being the part of the Debreu private ownership economy, so that the analysis includes static as well as dynamic forms. Moreover, this research program has been recently combined (see Lipieta & Malawski, 2016; Lipieta, 2013) with Hurwicz's theory of economic mechanism (see for instance Hurwicz & Reiter, 2006).

At the same time, the current neo-Schumpeterian studies suggest (Hanusch & Pyka, 2007; Andersen, 2009) that the Schumpeterian innovative evolution is governed by two different kinds of mechanisms. First, quantitative, price mechanisms to determine the prices and quantities of goods in the state of Walrasian equilibrium corresponding to the circular flow, and, second, qualitative mechanisms typical for economic development explaining the role of innovations.

Indeed, Andersen (2009) identifies two opposing evolutionary mechanisms: first, the mechanism of innovation which moves the economic system from a stationary state to its maximally disequilibrated state; Second, the mechanism of adaptation to move the system back to a new stationary state, where previous innovations have been absorbed in an equilibrated system of economic routines.

Similarly, transition from the circular flow to economic development can be characterized as follows (Hanusch & Pyka, 2007): *"It is no longer price competition only, but following his ideas of development, quality competition, driven by innovations and imitations of economic actors, takes over the leading role. In other words, profit opportunities are signaled not exclusively by market prices but also by creativity and daringness of entrepreneurial actors who change the relative scarcity in an economic system"*.

This analysis of Schumpeterian evolution mechanisms, presented above, suggests that the mechanisms under study can be classified into two categories: price mechanisms corresponding to circular flow and qualitative

mechanisms based on innovations. However, our general, more rigorous setting (see also Lipieta & Malawski, 2016; Lipieta, 2013) implies that it is difficult to preserve this dichotomy and a variety of economic mechanisms should be taken into account. The main premise in this context is based on our viewpoint that the consequences of innovative changes contribute to more diversified results. Specifically, this variety of qualitative mechanisms concerns the agents whose positions get better off. Thus we can distinguish qualitative mechanism with respect to the given set of agents, for example, the set of innovators or all producers.

RESEARCH METHOD

The axiomatic method is the main method used in the paper. The axiomatic method in economy was initiated in the 1930s, during the studies on the problem of the existence of the Walras equilibrium, especially by Wald and Neumann. After that, the axiomatic method appeared respective, natural and useful, especially in theoretical economics. Using the rationality assumption of behavior of economic agents and the principle *ceteris paribus*, it lets us isolate the objects under study from the rest of the world. We can find axiomatic models in, for instance, the theory of general equilibrium, social choice theory, and the theory of mechanism design. These theoretical models play an important role also in empirical economics, indicating the objects and variables worth being empirically verified.

Generally, we can say that the mathematical methods play the role of mental experiments to allow us the analysis of economic processes. Some of our results have the form of theorems with rigorous proofs.

ANALYSIS

The private ownership economy with almost all inactive agents

In the process of evolution of an economy, some agents can enter or exit the market. Hence, in modeling the structure of Schumpeterian evolution, it is convenient to consider the economy with a countable number of agents (compare to Lipieta, 2013). Firstly, the production sector of the economy will be defined. Let

- $B = (b_j)_{j \in \mathbb{N}}$ - be a countable set of producers,
- $y: B \ni b_j \rightarrow Y^{b_j} \subset \mathbb{R}^\ell$ - be a correspondence of production sets, which to every producer b_j assigns a non-empty production set $y(b_j) = Y^{b_j} \subset \mathbb{R}^\ell$ of the producer's feasible production plans, where

$$\exists n \in \mathbb{N} \forall j > n \ y(b_j) \stackrel{\text{def}}{=} \{0\},$$

- $p \in \mathbb{R}^\ell$ be a price vector.

Definition 1. The two-range relational system

$$P_q = (B, \mathbb{R}^\ell; y, p),$$

is called the quasi-production system. The producer b_j for which $y(b_j) = \{0\}$ is called the inactive producer, while the producer for which $y(b_j) \neq \{0\}$ is called the active one.

The idea of the set of inactive agents simplifies comparing changes in the system under study at different points of time. Especially, it enables us to consider the potential future producers in the initial system P_q as well as the producers which will stop, after some time, their activities in the market.

Definition 2. If $P_q = (B, \mathbb{R}^\ell; y, p)$ is the quasi-production system in which for given price vector $p \in \mathbb{R}^\ell$

$$\forall b \in B \ \eta^b(p) \stackrel{\text{def}}{=} \{y^{b^*} \in Y^b : p \circ y^{b^*} = \max\{p \circ y^b : y^b \in Y^b\}\} \neq \emptyset,$$

then

- $\eta: B \ni b \rightarrow \eta^b(p) \subset \mathbb{R}^\ell$ is called the correspondence of supply at price system p ,
- $\pi: B \ni b \rightarrow \pi(b) = p \circ y^{b^*} \in \mathbb{R}$ is called the maximal profit function at price system p , where $y^{b^*} \in \eta^b(p)$ for every $b \in B$,
- the quasi-production system P_q is called the production system and denoted by

$$P_q = P = (B, \mathbb{R}^\ell; y, p, \eta, \pi).$$

Every element y^{b^*} of the set $\eta^b(p)$ is called the optimal plan of producer b .

The “quasi-type” of production systems enables us to model the production sector of an economy under a bounded rationality assumption. This is because, in the quasi-production system, the aims of producers are not specified in contrast to the production system (compare to Def. 1 and 2), where producers maximize profits at given prices and technologies. Hence, to keep up the spirit of Schumpeterian thinking, innovations and structural changes of the production sector of an economy are modeled in the quasi-production systems (compare to Lipieta, 2013).

Similarly, a quasi-consumption system is defined. Let

- $A = (a_i)_{i \in \mathbb{N}}$ be a countable set of consumers,
- $Pref \subset \mathbb{R}^\ell \times \mathbb{R}^\ell$ be the family of all preference relations in \mathbb{R}^ℓ ,
- $\chi: A \ni a_i \rightarrow \chi(a_i) = X^{a_i} \subset \mathbb{R}^\ell$ be a correspondence of consumption sets which to every consumer a_i assigns a nonempty consumption set $\chi(a_i) = X^{a_i}$ being a subset of the commodity space \mathbb{R}^ℓ and representing the consumer’s feasible consumption plans with respect to his psycho-physical structure; moreover

$$\exists m \in \mathbb{N} \forall i > m \ \chi(a_i) \stackrel{\text{def}}{=} \{0\},$$

- $\epsilon: A \ni a_i \rightarrow \epsilon(a_i) \in \chi(a_i)$ be an initial endowment mapping,
- $\varepsilon \subset A \times (\mathbb{R}^\ell \times \mathbb{R}^\ell)$ be a correspondence, which to every consumer $a \in A$ assigns a preference relation \preceq_a from set $Pref$ restricted to set $\chi(a) \times \chi(a)$,
- $p \in \mathbb{R}^\ell$ be a price vector.

Definition 3. The three-range relational system

$$C_q = (A, \mathbb{R}^\ell, Pref; \chi, \epsilon, \varepsilon, p)$$

is called the quasi-consumption system. The consumer a_i for which $\chi(a_i) = \{0\}$ is called the inactive consumer, while the consumer for which $\chi(a_i) \neq \{0\}$ is called the active one.

Definition 4. If $C_q = (A, \mathbb{R}^\ell, Pref; \chi, \epsilon, \varepsilon, p)$ is the quasi-consumption system in which for price vector $p \in \mathbb{R}^\ell$ and for every $a \in A$

$$\begin{aligned} \beta^a(p) &= \{x \in \chi(a) : p \circ x \leq p \circ e(a)\} \neq \emptyset. \\ \varphi^a(p) &= \{x^{a*} \in \beta(a) : \forall x^a \in \beta(a) \ x^a \preceq_a x^{a*}, \preceq_a \in Pref\} \neq \emptyset, \end{aligned}$$

then

- $\beta: A \ni a \rightarrow \beta^a(p) \subset \mathbb{R}^\ell$ is the correspondence of budget sets at price system p ,
- $\varphi: A \ni a \rightarrow \varphi^a(p) \subset \mathbb{R}^\ell$ is the demand correspondence at price system p ,
- the quasi-consumption system C_q is called the consumption system and denoted by $C = (A, \mathbb{R}^\ell, Pref; \chi, \epsilon, \varepsilon, p, \beta, \varphi)$.

Every element x^{a*} of the set $\varphi^a(p)$ is called the optimal plan of consumer a .

The “quasi-type” of consumption system allows a situation where there is no upper bound on the budget set for the preference relation of a consumer. However, we assume, according to the rationality assumption, that if there is a consumption plan maximizing the preference relation of consumer a on his budget set, then consumer a just realizes his best plan (one of his best plans). Now, we can assume the following definition:

Definition 5. The relational system

$$\mathcal{E}_q = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$$

where

- $P_q = (B, \mathbb{R}^\ell; y, p)$ is the quasi-production system,
 - the mapping $\theta: A \times B \rightarrow [0, 1]$ satisfies

$$\theta(a_i, b_j) = 0 \text{ if } i > m \text{ or } j > n, \forall b \in B \sum_{a \in A} \theta(a, b) = 1,$$
 - $C_q = (A, \mathbb{R}^\ell, Pref; \chi, \epsilon, \varepsilon, p)$ is the quasi-consumption system,
 - $\epsilon(a_i) \in \mathbb{R}^\ell$ for $i \in \mathbb{N}$, $\epsilon(a_i) \stackrel{\text{def}}{=} 0 \in \mathbb{R}^\ell$ for $i > m$,
- $$\sum_{a \in A} \epsilon(a) = \omega$$

is called the private ownership economy with almost all inactive agents. If P_q is the production system ($P_q = P$) and C_q is the consumption system ($C_q = C$), then the private ownership economy with almost all inactive agents \mathcal{E}_q will be called the Debreu economy.

If \mathcal{E}_q is the Debreu economy, then it will be denoted by $\mathcal{E}_q = \mathcal{E}_p$ where $\mathcal{E}_p = (\mathbb{R}^\ell, P, C, \theta, \omega)$.

The private ownership economy with almost all inactive agents operates as follows. Let a price vector $p \in \mathbb{R}^\ell$ be given. Every active producer b realizes a production plan $\tilde{y}^b \in y(b)$. It is assumed that every inactive producer b_j realizes plan $\tilde{y}^{b_j} = 0 \in \mathbb{R}^\ell$ (his activity is reduced to zero production plan). The profit of each producer b , by realization of the plan \tilde{y}^b , is divided among all consumers according to function θ . Hence, the expenditure (wealth) of every consumer a cannot be greater than the value

$$w(a) = p \circ \epsilon(a) + \sum_{b \in B} \theta(a, b) \cdot p \circ \tilde{y}^b.$$

So the budget set of every consumer a at price system p is of the form

$$\beta^a(p) = \{x \in \chi(a) : p \circ x \leq w(a)\}.$$

In this situation, if $\beta^a(p) \neq \emptyset$ and $\varphi^a(p) \neq \emptyset$ at given price system p (see Def. 4), then consumer a chooses his consumption plan $\tilde{x}^a = x^{a*} \in \varphi^a(p) \subset \chi(a)$ maximizing his preference on the budget set $\beta^a(p)$.

If $\beta^a(p) \neq \emptyset$ and $\varphi^a(p) = \emptyset$, then consumer a chooses his consumption plan $\tilde{x}^a \in \beta^a(p)$, due to his own criterion. If $\beta^a(p) = \emptyset$, then we assume that $\tilde{x}^a = 0 \in \mathbb{R}^\ell$. As above, it is assumed that every inactive consumer realizes plan $\tilde{x}^{a_i} = 0 \in \mathbb{R}^\ell$ for $i > m$.

Consider the Debreu economy $\mathcal{E}_p = (\mathbb{R}^\ell, P, C, \theta, \omega)$. Let $x^{a*} \in \varphi^a(p)$ for every $a \in A$ as well as $y^{b*} \in \eta^b(p)$ for every $b \in B$. If

$$\sum_{a \in A} x^{a*} - \sum_{b \in B} y^{b*} = \omega, \tag{1}$$

then the sequence

$$((x^{a*})_{a \in A}, (y^{b*})_{b \in B}, p), \tag{2}$$

where $(x^{a*})_{a \in A} \stackrel{\text{def}}{=} (x^{a_1^*}, \dots, x^{a_m^*}, 0, 0, \dots)$ and $(y^{b*})_{b \in B} \stackrel{\text{def}}{=} (y^{b_1^*}, \dots, y^{b_n^*}, 0, 0, \dots)$ is called the state of the Walras equilibrium in economy \mathcal{E}_p .

Extensions of the private ownership economies

To study changes in the economies, we will examine the concept of extensions of production and consumption systems respectively, as well as the economy as a whole (see also Lipieta, 2013).

Consider a quasi-production system $P_q = (B, \mathbb{R}^\ell; y, p)$ in the fixed point of time $t = 0$. Assuming that system P_q evolves, after a certain time in the point $t = 1$, the components (see Def. 2.1) of system P_q can be transformed into the components of a quasi-production system $P'_q = (B', \mathbb{R}^{\ell'}; y', p')$, where additionally $b_j = b'_j$ for every $j \in \{1, \dots, \max\{n, n'\}\}$. That will be noted by $P_q \subset P'_q$. The quasi-production system P'_q will be called the transformation of the system P_q on the time interval $[0, 1]$.

If $P_q \subset P'_q$ and an active producer b_j from system P_q stops his activity on the market in the observable time interval, then he will become the inactive producer in the system P'_q . Hence for producer b_j ,

$$y(b_j) \neq \{0\} \text{ and } y'(b_j) = \{0\}$$

Similarly, if an active producer b_j appears in the system P'_q which is the transformation of system P_q , then he is considered as the inactive producer in the system P_q , formally

$$y(b_j) = \{0\} \text{ and } y'(b_j) \neq \{0\}.$$

Notice that inactive agents, in fact, do not influence on actions of active producers on the market. Hence if $P_q \subset P'_q$, then without loss of generality we can assume that $b_j = b'_j$ for every $j \in \{\max\{n, n'\} + 1, \dots\}$. Hence, we assume that $B = B'$.

In a given transformation of the given quasi-production system, we model the improvement in the producers' position (compare to Def. 4.20 in Lipieta, 2013). Namely, if $P_q = (B, \mathbb{R}^\ell; y, p)$ and $P'_q = (B', \mathbb{R}^{\ell'}; y', p')$ are the quasi-production systems where $P_q \subset P'_q$, then we say that a producer $b \in B = B'$ is better off in system P'_q than in system P_q if and only if,

$$\exists y'^b \in y'(b) \forall y^b \in y(b) p \circ y^b < p' \circ y'^b. \quad (3)$$

In the same way, as in case of quasi-production systems, we define and note down the transformation of quasi-consumption systems as well as private ownership economies with almost all inactive agents. Analogously, if $C_q = (A, \mathbb{R}^\ell, Pref; \chi, \epsilon, \epsilon, p)$ and $(A', \mathbb{R}^{\ell'}, Pref'; \chi', \epsilon', \epsilon', p')$ are the quasi-consumption systems where $C_q \subset C'_q$, then we say that a consumer $a \in A = A'$ is better off in system C'_q than in system C_q if and only if,

$$\exists x'^a \in \chi'(a) \forall x^a \in \chi(a): [(\text{proj}_{\mathbb{R}^\ell}(x'^a) \in \chi(a)) \wedge (x^a <_a \text{proj}_{\mathbb{R}^\ell}(x'^a))]. \quad (4)$$

If $\mathcal{E}_q = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$ and $\mathcal{E}'_q = (\mathbb{R}^{\ell'}, P'_q, C'_q, \theta', \omega')$ are the private ownership economies with almost all inactive agent, where $P_q \subset P'_q$ and $C_q \subset C'_q$ on the same time interval $[0, 1]$, then we will say that economy \mathcal{E}'_q is the transformation of economy \mathcal{E}_q and note down $\mathcal{E}_q \subset \mathcal{E}'_q$.

As it was emphasized before, to model and compare some changes in the economy under study, various kinds of extensions of adequate systems will be defined. In the below definitions, the natural projection from space $\mathbb{R}^{\ell'}$ on space \mathbb{R}^{ℓ} , namely mapping

$$\text{proj}_{\mathbb{R}^{\ell}}: \mathbb{R}^{\ell'} \ni (x_1, \dots, x_{\ell'}) \rightarrow (x_1, \dots, x_{\ell}) \in \mathbb{R}^{\ell}$$

for $\ell, \ell' \in \{1, 2, \dots\}$, $\ell \leq \ell'$, is involved.

Let $P_q = (B, \mathbb{R}^{\ell}; y, p)$, $P_{q'} = (B', \mathbb{R}^{\ell'}; y', p')$ be the quasi-production systems and $P_q \subset_c P_{q'}$. Under the above notations, the following definition is formulated.

Definition 6. The quasi-production system $P_{q'}$ is called the cumulative extension of the quasi-production system P_q , in short $P_q \subset_c P_{q'}$, if

1. $\ell \leq \ell'$,
2. $p \leq \text{proj}_{\mathbb{R}^{\ell}}(p')$,
3. $\forall b \in B \ y(b) \subset \text{proj}_{\mathbb{R}^{\ell}}(y'(b))$,
4. $\forall b \in B \ \forall y^b \in y(b) \ \exists y'^b \in y'(b) \ p \circ y^b \leq p' \circ y'^b$.

If $P_q \subset_c P_{q'}$, then the quasi-production system $P_{q'}$ is said to be the strong cumulative extension of quasi-production system P_q ($P_q \subset_{sc} P_{q'}$), with respect to the profit, if and only if,

$$\exists b \in B \ \exists y'^b \in y'(b) \ \forall y^b \in y(b) \ p \circ y^b < p' \circ y'^b,$$

Notice that if $P_q \subset_c P_{q'}$ and $\ell = \ell'$ (then the natural projections are identity mappings), then neither new firms nor commodities appear and the old ones are not eliminated from the production process. The old technologies are still used (condition 3 by Def. 6) with non-decreasing prices (condition 2 by Def. 6), which result in not less profit (condition 4 by Def. 6). Hence, the idea of the cumulative extension of the quasi production system, where $\ell = \ell'$ can be interpreted as the mathematical model of the Schumpeterian circular flow in the production sphere (compare to Schumpeter, 1934 and Lipieta, 2013). If $\ell < \ell'$, then new commodities appear on the market. Moreover, if $y(b) = \{0\}$ and $y'(b) \neq \{0\}$ for some $b \in B$, then producer b enters the market, if $y(b) \neq \{0\}$ and $y'(b) = \{0\}$, then producer b exits the market.

The strong version of the cumulative extension of a production system with respect to its given component is defined to model and express substantial changes in the production sector (compare to Malawski, 2013).

We start now the analysis of the Schumpeterian economic development from definitions of innovations and innovative changes. The innovation is a new commodity or a new technology introduced into the economy. The innovator is the producer who introduces an innovation. Consequently, introducing a new commodity or a new technology into the production sector of an economy are called the innovative changes in the production sector (of the economy) or, simply, in that economy. To model the innovative changes

in the production sector, the innovative extension of a production system is defined (compare to Lipieta, 2013).

Definition 7. The quasi-production system P'_q is called the innovative extension of the quasi-production system P_q , in short $P_q \subset_i P'_q$, if

1. $\ell \leq \ell'$,
2. $\ell = \ell' \Rightarrow \exists b \in B \forall y^b \in y(b) \exists y'^b \in y'(b) \setminus \bigcup_{b \in B} y(b): p' \circ y'^b > p' \circ y^b$,
3. $\ell < \ell' \Rightarrow \exists b \in B \forall y^b \in y(b) \exists y'^b \in y'(b) \setminus (\bigcup_{b \in B} (y(b) \times \{0\} \times \dots \times \{0\})): p' \circ y'^b > \text{proj}_{\mathbb{R}^\ell}(p') \circ y^b$

The producer satisfying condition 2 or 3 (by Def. 7) adequately, is called the innovator. If producer b is the innovator then the vectors y^b are called (his) innovative plans.

The set of innovators will be denoted by B_{in} .

If $P_q \subset_i P'_q$ where $\ell = \ell'$, then innovations are reduced to the implementation of new technology into production without introducing a new commodity. Condition 2 by Definition 7 means that every innovator b in system P'_q can realize the innovative plan y^b which guarantees him a higher profit at prices determined in system P'_q than any of his plan y^b realized in system P_q . If $P_q \subset_i P'_q$ and $\ell < \ell'$, then a new commodity is introduced by an innovator and every innovator introduces new technology into the production sphere (condition 3 by Def. 7). The innovative plan y^b carried out by innovator b in system P'_q gives him also more profit than any plan y^b realized by him in system P_q but at respective prices taken from system P'_q . We assume, following Schumpeterian thinking, that producers' aim is to increase the profits and it motivates them to introduce innovations. Hence, if $P_q \subset_i P'_q$, then every innovator in system P'_q realizes such plan, which gives him a higher profit than by realizing plans feasible so far, that is one of his innovative plans. Consequently, if P'_q is the production system ($P'_q = P'$), then every innovator b realizes some plan y^b satisfying condition 2 or 3 (by Def. 7) respectively, and it has to be one of his optimal plans. Moreover, the set $\eta^b(p)$, for every $b \in B_{in}$, consists only of optimal plans of producer b . As a results, if $\mathcal{E}_q = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$ and $\mathcal{E}'_q = (\mathbb{R}^{\ell'}, P'_q, C'_q, \theta', \omega')$ are the private ownership economies with almost all inactive agent, where $P_q \subset_i P'_q, P'_q = P'$ as well as $\mathcal{E}_q \subset \mathcal{E}'_q$, then the state of equilibrium (see (2)) if existed, in economy \mathcal{E}'_q contains on the coordinate proper for innovator b , one of his innovative plan which gives him maximal profit.

If $P_q \subset_i P'_q$ and P_q is the production system ($P_q = P$), then by conditions 2 and 3 by Definition 7, it follows that

$$\forall b \in B_{in} \exists y^b \in y'(b) \setminus \bigcup_{b \in B} y(b): \forall y^b \in y(b) p' \circ y^b > p' \circ y^b \text{ if } \ell = \ell'$$

or

$$\forall b \in B_{in} \exists y^b \in y'(b) \setminus \bigcup_{b \in B} (y(b) \times \{0\} \times \dots \times \{0\}): \forall y^b \in y(b): p' \circ y^b > \text{proj}_{\mathbb{R}^\ell}(p') \circ y^b \text{ if } \ell < \ell',$$

The above conditions mean that if $P_q \subset_i P_{q'}$ and P_q is the production system, then every innovator b in system $P_{q'}$ gets, by realization one of his innovative plans y^b , the profit higher than profit obtained by realization any of his plans from system P_q at respective prices from system $P_{q'}$. Hence the innovators are better off in the system $P_{q'}$ than in the system P_q in the sense of condition (3). Hence if $p = \text{proj}_{\mathbb{R}^\ell}(p')$, then the innovators are better off in the system $P_{q'}$ than in the system P_q in the sense of condition (3).

The innovator $b_{0'}$ for whom

$$\exists y^{b_0} \in y'(b_0) \setminus \bigcup_{b \in B} y(b) \forall b \in B \forall y^b \in y(b) p' \circ y^{b_0} > p' \circ y^b \text{ if } \ell = \ell'$$

or

$$\exists y^{b_0} \in y'(b_0) \setminus \bigcup_{b \in B} (y(b) \times \{0\} \times \dots \times \{0\}) \forall b \in B \forall y^b \in y(b) p' \circ y^{b_0} > \text{proj}_{\mathbb{R}^\ell}(p') \circ y^b \text{ if } \ell < \ell'.$$

is called the leading innovator, the market leader or shortly the leader. If $P_q \subset_i P_{q'}$ as well as one of the above condition is satisfied, then there is at least one innovator b in system $P_{q'}$ who gains, by realization one of his innovative plans y^b , the profit higher than profits of all producers from system P_q , determined at respective prices taken from system $P_{q'}$.

The leaders can also appear in quasi-production systems but if there is a producer in system P_q for whom the maximal profit does not exist, then no leader will appear in system $P_{q'}$. If $P_{q'}$ is the production system ($P_{q'} = P'$), then there is at least one market leader in system $P_{q'}$.

Let us notice that if the quasi-production system $P_{q'}$ is the cumulative extension of the production system P_q ($P_q \subset_c P_{q'}$) with respect to the profit, then $P_{q'}$ can be also the innovative extension of P_q ($P_q \subset_i P_{q'}$).

Similarly, and for the same reasons as in case of the production sector, we define extensions of the quasi-consumption system. Let $C_q = (A, \mathbb{R}^\ell, Pref; \chi, e, \varepsilon, p)$, $C_{q'} = (A', \mathbb{R}^{\ell'}, Pref'; \chi', e', \varepsilon', p')$ be the quasi-consumption systems and $C_q \subset_c C_{q'}$.

Definition 8. The quasi-consumption system $C_{q'}$ is said to be the cumulative extension of the quasi-consumption system C_q , in short $C_q \subset_c C_{q'}$, if

1. $\ell \leq \ell'$,
2. $p \leq \text{proj}_{\mathbb{R}^\ell}(p')$,
3. $A = A'$,
4. $\forall a \in A \chi(a) \subset \text{proj}_{\mathbb{R}^\ell}(\chi'(a))$,
5. $\forall a \in A e(a) \leq \text{proj}_{\mathbb{R}^\ell}(e'(a))$,
6. $\forall a \in A \varepsilon(a) \subset \text{proj}_{\mathbb{R}^\ell}(\varepsilon'(a))$,
7. $\forall a \in A \forall x^a \in \chi(a) \exists x'^a \in \chi'(a) \text{proj}_{\mathbb{R}^\ell}(x'^a) \in \chi(a) \wedge x^a \leq_a \text{proj}_{\mathbb{R}^\ell}(x'^a)$.

The cumulative extension $C_{q'}$ is the strong cumulative extension ($C_q \subset_c C_{q'}$) of the quasi-consumption system C_q , with respect to the demand \Leftrightarrow

$$\exists a \in A \exists x'^a \in \chi'(a) [(\text{proj}_{\mathbb{R}^\ell}(x'^a) \in \chi(a)) \wedge (\forall x^a \in \chi(a) x^a <_a \text{proj}_{\mathbb{R}^\ell}(x'^a))].$$

The complete definition of the strong cumulative extensions of the quasi-consumption system due to other criteria, the reader can find, for instance in (Malawski, 2013).

Let $\mathcal{E}_q = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$ and $\mathcal{E}'_q = (\mathbb{R}^{\ell'}, P'_q, C'_q, \theta', \omega')$ be the private ownership economies with almost all inactive agents. Let $\mathcal{E}_q \subset \mathcal{E}'_q$. On the basis of the above definitions, we put the following:

Definition 9. The economy \mathcal{E}'_q is said to be the cumulative extension of the \mathcal{E}_q , in short $\mathcal{E}_q \subset_c \mathcal{E}'_q$, if

1. $P_q \subset_c P'_q$,
2. $C_q \subset_c C'_q$,
3. $\omega \leq \omega'$.

If $\mathcal{E}_q \subset_c \mathcal{E}'_q$ and $P_q \subsetneq P'_q$ or $C_q \subsetneq C'_q$, then economy \mathcal{E}'_q is said to be the strong cumulative extension of economy \mathcal{E}_q , in short $\mathcal{E}_q \subsetneq_c \mathcal{E}'_q$.

If $P_q \subset_i P'_q$ then economy \mathcal{E}'_q is the innovative extension of economy \mathcal{E}_q , in short $\mathcal{E}_q \subset_i \mathcal{E}'_q$.

Mechanisms connected to evolutions of the private ownership economies

In this part of the paper, some definitions useful for modeling the structure of Schumpeterian evolution mechanisms will be formulated.

Let $E \neq \emptyset$ be the set of environments, namely elements that constrain the situation of economic agents (see Hurwicz, Reiter, 2006; Jordan 1982). The set of desired outcomes (the outcome sets) is denoted by Z ($Z \neq \emptyset$). It is assumed that the economic agents can communicate by sending and retrieving messages that are necessary for achieving goals.

Definition 10. (Hurwicz, Reiter, 2006). The triple $\Gamma = (M, \mu, h)$, where

- $M \neq \emptyset$ is the message space,
- $\mu: E \rightarrow M$ is the message correspondence,
- $h: M \rightarrow Z$ is the outcome function

is called the economic mechanism.

It is said that an economic mechanism $\Gamma = (M, \mu, h)$ realizes the goal function (or correspondence) $F: E \rightarrow Z$ if

$$\forall e \in E \ h(\mu(e)) \subset F(e).$$

Now, we will distinguish two classes of mechanisms, price and qualitative mechanisms.

Definition 11 (Lipieta, 2013). An economic mechanism, in which the prices of commodities are elements of the message space which will be called the price mechanism.

An economic mechanism, in the consequence of which the position of at least one agent from a subset of the set of all agents will be better off in the sense of conditions (3) and (4), without making the position of the rest of the agents from the subset worse off, will be called the qualitative mechanism with respect to this subset.

Now let us focus on the structure of evolution of the economy under study. At the beginning, we consider the Debreu economy $\mathcal{E}_p = (\mathbb{R}^\ell, P, C, \theta, \omega)$ in which a state of equilibrium exists. According to Schumpeterian ideas (see Schumpeter, 1934) economy \mathcal{E}_p evolves for a certain time, in the direction to its modified form that is its innovative extension $\mathcal{E}'_p = (\mathbb{R}^{\ell'}, P', C', \theta', \omega')$. Hence $\mathcal{E}_p \subset_i \mathcal{E}'_p$. The final economy \mathcal{E}'_p should also be the Debreu economy in equilibrium. In the meantime, some agents might enter or exit the economy, the producers can change their technologies, some innovations can be introduced into the market, the consumption sets and the budget sets might be verified as well as the producers' and consumers' optimal plans can be changed. In some cases, the producers do not maximize their profits or the consumers do not manage to maximize their preferences, etc. All of that becomes the basis for our modeling.

It should be emphasized that the expected increase in the profits motivates innovators to modifying their technologies.

Let \mathcal{E}_q be the private ownership economy. By $\mathcal{E}'_q(t)$, for every $t \in (0,1]$ we will denote the transformation of the economy \mathcal{E}_q at point of time t , defined in the same way as for $t = 1$. The above dependence will be denoted as above, namely $\mathcal{E}_q \subset \mathcal{E}'_q(t)$. The set $\mathbb{E}_q(\mathcal{E}_q)$ stands for the set of all possible transformations of economy \mathcal{E}_q on the time interval $(0,1]$, namely

$$\mathbb{E}_q(\mathcal{E}_q) = \{\mathcal{E}'_q(t) : \mathcal{E}_q \subset \mathcal{E}'_q(t) \wedge t \in (0,1]\}.$$

Let points of time t_0, t_1, \dots, t_s satisfying $0 = t_0 < t_1 < \dots < t_s = 1$ for some $S \in \{1,2,\dots\}$ be all the points of changes in economic activity of producers or consumers.

Definition 12. The mapping $T: [0,1] \rightarrow \mathbb{E}_q(\mathcal{E}_q)$ satisfying

$T(0) = \mathcal{E}_q, T(1) = \mathcal{E}'_q(1) = \mathcal{E}'_q, T(t) = \mathcal{E}'_q(t_s)$ for $t \in [t_{s-1}, t_s)$ for $s \in \{1,2, \dots, S\}$ is called the transition from the economy \mathcal{E}_q to the economy \mathcal{E}'_q .

If additionally $\mathcal{E}_q \subset_i \mathcal{E}'_q$ then transition T is called the innovative evolution of economy \mathcal{E}_q .

The interval $[0,1]$ is interpreted as the time of evolution of economy \mathcal{E}_q to economy \mathcal{E}'_q .

Theorem 1 If \mathcal{E}_q and \mathcal{E}'_q are private ownership economies with almost all inactive agents, then the transition T from economy \mathcal{E}_q to economy \mathcal{E}'_q , is the price mechanism.

Proof. Let $K = \{a_1, b_1, a_2, b_2, \dots\}$ be the set of agents. The environment of every agent $k \in K$ in this situation is determined by the characteristics of that agent in economy \mathcal{E}_q . Hence it is of the form:

$$e^k \stackrel{\text{def}}{=} \begin{cases} (p, y(k), \{0\}, 0, \{\emptyset\}, f_0) & \text{if } k \in B \setminus A \\ (p, \{0\}, \chi(k), \epsilon(k), \varepsilon(k), \theta(k, \cdot)) & \text{if } k \in A \setminus B \\ (p, y(k), \chi(k), \epsilon(k), \varepsilon(k), \theta(k, \cdot)) & \text{if } k \in A \cap B. \end{cases} \quad (5)$$

Hence the set of environments E^k of every agent k and the set of environments E are given by

$$E^k = \mathbb{R}^\ell \times P(\mathbb{R}^\ell) \times P(\mathbb{R}^\ell) \times \mathbb{R}^\ell \times P(\mathbb{R}^{2\ell}) \times \mathcal{F}(B, [0,1]), \quad (6)$$

$$E \stackrel{\text{def}}{=} E^{k_1} \times E^{k_2} \times \dots,$$

where

$$\mathcal{F}(B, [0,1]) = \{f: B \rightarrow [0,1]\}, f_0 \in \mathcal{F}(B, [0,1]), f_0 \equiv 0$$

Put

$$z^k \stackrel{\text{def}}{=} \begin{cases} (p', y'(k), \{0\}, 0, \{\emptyset\}, f_0) & \text{if } k \in B \setminus A \\ (p', \{0\}, \chi'(k), \epsilon'(k), \varepsilon'(k), \theta'(k, \cdot)) & \text{if } k \in A \setminus B \\ (p', y'(k), \chi'(k), \epsilon'(k), \varepsilon'(k), \theta'(k, \cdot)) & \text{if } k \in A \cap B. \end{cases}$$

and consequently

$$Z^k = \mathbb{R}^{\ell'} \times P(\mathbb{R}^{\ell'}) \times P(\mathbb{R}^{\ell'}) \times \mathbb{R}^{\ell'} \times P(\mathbb{R}^{2\ell'}) \times \mathcal{F}(B, [0,1]).$$

The logic structure of action of economy \mathcal{E}_q implies that

$$m^k \stackrel{\text{def}}{=} \begin{cases} (p', y'^k, 0, 0, \{\emptyset\}, f_0) & \text{if } k \in B \setminus A \\ (p', 0, x'^k, \epsilon'(k), \varepsilon'(k), \theta'(k, \cdot)) & \text{if } k \in A \setminus B \\ (p', y'^k, x'^k, \epsilon'(k), \varepsilon'(k), \theta'(k, \cdot)) & \text{if } k \in A \cap B \end{cases}$$

as well as $\mu^k: E^k \rightarrow M$, for every agent $k \in K$, is given by

$$\mu^k(e^k) \stackrel{\text{def}}{=} \begin{cases} \bigcup_{y'^k \in Y'^k} m^k & \text{if } k \in B \setminus A \\ \bigcup_{x'^k \in X'^k} m^k & \text{if } k \in A \setminus B \\ \bigcup_{y'^k \in Y'^k, x'^k \in X'^k} m^k & \text{if } k \in A \cap B. \end{cases}$$

Now we get that

$$M^k = \mathbb{R}^{\ell'} \times \mathbb{R}^{\ell'} \times \mathbb{R}^{\ell'} \times \mathbb{R}^{\ell'} \times \mathbb{R}^{2\ell'} \times \mathcal{F}(B, [0,1]), M \stackrel{\text{def}}{=} M^{k_1} \times M^{k_2} \times \dots$$

Defining message correspondence $\mu: E \rightarrow M$ by the rule

$$\mu(e) \stackrel{\text{def}}{=} \bigcup_{k \in K} \mu^k(e^k)$$

and the outcome function $h: M \rightarrow Z$

$$h: M \rightarrow Z, h \stackrel{\text{def}}{=} id_M,$$

we get that the transition from economy \mathcal{E}_q to economy \mathcal{E}'_q is the privacy preserving price mechanism realizing the goal correspondence

$$F: E \ni (e^1, e^2, \dots) \rightarrow \{(z^1, z^2, \dots)\} \in Z,$$

with the set of outcomes Z . The components of the environments $\{z^k\}_{k \in K}$ form the economy \mathcal{E}'_q which gives the results.

A similar reasoning leads us to the theorems which give the conditions sufficient for the price mechanism T to be a suitable qualitative mechanism.

Theorem 2. Let \mathcal{E}_q and \mathcal{E}'_q be the private ownership economies with almost all inactive agents, $\mathcal{E}_q \subset \mathcal{E}'_q$.

1. If $P_q \subset_i P'_q$, $p = \text{proj}_{\mathbb{R}^\ell}(p')$ and $P'_q = P'$, then the price mechanism T is also the qualitative mechanism with respect to the set of innovators,
2. If $P_q \subset_c P'_q$ with respect to the profit and $P'_q = P'$, then the price mechanism T is the qualitative mechanism with respect to the set of all producers,
3. If $C_q \subset_c C'_q$ with respect to the demand and $C'_q = C'$, then the price mechanism T is the qualitative mechanism with respect to the set of all consumers.

On the basis of theorems 1 and 2 we get the following:

Theorem 3. Let $\mathcal{E}_q, \mathcal{E}'_q$ be the private ownership economies with almost all inactive agents, $\mathcal{E}_q \subset \mathcal{E}'_q$ as well as $\mathcal{E}'_q = \mathcal{E}'_p$.

1. If $\mathcal{E}_q \subset_c \mathcal{E}'_q$, where $C_q \subset_c C'_q$ with respect to the demand or $P_q \subset_c P'_q$ with respect to the profit, then the price mechanism T is also the qualitative mechanism with respect to the set of all agents.
2. If $\mathcal{E}_q \subset_i \mathcal{E}'_q$ and $p = \text{proj}_{\mathbb{R}^\ell}(p')$, then the price mechanism T is also the qualitative mechanism with respect to the set of innovators.
3. If $\mathcal{E}_q \subset_i \mathcal{E}'_q$, $p = \text{proj}_{\mathbb{R}^\ell}(p')$ as well as $C_q \subset_c C'_q$, then the price mechanism T is also the qualitative mechanism with respect to the set consisted of consumers and innovators.

Comparative analysis of mechanisms of evolutions of the Debreu economy

To compare possible innovative evolutions of the Debreu economy, we define the index of innovativeness of a possible transformation of the economy under study. It relies on comparing states of equilibrium in the adequate economies.

Let $\mathcal{E}_q = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$ and $\mathcal{E}'_q = (\mathbb{R}^{\ell'}, P'_q, C'_q, \theta', \omega')$ be the private ownership economies with almost all inactive agents. First we determine the distance between the allocations in economies \mathcal{E}_q and \mathcal{E}'_q . Let us recall that if a producer b_j , for $j \in \{1, 2, \dots, n\}$, will exit the market in point of time $t \in (0, 1]$, then $y'(b_j) = \{0\}$ and consequently $y^{bj} = 0 \in \mathbb{R}^{\ell'}$. Similarly, if a producer b_j , for $j > n$, enter the market in point $t \in (0, 1]$, then we put $y^{bj} = 0$. Under the above

assumptions, for $j \in J \stackrel{\text{def}}{=} \{1, 2, \dots, \max\{n, n'\}\}$ the distance between vectors y^{bj} and y'^{bj} , is defined b

$$\begin{aligned} \text{dist}(y^{bj}; y'^{bj}) &= \max_{k \in \{1, 2, \dots, \ell\}} \left\{ \left| y_k^{bj} - y_k'^{bj} \right| \right\} \quad \text{if } \ell = \ell' \\ \text{dist}(y^{bj}; y'^{bj}) &= \\ \max \left\{ \max_{k \in \{1, 2, \dots, \ell\}} \left\{ \left| y_k^{bj} - y_k'^{bj} \right| \right\}, \left| y_{\ell+1}^{bj} \right|, \dots, \left| y_{\ell'}^{bj} \right| \right\} &\quad \text{if } \ell < \ell'. \end{aligned}$$

In the same way, the distance between consumption plans x^{ai} and x'^{ai} for every $i \in I \stackrel{\text{def}}{=} \{1, 2, \dots, \max\{m, m'\}\}$ is defined.

On the basis of the above, we define the index which helps to compare the innovativeness of different transformations of the initial economy. Following Schumpeterian thinking, we assume that both: the initial and final economies are the Debreu economies $(\mathcal{E}_q = \mathcal{E}_p, \mathcal{E}'_q = \mathcal{E}'_p)$ as well as $\mathcal{E}_p \subset_i \mathcal{E}'_p$. Let $((x^{a*})_{a \in A}, (y^{b*})_{b \in B}, p)$ and $((x'^{a*})_{a \in A}, (y'^{b*})_{b \in B}, p')$ be states of equilibrium in the economies, adequately \mathcal{E}_p and \mathcal{E}'_p .

The distance between two states is equal:

$$\text{dist}(((x^{a*})_{a \in A}, (y^{b*})_{b \in B}); ((x'^{a*})_{a \in A}, (y'^{b*})_{b \in B})) \stackrel{\text{def}}{=} \max \{ \max \{ \text{dist}(y^{bj*}; y'^{bj*}); j \in J \}; \max \{ \text{dist}(x^{ai*}; x'^{ai*}); i \in I \} \} \quad (7)$$

The number (7) is called the index of innovativeness of the economy \mathcal{E}'_q with the realized allocation $((x'^{a*})_{a \in A}, (y'^{b*})_{b \in B})$. It measures the highest difference between the quantities of commodities in the agents' plans of actions in times $t = 0$ and $t = 1$. Consequently, the above defined index of innovativeness shows the biggest change introduced to the economy under study on the given time interval. Let us emphasize that the level of the index of innovativeness of the economy \mathcal{E}'_p depends not only on the initial economy but also on the realized allocation. If the designer of economic activity aims at inducing or increasing the innovative activities on market, then he will intend to establish the state of equilibrium with the higher level of the index of innovativeness rather than with the smaller one, especially if the innovators are better off (see (3)) in the economy \mathcal{E}'_p than in the initial economy \mathcal{E}_p .

It may happen that in the final economy \mathcal{E}'_p there are at least two different states of equilibrium with the same index of innovativeness. Then it seems to be "very Schumpeterian" that the designer will tend to establish a "better" state of equilibrium. This is the problem under study in the next part of the paper.

Comparative analysis of mechanisms of equilibrium in the Debreu economy

As was emphasized earlier, the final stage of Schumpeterian economic development is moving the system to a new stationary state, where previous

innovations have been absorbed in the equilibrated system (see for instance Andersen, 2009). If, for some $s \in \{1, 2, \dots, S\}$, $\mathcal{E}_q \subset_i \mathcal{E}'_q(t_s)$ where $\mathcal{E}'_q(t_s)$ is the Debreu economy, then at time t_s , the adapting mechanisms will start working in the economy $\mathcal{E}'_q(t_s)$ until any producer does not change his activity on the market. If any producer introduces innovative changes, then it means that innovative evolution of economy \mathcal{E}_q is still working. The innovative evolution will be stopped when every producer will be satisfied with his profit and the consumers will adopt the innovations into consumptions plans. Hence if $\mathcal{E}_q \subset_i \mathcal{E}'_q$ and the producers do not change their plans of action as well as \mathcal{E}'_q is the Debreu economy ($\mathcal{E}'_q = \mathcal{E}'_p$), the adopting procedures start working.

Now we face a challenge to model the second type of mechanism whose output is a state of equilibrium in the given economy. This type of mechanism was defined in Lipieta (2013) but for an economy with a finite number of agents. The following theorem is proved in the same way as Theorem 4. 1 in Lipieta (2013).

Theorem 4. Let $\mathcal{E}_p = (\mathbb{R}^\ell, P, C, \theta, \omega)$ be the Debreu economy and $Z = \{((x^{a^*})_{a \in A}, (y^{b^*})_{b \in B}) : \exists p \in \mathbb{R}^\ell \forall a \in A, b \in B \ x^{a^*} \in \varphi^a(p), y^{b^*} \in \eta^b(p) \wedge \sum_{a \in A} x^{a^*} - \sum_{b \in B} y^{b^*} = \omega\}$.

If the set Z is not empty, then the components of economy \mathcal{E}_p form the economic mechanism with Z as the set of outcomes.

Proof. Let $K = \{a_1, b_1, a_2, b_2, \dots\}$ be the set of agents. The environment of agent $k \in K$ is of the form (5), the set of environments E^k of every agent $k \in K$ as well as the set of environments E are of the form (6). Define

- $M = \{m = (p, x^{a_1}, y^{b_1}, x^{a_2}, y^{b_2}, \dots) \in \mathbb{R}^\ell \times X^{a_1} \times Y^{b_1} \times \dots : \sum_{i=1}^\infty x^{a_i} - \sum_{j=1}^\infty y^{b_j} = \omega\}$,
- $\mu(e) = \mu(e^{a_1}, e^{b_1}, e^{a_2}, e^{b_2}, \dots) \stackrel{\text{def}}{=} \bigcap_{k \in K} \mu^k(e^k)$ where $\mu^k: E^k \rightarrow M$ is the message correspondence of agent $k \in K$ such that
$$\mu^k(e^k) \stackrel{\text{def}}{=} \begin{cases} \{m \in M : y^k \in \eta^k(p)\} & \text{for } k \in B \setminus A \\ \{m \in M : x^k \in \varphi^k(p)\} & \text{for } k \in A \setminus B \\ \{m \in M : y^k \in y(k), x^k \in \varphi^k(p) \wedge y^k \in \eta^k(p)\} & \text{for } k \in A \cap B, \end{cases}$$
- $h: M \rightarrow Z, h(p, x^{a_1}, y^{b_1}, x^{a_2}, y^{b_2}, \dots) \stackrel{\text{def}}{=} (x^{a_1}, \dots, x^{a_m}, y^{b_1}, \dots, y^{b_n})$.

By the above definitions, we immediately get that the structure $\Gamma = (M, \mu, h)$, is the price mechanism realizing the goal correspondence

$$F: E \ni (e^{k_1}, e^{k_2}, \dots) \rightarrow (x^{a_1^*}, \dots, x^{a_m^*}, y^{b_1^*}, \dots, y^{b_n^*}) \in Z$$

The mechanism defined in Theorem 4 will be called the mechanism of equilibrium in economy \mathcal{E}_p or the adopting mechanism. As we see, if there is equilibrium in the given Debreu economy, then comparing mechanisms of equilibrium in this economy refers to comparing its feasible states of

equilibrium in this economy, which are the output of some mechanism of Schumpeterian evolution studied earlier.

DISCUSSION

Let $\mathcal{E}_p = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$ be the Debreu economy where two states of equilibrium (see (2)) are feasible, namely

$$\tilde{R} \stackrel{\text{def}}{=} ((\tilde{x}^{a*})_{a \in A}, (\tilde{y}^{b*})_{b \in B}, \tilde{p}) \text{ and } \tilde{R} \stackrel{\text{def}}{=} ((\tilde{x}^{a*})_{a \in A}, (\tilde{y}^{b*})_{b \in B}, \tilde{p}). \quad (8)$$

Now the problem under study is to define a criterion to enable comparing these two sequences in the context of improving positions of the economic agents taking part in the market activities in the meaning of conditions (3) and (4) or under improvement of the position of the economy as a whole. The term: improvement of the position of the economy will be defined later.

First, some basic properties of states of equilibrium or quasi-equilibrium in the private ownership economy will be presented. Assume first that $\tilde{p} = p$. Then

$$x^{a_i*} \sim_i \tilde{x}^{a_i*} \text{ for every } i \in \{1, \dots, m\} \text{ and } p \circ y^{b_j*} = \tilde{p} \circ \tilde{y}^{b_j*} \text{ for every } j \in \{1, \dots, n\}.$$

It means that the positions of every economic agent in the sense of conditions (3) and (4) are not changed. If $\tilde{p} = k \cdot p$ for $k > 1$, then also

$$x^{a_i*} \sim_i \tilde{x}^{a_i*} \text{ for every } i \in \{1, \dots, m\}$$

but

$$p \circ y^{b_j*} > 0 \implies p \circ y^{b_j*} < \tilde{p} \circ \tilde{y}^{b_j*} \text{ for every } j \in \{1, \dots, n\}$$

as well as

$$p \circ y^{b_j*} < 0 \implies p \circ y^{b_j*} > \tilde{p} \circ \tilde{y}^{b_j*} \text{ for every } j \in \{1, \dots, n\}$$

As we see, if the prices are proportionally higher in the sequence \tilde{R} than in sequence R (see (8)) then some economic agents can be better off (see (3)) while some of them can be worse off in the state of economy of the form \tilde{R} in comparing to the state R . The same can appear if vectors \tilde{p} and p are diametrically different. So, in many cases, the positions of some economic agents are improved while some of them not.

By this reason, we focus on ordering the feasible states of equilibrium in the Debreu economy under the other criterion. Let $\mathcal{E}_p = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$ be the Debreu economy where two states of equilibrium: R and \tilde{R} , are feasible (see (2)). Notice firstly that

$$p \circ (\sum_{a \in A} x^{a*}) = p \circ \omega + (p \circ \sum_{b \in B} y^{b*}). \quad (9)$$

The number

$$w \stackrel{\text{def}}{=} p \circ \left(\sum_{a \in A} x^{a^*} \right) \tag{10}$$

can be interpreted as the total wealth of economy \mathcal{E}_p at state R (see (8)), while the number

$$W = w - p \circ \omega \tag{11}$$

is the increment of the total wealth of the economy \mathcal{E}_p at state R . We can say that Debreu economy \mathcal{E}_p improved its position at state R if $W > 0$.

The increment of the total wealth of the economy \mathcal{E}_p can be obtained, among others, by activity of innovators on the market.

Analogously, we define numbers \tilde{w} and \tilde{W} at state \tilde{R} (see (8), (10) and (11)). By (9) we get that if

$$p \circ \sum_{b \in B} y^{b^*} > \tilde{p} \circ \sum_{b \in B} \tilde{y}^{b^*} \implies W > \tilde{W} \tag{12}$$

On the basis of property (12) we say that the state \tilde{R} is more beneficial (more preferable) for economy \mathcal{E}_p than state R , shortly $R < \tilde{R}$, if and only if increment of the total wealth of that economy at state \tilde{R} is higher than at state R , formally

$$R < \tilde{R} \iff W < \tilde{W}.$$

Hence if R, \tilde{R} are two feasible states of equilibrium in economy \mathcal{E}_p (see (8)) and $R < \tilde{R}$, then the designer of economic activity in economy \mathcal{E}_p should make producers and consumers realize their optimal plans from sequence \tilde{R} rather than from sequence R . Recall that innovators realize their innovative plans and that is why they are elements of the sequence adequately R or \tilde{R} (see (8)). Hence the sufficiently large number of innovators allows, in many cases, for the gain of an increment of the total wealth of the Debreu economy at a possibly high level.

Analogously, we say that states \tilde{R} and R are equally beneficial (indifferent), in short $\tilde{R} \sim R$, if the increments of the total wealth of that economy at state R and at state \tilde{R} are equal, precisely

$$\tilde{R} \sim R \iff W = \tilde{W}.$$

On the basis of the above, we say that state \tilde{R} is at least preferred as state R if it is more beneficial or indifferent. Formally,

$$R \preceq \tilde{R} \iff R < \tilde{R} \vee R \sim \tilde{R} \tag{13}$$

It is easy to check that relation $\preceq \subset (\mathbb{R}^{\ell})^{2(m+n+1)}$ is reflexive, transitive and complete. Hence the relation defined in (13) is the preference relation in the set of all feasible states of equilibrium of economy \mathcal{E}_p .

Let $\mathcal{E}_p = (\mathbb{R}^\ell, P, C, \theta, \omega)$ and $\tilde{\mathcal{E}}_p = (\mathbb{R}^\ell, \tilde{P}, \tilde{C}, \theta, \omega)$ be two Debreu economies different only in price system. Let Γ and $\tilde{\Gamma}$ be the mechanisms of equilibrium respectively in economies \mathcal{E}_p and

Taking all the above into consideration we define

$$\Gamma < \tilde{\Gamma} \Leftrightarrow W < \tilde{W}, \quad \Gamma \sim \tilde{\Gamma} \Leftrightarrow W = \tilde{W}$$

and consequently

$$\Gamma \leq \tilde{\Gamma} \Leftrightarrow W \leq \tilde{W}.$$

Let:

$\mathcal{E}_q = (\mathbb{R}^\ell, P_q, C_q, \theta, \omega)$, $\mathcal{E}'_q = (\mathbb{R}^\ell, P'_q, C'_q, \theta', \omega')$, $\tilde{\mathcal{E}}'_q = (\mathbb{R}^\ell, \tilde{P}'_q, \tilde{C}'_q, \theta', \omega')$ be the Debreu economies and $\mathcal{E}_q \subset_i \mathcal{E}'_q$ and $\mathcal{E}_q \subset_i \tilde{\mathcal{E}}'_q$ on time interval $[0,1]$. We can implement the results of that part of the paper to the economies \mathcal{E}'_q and $\tilde{\mathcal{E}}'_q$. On the basis of the above results, the designer can order the adopting mechanisms in the set of possible economies \mathcal{E}'_q for which $\mathcal{E}_q \subset_i \mathcal{E}'_q$, which differ only in price system, formally in the set:

$$\mathbb{E}_q(\mathcal{E}_q; \mathcal{E}'_q) \stackrel{\text{def}}{=} \{\tilde{\mathcal{E}}'_q \in \mathbb{E}_q: \mathcal{E}_q \subset_i \tilde{\mathcal{E}}'_q \wedge \mathcal{E}'_q \text{ and } \tilde{\mathcal{E}}'_q \text{ differ only in price system}\}.$$

The internal structure of this domain can be the research object of the future studies.

CONCLUSION

In contrast to some neo-Schumpeterian studies, where two kinds of mechanisms in the framework of Schumpeterian evolution, namely the innovative evolution mechanism as well as the adopting mechanism were only indicated and considered verbally, we distinguished and modeled them in a general and rigorous manner. Moreover, some of these mechanisms appear to be qualitative ones, which reveal their complex structure and can be a promising starting point for further analysis of these types of mechanisms. We have also precisely explained the motivations of innovators and the reason for which the innovations are adopted into the producers' and consumers' plans of action and, in consequence, their influence on the components of states of equilibrium.

The criteria for comparing the two types of modeled mechanisms, based on some properties of the adequate set of outcomes, also were presented. They enable, among others, the measurement of the innovativeness of the processes under study, as well as the comparison of the feasible states of equilibrium in the modified economies. All this can be the basis for further research. Especially, the role of market leaders in the evolutionary processes seems to be worth studying as well as examining the "best" or at least the

“good enough” mechanisms among the mechanisms presented in the paper, from the point of view of designers, consumers or innovators, respectively.

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Abstrakt

Niniejszy artykuł powstał w ramach programu badawczego dotyczącego modelowania wizji rozwoju innowacyjnego Schumpetera w aparacie pojęciowym teorii ogólnej równowagi Arrowa-Debreu. Aby analizować zmiany w sferze produkcji oraz całej gospodarki wykorzystano pojęcie rozszerzenia systemu ekonomicznego oraz jego podsystemów, co umożliwiło modelowanie schumpeterowskich mechanizmów ewolucji gospodarki, w ujęciu teorii mechanizmów ekonomicznych Hurwicza.

Celem artykułu jest rozszerzenie naszych poprzednich badań w dwu nowych kierunkach. Po pierwsze określimy warunki wystarczające do poprawy sytuacji ekonomicznej różnych grup podmiotów, takich jak producenci, innowatorzy, konsumenci etc., w wyniku działania mechanizmu cenowego lub jakościowego. Po drugie, aby porównywać mechanizmy schumpeterowskiej ewolucji, odwołujemy się do logiki procesu, zdeterminowanego przez zmiany innowacyjne lub zmiany adaptujące zmierzające do równowagi, co prowadzi do sformułowania dwóch różnych kryteriów, opartych z jednej strony na współczynniku odległości pomiędzy dwoma rozszerzeniami innowacyjnymi, z drugiej strony na współczynniku zamożności rozważanych grup podmiotów.

W artykule analizowane są również motywacje wprowadzania innowacji przez firmy oraz powody dla których innowacje są adoptowane do rutynowych działań producentów i konsumentów. Wyniki naszych teoretycznych rozważań mogą być przydatne w analizach rynkowych m. in. w przypadku braku wystarczającego dostępu do danych statystycznych. Z uwagi na formalny charakter zarówno teorii ogólnej równowagi jak i podejścia Hurwicza do problemu projektowania mechanizmów ekonomicznych, główne rezultaty mają postać twierdzeń matematycznych interpretowanych w języku ekonomii.

Słowa kluczowe: ewolucja Schumpetera, mechanizmy, mechanizmy projektowania, gospodarka Debreu.

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Innovativeness of Enterprises in Poland in a Regional Context

*Anna Golejewska*¹

Abstract

The article examines the innovativeness of enterprises in 69 Polish NUTS3 sub-regions in 2014. The analysis is based on unpublished regional data from the Polish Central Statistical Office covering the following variables: the share of enterprises which have incurred outlays for innovative activities, the share of enterprises implementing process or product innovations, the share of companies collaborating in the field of innovation, and the share of new or modernized products in total production sold in industrial companies. The analysis focuses on building rankings and cluster analysis of NUTS3 regions. As research methods, the author uses selected methods of multidimensional comparative analysis, principal component analysis and the hierarchical Ward's method. The results show that there are substantial differences among NUTS3 sub-regions as regards innovativeness of enterprises. The low level of cooperation does not foster innovation. Innovation outputs of enterprises are also unsatisfactory. The highest variation is seen in the share of new or modernized products in total production sold in industrial companies. The final effect of the cluster analysis is the division of regions into 7 groups. In the case of units where innovation inputs are not reflected in innovation outputs, it would be useful to explore regional and local factors influencing those relations. Further research is still needed.

Keywords: *innovation, enterprises, regional differences.*

INTRODUCTION

In the majority of the EU countries, there is a noticeable outflow of enterprises from innovative activity. The same applies in Poland, particularly to service enterprises. In well-developed economies with accumulated innovation potential this trend does not entail such enormous risks as in less innovative countries. Despite the declining percentage of innovative firms in Poland, one can observe an increase in expenditure on innovation, but it still remains below

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the EU average. The level of cooperation between Polish enterprises seems to be quite favorable in comparison to other countries; nevertheless, innovation cooperation remains unsatisfactory (Zadura-Lichota, 2015, pp. 5-63).

The activity of companies determines innovativeness at a national, regional and local level. Researchers on innovation issues often underline the importance of regions in the innovation process. There exists extensive evidence that knowledge and innovation are concentrated in selected regions, sub-regions or cities (Simmie, 2003; Nowakowska, 2009; Siłka, 2012; Golejewska, 2013; Golejewska, 2012). A region, through its specific assets including knowledge, learning ability, organizational culture, infrastructure, etc., has an impact on the competitiveness of local businesses and their innovative activity. Local competitive advantages result from a concentration of highly specialized knowledge, the presence of public institutions, competition, trade partners and consumers (Pinto, 2009).

The aim of the paper is to examine disproportions in innovativeness between enterprises in 69 Polish NUTS3 sub-regions in 2014. To achieve the main objective of the paper, the following detailed objectives are expected to be met: 1) presentation of the literature review; 2) empirical research on the innovativeness of Polish firms covering the creation of rankings and cluster analysis, and finally 3) conclusions.

LITERATURE REVIEW

Innovation has been and continues to be an important topic of study for a number of different disciplines, including economics, business, engineering, science, and sociology. The importance and role of knowledge assets in determining competitiveness, productivity, and finally output growth is a frequent theme in the spatial and non-spatial literature (Harris, 2008, p. 16).

Technology consists of three key elements: knowledge, skills and artefacts. Technological innovation involves “the process of applying knowledge and skills to combine an existing set of artifacts into a novel combination that fill a market demand and thereby create value” (Wolfe, 2011, p. 44). A firm is a central actor for the effectuation of innovation and technological change. Innovativeness determines the standards and directions of development of an enterprise, and thus its development and competitive advantage. Through a process of competition, firms with new products make firms with old products redundant and firms with more efficient modes of production eliminate less-efficient producers from the market. Differences in total factory productivity account for roughly half the differences in income across countries and are generally associated with differences in technological progress (Hall & Jones, 1999). Firms

introducing new products and new methods of production and distribution directly enhance economic growth (Bosma, Schutjens & Stam, 2011, p. 483).

A region may be regarded as an “innovation incubator” which provides appropriate conditions for the setting up and the development of innovative companies, as well as pro-innovation behavior among other important entities in a territory. Recent literature calls into question whether innovations emerge from the single inventor or even in whole internally within a firm or organization (Amara, Landry & Lamari, 2003; Wolfe, 2009; Johnson, 2011). Knowledge-based transformations should not be understood as the results of the actions of firms alone, “but as a structural characteristic of knowledge-based economies” (Leydesdorff, 2001, p. 4) and “a social process that depends on interaction and learning” (Hall, 2010, p. 10). The literature indicates various “territorial innovation systems” (Legendijk, 1997; Moulaert & Mehmood, 2010). Their typology often includes industrial districts (focused on the growth dynamics of small and medium-sized enterprises), innovative milieu, regional innovation systems, clusters and learning regions (Legendijk, 1997; Porter, 2000; De Propriis & Crevoisier, 2011). The last ones may be treated as a general synthesis of the above-mentioned concepts (Moulaert & Mehmood, 2010).

Innovation is a complex and multidimensional activity that cannot be measured directly or with a single indicator. Measuring innovation has been studied extensively by scholars and practitioners. In the literature, even “innovation economics” exists - a sub-discipline that analyses the relationship between investments in innovation and their financial outcomes. Innovation indicators are split into four groups-generations, from less to more complex. The first group, focusing on a linear model of innovation, includes such indicators as R&D investment, research personnel, university graduates, etc. The second group is extended by output indicators. The third generation is focused on a wider set of innovation indicators and indexes based on surveys and the integration of publicly available data. The fourth generation is currently at an embryonic stage and includes knowledge, networks, risk, clusters, management techniques, etc. (Gamal, 2011, p. 10).

In the literature, two broad streams of research on the measurement of innovation are noticeable. The first one concentrates on innovation inputs, such as R&D intensity, and outputs, such as patents. Nevertheless, these measures merely concern a small part of all the possible innovation activities. Due to empirical evidence, the linkage between such measures and organizational innovativeness and economic growth is vague. An appropriate example is a research conducted by Booz (2005) based on 1000 top global innovation spenders which confirmed there was no significant relationship between R&D spending and nearly all measures of business success. The value of patents as indicators of innovation, at a micro level, is rather limited

(Gittleman, 2008). The second stream is focused on the macro level. In the EU, countries' innovation capabilities are measured through objective economic measures, such as the Oslo Manual (2005), the European Community Innovation, and the European Innovation Scoreboard (EIS) (Gamal, 2011, p. 9). Regional innovation performance, measured by the Regional Innovation Scoreboard, should be based on the same indicators as EIS. Nevertheless, for many of them regional data are not available and are calculated using only 18 of the 27 EIS indicators. Some indicators relating to entrepreneurial activity belong among others: R&D expenditure in the business sector as a percentage of GDP; SMEs innovating in-house as a percentage of SMEs; innovative SMEs collaborating with others as a percentage of SMEs; EPO patent applications per billion of regional GDP; SMEs introducing product or process innovations as a percentage of SMEs; SMEs introducing marketing or organizational innovations as a percentage of SMEs, sales of new-to-market and new-to-firm innovations as a percentage of total turnover etc. (Hollanders & Es-Sadki, 2017). In the paper, the author followed the approach of the Regional Innovation Scoreboard, in which input-type and output-type measures have been used simultaneously.

There have been and continue to be substantial differences among Polish regions as regards innovativeness (Kowalik, 2014; Golejewska, 2013; Górecka & Muszyńska, 2011; Nowakowska, 2009; Siłka, 2012). According to the findings presented in the Regional Innovation Scoreboard (2017), 7 out of 16 Polish regions have been classified as moderate innovators and none as innovation leader or strong innovator. Research results show that high innovation inputs do not often correspond with high innovation outputs (Golejewska, 2013). Polish regions are also internally diversified as regards innovativeness (Brodzicki & Golejewska, 2017). Disproportions between the best performing regions and the rest of the country are a big challenge for regional innovation policy.

RESEARCH METHODS

The group of analyzed regions consists of 69 units (out of 72 units according to the territorial breakdown of 1 January 2015). The analysis is based on unpublished regional data of the Polish Central Statistical Office covering the following variables: the share of enterprises which have incurred outlays for innovative activities, the share of enterprises implementing process or product innovations, the share of companies collaborating in the field of innovation, and the share of new or modernized products in total production sold by industrial companies. The fifth available variable - internal expenditure on research and

development – has been omitted from the analysis due to a significant lack of data. The data cover industrial enterprises employing more than 49 people and have been extracted from innovation statements in the industry (PNT-02). The analysis was conducted for 2014, the most recent year for which data were available up to this point. Due to a lack of data, three NUT3 regions have been omitted: Bialski (PL311), Ciechanowski (PL12B) and Nowotarski (PL 219).

The empirical analysis starts with the creation and comparison of innovativeness rankings on the basis of the method of ranks and method of standardized values. Some of the differences between the ranks have been explained by the results of the principal component analysis. Finally, a cluster analysis employing the hierarchical Ward's method was conducted. The applied method is effective in building homogenous clusters with the lowest inter-group variance (Grabiński, 2003, p. 110).

RESULTS AND DISCUSSION

Descriptive statistics of the analyzed variables are presented in Table 1. The highest coefficient of variation (75.4) was recorded for the share of sold production of new or substantively improved (modernized) goods in the sold value of industry, the lowest (19.1) for the share of enterprises which implemented process or product innovations. The results of the analysis of mean values indicate a very low level of innovation cooperation and sold production of new goods. This might suggest that there is still a mutual distrust between companies in Poland and also that they do not derive significant benefits from cooperation and implemented innovations.

Table1. Descriptive statistics

Variable	N	Mean	Median	Min.	Max.	Lower quartile	Upper quartile	Standard deviation	Coefficient of variation
X1	69	28.9	28.2	15.2	44.7	23.8	34.0	6.9	23.9
X2	69	14.1	13.2	5.1	29.1	9.9	17.6	5.5	38.7
X3	69	35.7	36.2	19.6	48.4	30.5	40.8	6.8	19.1
X4	69	10.1	8.0	0.7	44.3	4.2	12.9	7.6	75.4

Note: X1: share of enterprises which have incurred outlays for innovative activities in 2014 (input),
 X2: share of enterprises involved in innovation cooperation in 2012-2014 (input),
 X3: share of enterprises which implemented process or product innovations in 2012-2014 (output),
 X4: share of sold production of new or substantively improved (modernized) goods introduced in 2012-2014 in sold value of industry in 2014 (output).

Source: own elaboration based on CSO data.

The highest share of enterprises which incurred outlays for innovative activities was recorded in PL213: city of Kraków – 44.7%, PL523: Nyski – 43.8%, PL514: city of Wrocław and PL127: city of Warszawa – 42.7%. The lowest, less than 20% - in PL116: Sieradzki, PL417: Leszczyński, PL634: Gdański, PL637: Chojnicki, PL312: Chełmsko-Zamojski, PL616: Grudziądzki and PL12D: Ostrołęcki. Enterprises implementing innovations most frequently cooperated in PL213: city of Kraków, PL326 Tarnobrzesci, PL343 Białostocki and PL514: city of Wrocław (in all sub-regions at least 25%). The lowest share of cooperating enterprises was recorded for PL616: Grudziądzki, PL417: Leszczyński, PL636: Słupski, PL116: Sieradzki, PL345 Suwalski and PL312: Chełmsko-Zamojski. In all cases, the share did not exceed 7.5%. Most of the leaders in the share of innovative enterprises were placed highly in the ranking based on implemented process or product innovations. The highest share of sold production of new or substantively improved (modernized) goods was recorded in Trójmiejski sub-region (44.3%), the city of Łódź (31.7%) and Ostrołęcki sub-region (25%). The difference between the best and the worst performing sub-region was, in this case, the highest in comparison to other variables. The lowest shares amounted to 0.7% in Siedlecki and 1.9% in Przemyski sub-region. Rankings by selected variables are presented in Table 2.

Table 2. Rankings by selected variables (method of ranks)

Rank	X1	X2	X3	X4	Rank	X1	X2	X3	X4
1	PL213	PL213	PL523	PL633	36	PL432	PL619	PL117	PL432
2	PL523	PL326	PL343	PL113	37	PL12C	PL332	PL224	PL332
3	PL514	PL343	PL127	PL12D	38	PL228	PL637	PL344	PL617
4	PL127	PL514	PL514	PL225	39	PL424	PL634	PL411	PL619
5	PL415	PL21A	PL415	PL638	40	PL218	PL117	PL516	PL116
6	PL325	PL127	PL213	PL129	41	PL618	PL115	PL619	PL22A
7	PL315	PL424	PL21A	PL518	42	PL331	PL623	PL426	PL637
8	PL21A	PL523	PL315	PL418	43	PL414	PL344	PL432	PL224
9	PL343	PL325	PL113	PL22B	44	PL517	PL411	PL115	PL623
10	PL314	PL613	PL229	PL218	45	PL431	PL324	PL617	PL424
11	PL22B	PL12A	PL217	PL517	46	PL411	PL12E	PL114	PL417
12	PL324	PL415	PL326	PL616	47	PL224	PL622	PL431	PL426
13	PL113	PL22C	PL517	PL613	48	PL427	PL428	PL218	PL636
14	PL326	PL524	PL314	PL325	49	PL117	PL515	PL622	PL12A
15	PL229	PL314	PL129	PL214	50	PL12E	PL217	PL515	PL523
16	PL22C	PL22A	PL325	PL514	51	PL217	PL638	PL128	PL415
17	PL524	PL114	PL22A	PL127	52	PL621	PL416	PL427	PL217

Rank	X1	X2	X3	X4	Rank	X1	X2	X3	X4
18	PL129	PL22B	PL418	PL326	53	PL515	PL617	PL331	PL621
19	PL225	PL516	PL22C	PL515	54	PL623	PL12D	PL618	PL431
20	PL22A	PL517	PL225	PL516	55	PL617	PL224	PL227	PL634
21	PL613	PL225	PL428	PL114	56	PL227	PL618	PL621	PL331
22	PL633	PL633	PL613	PL227	57	PL128	PL426	PL414	PL115
23	PL518	PL113	PL623	PL428	58	PL345	PL12C	PL634	PL344
24	PL418	PL418	PL518	PL343	59	PL115	PL431	PL416	PL312
25	PL428	PL229	PL323	PL22C	60	PL638	PL128	PL12D	PL427
26	PL332	PL432	PL22B	PL229	61	PL636	PL621	PL636	PL128
27	PL516	PL227	PL633	PL213	62	PL416	PL218	PL616	PL315
28	PL619	PL129	PL324	PL414	63	PL12D	PL315	PL345	PL12C
29	PL12A	PL331	PL524	PL524	64	PL616	PL312	PL638	PL622
30	PL114	PL228	PL214	PL416	65	PL312	PL345	PL228	PL117
31	PL344	PL427	PL332	PL314	66	PL637	PL116	PL312	PL618
32	PL214	PL214	PL12E	PL323	67	PL634	PL636	PL637	PL345
33	PL323	PL323	PL12A	PL411	68	PL417	PL417	PL417	PL324
34	PL426	PL518	PL424	PL21A	69	PL116	PL616	PL116	PL12E
35	PL622	PL414	PL12C	PL228					

Source: own elaboration based on CSO data (2014).

Ranking considering all variables, based on the method of ranks is presented in Table 3. The leaders among cities are Wrocław, Warszawa and Kraków. The top ten also includes Łódź and sub-regions of Podkarpackie (PL325, PL326), Małopolskie (PL 21A), Podlaskie (PL343), Opolskie (PL523) and Śląskie (PL 22B). Among the ten least innovative sub-regions, three represent the region of Pomorskie. These results differ from the results obtained by the method of standardized values (Table 4). This is particularly the case for such NUTS 3 sub-regions as Trójmiejski (PL633), Rzeszowski (PL325), Bytomski (PL228), Płocki (PL12C), Skierniewicki (PL117), Łomżyński (PL344) and the City of Poznań (PL415). In those cases, the differences amount to at least six places. In the case of Trójmiejski sub-region, a significant impact on the difference has the highest value of the share of sold production. Low values of this variable in Rzeszowski and Bytomski sub-region result in their lower position in the second ranking. In other cases, the sub-regions were classified higher in ranking based on the method of standardized values. In this case, it results mainly from a high value of the share of enterprises which implemented process or product innovations in those regions.

Table 3. Rankings of NUTS3 sub-regions (method of ranks)

Rank	NUT 3 region	Rank	NUTS 3 region	Rank	NUTS 3 region
1	City of Wrocław	24	Legnicko-Głogowski	47	Koszaliński
2	Capital City Warszawa	25	Krakowski	48	Starogardzki
3	City of Kraków	26	Łódzki	49	Częstochowski
4	Białostocki	27	Szczeciński	50	Inowrocławski
5	Rzeszowski	28	Warszawski Zachodni	51	Skierniewicki
6	Tarnobrzeski	29	Krośnieński	52	Szczecinecko-Pyrzycki
7	City of Łódź	30	City of Szczecin	53	Płocki
8	Oświęcimski	31	Sandomiersko- Jędrzejowski	54	Olsztyński
9	Nyski	32	Puławski	55	Siedlecki
10	Sosnowiecki	33	Zielonogórski	56	Piotrkowski
11	Bielski	34	Włocławski	57	Kaliski
12	Bydgosko-Toruński	35	Przemyski	58	Gorzowski
13	Warszawski Wschodni	36	Nowosądecki	59	Grudziądzki
14	Lubelski	37	Rybnicki	60	Chojnicki
15	Trójmiejski	38	Piłski	61	Świecki
16	City of Poznań	39	Koniński	62	Gdański
17	Tyski	40	Tarnowski	63	Elbląski
18	Poznański	41	Ełcki	64	Radomski
19	Gliwicki	42	Bytomski	65	Słupski
20	Wrocławski	43	Łomżyński	66	Sieradzki
21	Wałbrzyski	44	Jeleniogórski	67	Leszczyński
22	Opolski	45	Ostrołęcki	68	Suwalski
23	Katowicki	46	Kielecki	69	Chełmsko-Zamojski

Source: own elaboration based on CSO data (2014).

Table 4. Rankings of NUTS3 sub-regions (method of standardized values)

Rank	NUT 3 region	Rank	NUTS 3 region	Rank	NUTS 3 region
1	City of Kraków	24	Warszawski Zachodni	47	Starogardzki
2	City of Wrocław	25	Legnicko-Głogowski	48	Częstochowski
3	Capital City Warszawa	26	City of Szczecin	49	Ostrołęcki
4	Białostocki	27	Łódzki	50	Bytomski
5	Nyski	28	Krakowski	51	Kielecki
6	Trójmiejski	29	Szczeciński	52	Siedlecki

Rank	NUT 3 region	Rank	NUTS 3 region	Rank	NUTS 3 region
7	City of Łódź	30	Puławski	53	Olsztyński
8	Oświęcimski	31	Krośnieński	54	Szczecinecko-Pyrzycki
9	Tarnobrzewski	32	Sandomiersko-Jędrzejowski	55	Inowrocławski
10	City of Poznań	33	Przemyski	56	Piotrkowski
11	Rzeszowski	34	Włocławski	57	Gorzowski
12	Bielski	35	Zielonogórski	58	Świecki
13	Bydgosko-Toruński	36	Łomżyński	59	Kaliski
14	Warszawski Wschodni	37	Ełcki	60	Elbląski
15	Sosnowiecki	38	Tarnowski	61	Radomski
16	Tyski	39	Nowosądecki	62	Gdański
17	Lubelski	40	Pilski	63	Grudziądzki
18	Poznański	41	Rybnicki	64	Chojnicki
19	Gliwicki	42	Koniński	65	Słupski
20	Katowicki	43	Koszaliński	66	Suwalski
21	Opolski	44	Jeleniogórski	67	Chełmsko-Zamojski
22	Wrocławski	45	Skierniewicki	68	Leszczyński
23	Wałbrzyski	46	Płocki	69	Sieradzki

Source: own elaboration based on CSO data (2014).

Some of the aforementioned differences between scores might be explained by the results of principal components analysis (Górniak, 1998; Leech, Barrett & Morgan, 2005). In the analysis, the first component is a composition of variables x1, x2 and x3 and the second represents variable x4. According to the scree plot, the first component explains the total variance of the analyzed variables at 66.44%, the second at 22.78%. Generally, the differences between rankings result from implemented methods. In ranking, each variable has in principle the same meaning but after standardization what is very important is the dispersal of observations, which is the highest for the fourth variable and thus has a greater impact on the final results of this method. From Figure 1 it is clear that Component 1 is the most significant for PL213, PL314, PL127, PL343 and PL523 and the least significant for PL116, PL417 and PL312. Component 2 remains the most significant for PL633, PL113, PL12D, PL638 and PL225 and the least significant for PL523, PL415 and PL315 (see Figure 1).

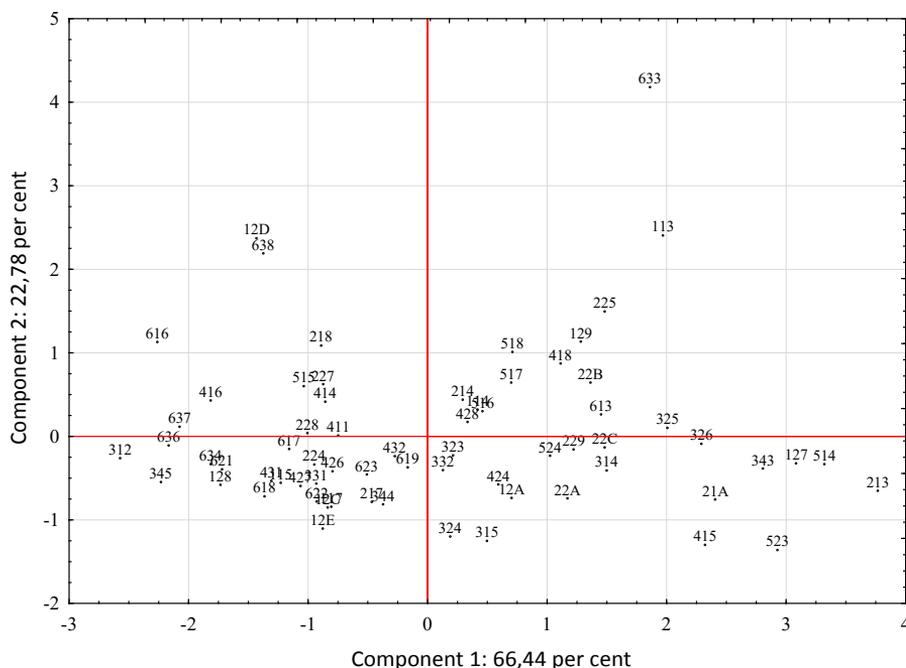


Figure 1. Results of principal component analysis

Source: own elaboration based on CSO data (2014).

The next step was the cluster analysis conducted using the hierarchical Ward's method. As a result, 69 sub-regions have been divided into 7 groups (see Table 5). The most numerous group consists of 16 NUTS3 sub-regions, the least numerous of 6 sub-regions. The results are presented graphically on the map (Figure 2).

The differences among groups were analyzed using mean values of the standardized variables (see Figure 3). The first group consists of 8 sub-regions located – apart from the capital region- in Małopolskie, Wielkopolskie, Dolnośląskie, Opolskie and in two Eastern regions: Podkarpackie and Podlaskie. It is characterized by the highest mean values of analyzed variables, apart from the value of sold production of new or substantively improved (modernized) goods which remains average. The second group comprises eight sub-regions located in Pomorskie (3 sub-regions), Wielkopolskie (2 sub-regions), łódzkie and in two Eastern regions: Lubelskie and Podlaskie. In contrast to the previous group, the sub-regions have the lowest values of variables apart from sold production which remains low.

Table 5. Results of cluster analysis, Ward's method

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
PL514	PL312	PL619	PL516	PL515	PL431	PL518
PL213	PL116	PL315	PL517	PL616	PL115	PL113
PL21A	PL345	PL432	PL613	PL218	PL117	PL129
PL127	PL634	PL323	PL314	PL12D	PL217	PL633
PL523	PL636	PL324	PL114	PL638	PL128	PL225
PL326	PL416	PL344	PL214	PL227	PL228	PL418
PL343	PL417	PL332	PL12A	PL414	PL224	
PL415	PL637	PL426	PL524		PL331	
		PL12C	PL325		PL621	
			PL229		PL623	
			PL22A		PL622	
			PL22B		PL411	
			PL22C		PL427	
			PL424		PL617	
			PL428		PL618	
					PL12E	

Source: own elaboration based on CSO data (2014).

The third group consists of 9 NUTS3 sub-regions and is characterized by a high share of innovative enterprises in which the level of cooperation and implemented innovation remain respectively low and average while sold production is rather low.

The next group is much more numerous and consists of 15 sub-regions. It is heterogynous and it is characterized by a high share of innovative enterprises, highly involved in cooperation, a high share of enterprises which implemented innovations and an average share of sold production of new goods. The fifth group comprises 7 sub-regions with low values of all the indicators apart from high production sold. The most numerous group 6 is characterized by low values of all indicators and the lowest mean value of production sold. The last group is the least numerous one. It consists of 6 sub-regions, all located in different regions. It is characterized by the highest mean value of the share of sold production of new or substantively improved (modernized) goods.

Definite leaders of the first, best performing group are Kraków and Wrocław. In the weakest group 2, the highest innovation indicators have enterprises located in Słupski and Kaliski sub-region. In the third group, the most innovative are enterprises in Krośnieński and Puławski sub-region, and in the fourth group – enterprises located in Rzeszowski, Sosnowiecki and Bydgosko-Toruński sub-region. The leaders of the next group are enterprises of Nowosądecki and Rybnicki sub-region. The highest innovation indicators in the sixth group were recorded in Ełcki, Tarnowski and Piłski sub-region and finally, in the last group in the enterprises of Trójmiejski sub-region.

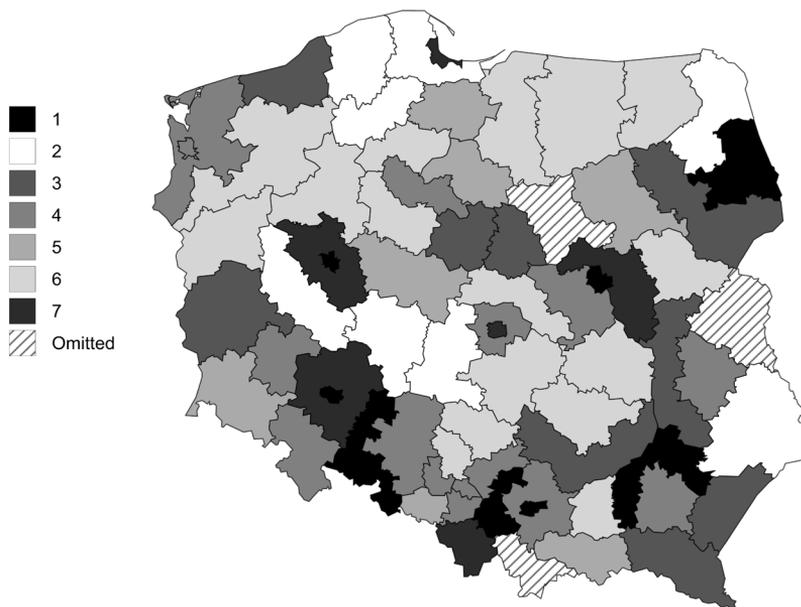


Figure 2. Results of cluster analysis, Ward’s method, groups

Source: own elaboration based on CSO data (2014).

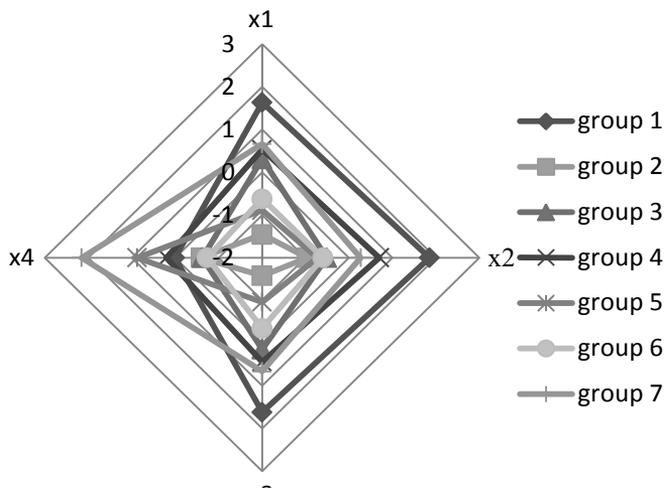


Figure 3. Mean values of variables by groups of regions

Source: own elaboration based on CSO data (2014).

CONCLUSION

Results of the analysis show that there are substantial disproportions in innovativeness between industrial enterprises located in different Polish NUTS 3 sub-regions. The greatest differences are visible in the share of sold production of new goods in the sold value of industry and in the level of innovation cooperation which remains unsatisfactory. The results confirm that there might still be a mutual distrust between companies in Poland as regards innovation activity and also that they might not derive significant benefits from cooperation and implemented innovations. The ranking scores show some differences mainly due to the high dispersal of observations for the share of sold production of new products. The scores confirm dominance at the forefront of major urban centers. Among the cities, the leaders are Wrocław, Warszawa and Kraków. It is noteworthy that not many of the Eastern sub-regions performed badly. The lowest innovation indicators have enterprises in Suwalski and Chełmsko-Zamojski sub-region. It is also interesting to note that three out of the ten worst performing sub-regions are located in the region of Pomorskie. Their low position results mainly from low innovation cooperation and a low share of sold production of new goods.

The final effect of the cluster analysis is the division of regions into 7 groups, of which the first one is characterized by the highest innovativeness of industrial enterprises and the second one by the lowest. The group in which low inputs translate into low outputs is group 6. The groups with high input variables are group 4 and group 7. In the latter group they translate into the highest share of sold production of new products. In group 5 low inputs correspond with the second highest value of the mentioned output indicator. Finally, group 3 consists of units in which the mean values of input and output variables are mixed: low or average. The groups of sub-regions are not “homogenous geographically” which means that Polish NUTS 2 regions are internally diverse as regards innovativeness of industrial enterprises. The only exception is Warmińsko-Mazurskie. As benchmarking, it could be interesting to identify sub-regions with high innovation outputs corresponding with lower or proportionate innovation inputs. In the case of units where inputs are not reflected in outputs, it would be useful to explore regional and local factors influencing those relations. It shall be a question for further study.

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Abstrakt

Artykuł analizuje innowacyjność przedsiębiorstw w 69 polskich podregionach NUTS-3 w 2014 roku. Analiza bazuje na niepublikowanych danych regionalnych GUS obejmujących następujące zmienne: udział przedsiębiorstw, które poniosły nakłady na działalność innowacyjną; udział przedsiębiorstw, które nawiązały współpracę w zakresie działalności innowacyjnej; udział przedsiębiorstw, które wdrożyły innowacje produktowe lub procesowe i udział produkcji sprzedanej wyrobów nowych lub ulepszonych w przedsiębiorstwach przemysłowych w wartości sprzedanej wyrobów ogółem. W opracowaniu przeprowadzono rankingi i analizę skupień. Zastosowane metody badawcze to wielowymiarowa analiza porównawcza, analiza głównych składowych i hierarchiczna metoda Warda. Wyniki potwierdziły istotne zróżnicowanie podregionów NUTS-3 w zakresie innowacyjności przedsiębiorstw. Niski poziom ich współpracy nie sprzyja innowacjom. Rezultaty działań innowacyjnych przedsiębiorstw również nie są satysfakcjonujące. Najwyższy poziom zmienności odnotowano dla udziału produkcji sprzedanej wyrobów nowych lub ulepszonych w wartości sprzedanej wyrobów ogółem. Wynikiem przeprowadzonej analizy skupień jest podział podregionów na 7 grup. W przypadku jednostek, w których potencjał nie przekłada się na innowacyjność należałoby zbadać lokalne i regionalne czynniki wpływające na te relacje. Niezbędne jest przeprowadzenie dalszych badań.

Słowa kluczowe: innowacje, przedsiębiorstwa, różnice regionalne.

Biographical note

Anna Golejewska, Ph.D., is a member of the staff of the Chair of Economics of European Integration at the Faculty of Economics of Gdańsk University. She lectures on economy and regional policy, including the system of implementation of the EU structural funds in Poland. She is a member of the Team of Experts assessing projects co-financed by the EU structural funds. She has authored publications devoted to competitiveness and innovativeness issues. She is a member of the Regional Studies Association.

Innovation Patterns in the Canned Fish Industry in Galicia (Spain)

*Manuel González-López*¹

Abstract

In this paper, we analyze the competitive and innovative trajectories followed by the canned fish industry in recent times. We base our study on four case studies from the Galician industry in Spain, which comprises the largest share of the European canned fish sector. At least four different innovation patterns are found in the industry. The first pattern is a conservative one where innovation is seen as a risk and therefore maintaining current routines is the chosen option. The second pattern has been defined as “large retailer-dominated” and is followed by companies that have signed exclusive agreements with large retailers, which increasingly determine most of their innovation activities. The third strategy we have defined as “territory-orientated,” since product innovation and incorporation of quality distinctions based on the territory are the main innovation drivers. Finally, we have an “ecological or nature-orientated” innovation strategy where meeting ecological normative requirements is the main innovation driver.

Keywords: *canned fish, innovation, trajectories, food industry, value chain, retailers, private labels, territory, ecological products.*

INTRODUCTION

The canned fish industry is one of the first examples of how modern industry entered into food production, as factory processing in this sector had already started by the middle of the 19th century. As with many other traditional industries in Europe, the canned fish industry has been affected by delocalization processes during the last decades. Nevertheless, in some European regions, it still has a strong presence in the economy and is also one of the few industries performing reasonably well in the current economic crisis. This is the case in Galicia, in North-West Spain, where less than 70

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companies produce around 85% of the total Spanish canned fish products and, with regards to canned tuna, 50% of total European production (ANFACO, 2013). Despite these figures, however, the sector has suffered a deep restructuring process during the last decades as the number of companies declined abruptly and many of the surviving firms changed their competitive strategy (Carmona & Fernández, 2001). Since the 1990s, the sector has shown a strong concentration of production and a marked heterogeneous internal composition. On the one hand, there is a small group of large companies which started an internationalization strategy, both in terms of trade and capital, some of which have become major multinational companies at a world level. Together with this small group of companies, the second group of SMEs has survived following different strategies. Some of them relied upon differentiation, focusing on artisanal processing and seasonal local species while others tried to survive by means of collaboration with larger companies or conserving their traditional client networks.

This paper aims to discuss the competitive and innovative trajectories followed by the canned fish industry during recent years based on the case of Galicia. In particular, we try to answer the question of why canned fish producers have followed different evolutionary paths and how they have managed, from an innovation strategy viewpoint, to follow such diverse trajectories. In the next section, we will discuss the relevant literature concerning innovation and change in the food industry, with a particular focus on contributions made by the Evolutionary School and the Relational Economic Geography stream. Later on, we present the main results of our empirical analysis, in which the cases of four representative companies have been studied in depth. Finally, some conclusions are drawn and summarized in the end section of the paper.

LITERATURE REVIEW

Change and innovation in the food industry: strategies of the embedded firm The evolutionary theory of firms: routines and changes

Nelson and Winter (1982) established the foundations of the Evolutionary theory of the firm in their book 'An Evolutionary Theory of Economic Change.' The evolutionary theory of the firm rests on the idea that companies cannot be considered as homogeneous units since they differ from one another in terms of their internal organizations, knowledge bases, capabilities and also in terms of their respective strategies for confronting change.

A major concept of the evolutionary theory of firms refers to routines. Routines and habits explain a good deal of the behavior of firms since

they facilitate decision-making, create stability and make the exchange of knowledge and information easier. As pointed out by (Nelson, 1994) a firm can be understood in terms of a hierarchy of practiced organization routines. Cohen et al. (1996, p. 683) define routines as “an executable capability for repeated performance in some context that has been learned by an organization in response to selection pressure.” Firms’ routines are nevertheless subject to continuous changes due to internal and external forces. Breaking and changing routines can, in the final analysis, be associated with the process of innovation itself, understood in Schumpeterian terms as new combinations of production factors.

Therefore firms usually rely upon routines that give them a basis of stability – but, at the same time, firms do change their routines when they innovate. This leads us to a second major concept of the evolutionary theory of the firm, which is “path-dependency.” Firms evolve following a path determined by past routines, practices and knowledge that need to be adapted to new contexts and realities. Consequently, history matters and companies’ decisions are taken according to an established trajectory of knowledge accumulation, past decisions, etc... The direction of those changes and trajectories is not easily predictable because uncertainty, rather than perfect information, dominates the scene (Dosi, 1988). The former constitutes a major difference between the evolutionary and the neoclassical schools of economic thought. In fact, “bounded rationality” can be considered as another central concept for evolutionary advocates since they understand that economic actors cannot know exactly what the outcomes of their actions will be. Therefore there are hardly any optimal choices and efficient outcomes in the evolutionary paradigm, but rather trajectories shaped by incomplete information, past decisions and present circumstances.

Moreover, firms differ in their innovation strategies to confront market changes (Schamp, 2005). A large literature exists concerning the different innovative strategies of firms at both an individual and aggregate level. As pointed out by Freeman (1982), whilst some companies follow traditional, dependent or imitative strategies and hardly get involved in R&D activities (apart from adaptive R&D), others exhibit more proactive behavior where innovation is concerned (defensive or offensive strategies). At sector level, the well-known taxonomy established by (Pavitt, 1984) identifies different sectoral patterns of innovation. While some companies, like the ones belonging to primary or traditional industries, are characterized as “supplier dominated” from a technological viewpoint, others are more prone to carry out their own innovative activities (“science-based” sectors or “specialized suppliers” sectors). We could, therefore, say that the response to technological change varies according to the type of firm and sector.

Finally, every firm has its own knowledge base that Nelson and Winter (1982) refer to as “production knowledge.” The authors put a particular emphasis on tacit knowledge, capabilities and know-how stored in firms in the form of routines. Some firms possess a strong scientific knowledge base, such as those belonging to research-intensive sectors such as pharmaceuticals or chemicals, and all firms also have a basis of tacit knowledge, which can be understood as knowledge that cannot be easily codified or standardized.

The importance given to implicit or tacit knowledge links the evolutionary theory of the firm with another important theoretical framework. Tacit knowledge is usually context-specific knowledge and hence is embedded in particular geographical, cultural and institutional contexts (Grabher, 1993). This consideration narrowly links the evolutionary school of economic thought with some contemporary contributions from the discipline of economic geography, sometimes labeled as relational economic geography.² Hayter & Patchell (2011), following previous contributions made by Storper (1997), indicate that the spatial distribution of economic activities must be understood within a framework of interaction between institutions, markets and technology that takes place in time and space. The context within which that interaction occurs is characterized by three principles that are easily connected to evolutionary economics: embeddedness, differentiation and evolution. Embeddedness refers to the inseparability of economic and non-economic factors where production activities are concerned. Evolution implies that market processes are fundamentally transformative, and that market economies change over time with respect to the location, nature, and organization of economic activities. Finally, differentiation refers to the unique nature of the places and spaces where interaction between markets, institutions and technology takes place (Hayter & Patchell, 2011, p. xvi). As we will see in the next section, changes in the food industry have already been analyzed from this perspective by different authors.

Changes in the food value chain: nature, territory and quality

According to Malassis (1977), two main processes have determined food production in contemporary times, the first being the growing industrialization of the agro-food chain and the second one the growing level of capitalization, concentration and internationalization. Industrialization has meant a structural transformation of the food sector manifested in a relative decline of the value added by agrarian activities (and a correlative increase of the value added in other stages like processing, distribution, etc.). Besides this, such industrialization processes have been associated with a generalization of industrial processes along the value chain. Regarding the second process, Malassis indicated that

² For a review see Martin (1999) or Scott (1988).

the introduction of capitalist forms into the agro-food sector has led to the emergence of giant industrial groups, operating on an international scale, in both the processing and distribution spheres. In this sense, according to the author, the agro-food market is a good example of an oligopolistic market based on monopolistic competence among a few stakeholders.

The changes pointed out by Malassis at the end of the 1970s have probably deepened further during the last two decades, in particular, due to the acceleration of the globalization process which has occurred since that time. Thus, the new agro-food chain described by Malassis 40 years ago is usually referred to nowadays as the “conventional mode of agriculture development and food production” (Morgan & Murdoch, 2000). The oligopolistic character of the food sector is manifested now as the dominance of (a few) giant distributors and retailers that act as “price-makers” while a large number of farmers and primary producers have become “price-takers” (Morgan, Marsden & Murdoch, 2008). Even the large processors which emerged during the 20th century have had to readjust to the hegemonic role now played by large-scale retail (Wilkinson, 2002). This last author points out that two major factors have affected the food value chain in the last decades: on the one hand, there has been an emergence of functional foods lead by science-based companies and on the other, as a response to the previous trend, there has been an explosion of organic food in food markets lead by large-scale retailers. As a result food producers now occupy a narrower space, particularly in terms of innovation, along with the food value chain. In the same vein, Burch and Lawrence (2005) consider that the effect of the dominance of large retailers that sell their own brand products is the creation of a “third food regime” where food firms act merely as flexible manufacturers attending retailers’ desires to attend highly-segmented niche markets. As pointed out by the authors *“There seems to us to be clear evidence that a retailer-dominated food production system has a different profile and trajectory from the two earlier regimes where power rested first, with the settler capitalist state/farm lobby and, second with the mass producers of branded food products”* (Burch & Lawrence, 2005, p. 14).

From a different perspective (Morgan & Murdoch, 2000) have discussed the role of knowledge production and distribution to explain the diversity of food supply chains. In particular, they discuss the differences between two food chains: the conventional agri-food chain and the organic agri-food supply chain, and they argue that the way knowledge is distributed along the chain varies from one to the other and, to some extent, the knowledge type is also different in each case. According to the authors, the emergence of the conventional chain meant that farmers’ local (traditional) knowledge was displaced by standardized knowledge coming from supply industries (such as growing mechanization, use of chemicals as fertilizers, etc.). The authors also

implied a net loss of power in the production chain by farmers in such a way that they have become the weakest link in the food chain. In the organic food chain a different set of practices and knowledge are needed to those of the conventional system and, to some extent, farmers recover old forms of local/traditional knowledge which is much more in tune with the maintenance of ecosystems. As indicated by the authors, in the organic chain, farmers can once again become “knowing agents.”

Finally, the changes which have happened in the food value chain have also had consequences on the geography of the agro-food production system. One of these major consequences is the “deterritorialization” of the food system due to the growing control of firms working on an international scale and therefore imposing a global logic into the system (Morgan et al., 2008). Nevertheless, the aforementioned general trends do not mean that alternative paradigms or trajectories do not exist or have not emerged during all this time. As also pointed out by Morgan et al. (2008), the globalization process followed by the food sector is constrained by two factors that determine the geography of food since they are territorially fixed: these factors are “nature” and “culture.” With regard to nature, although some natural constraints of food production, namely seasonality, have been overcome by industrialization forces (new conservation methods and growing technologies) and globalization forces (decreasing the cost of transport, trade liberalisation, etc.), this has not substituted the “old” role of nature and a growing trend associating food quality with non-industrialized practices has emerged. Something similar happens in terms of culture, since local cultures of production and consumption have been re-evaluated during recent years as a counterforce against standardization of products and tastes. The appearance of “guarantee of origin” denominations and others are a potential example of this. Therefore, where changes in the geography of food systems are concerned, a dialectical process between “deterritorialization” and “territorialization” forces has taken place.

Therefore, despite the dominance of the conventional model, there is not only one paradigm explaining the configuration of the food industry but diverse patterns that vary according to the interaction between institutions, territories and technologies.

We will see in the following paragraphs how all these factors affecting the food system as a whole are highly present in the case of the canned food industry and how therefore they help us to understand the changes which have happened in the sector during the last decades. The following paragraphs will be devoted to giving an overview of the Galician canned fish industry and detailing the results of the cases analyzed during our research.

STUDY

The canned fish industry confronting global and institutional changes
The Galician canned fish sector: a brief view of its history and current figures

The canned fish industry is the most representative sector of the modest industrialization process which took place in Galicia between the end of the 19th century and the beginning of the 20th century. Its roots can be found in the traditional salted fish plants, which were historically situated in sea towns. The first Galician canned fish companies were established in the first half of the 19th century although their growth was not significant until the end of that century. Thanks to nearby natural resources, the improvement of the communication infrastructure in Spain and favorable trade policies as well as the spread of French technology, the sector developed quickly and became one of the main exporter industries in Spain during the first quarter of the 20th century (Carmona, 1994).

The Spanish civil war marked an inflection point for the industry as, once it ended, the strong trade protection offered by the fascist regime allowed non efficient companies to maintain their activity artificially since it was an administrative decision (public quotes) and not a market decision which determined their success. Meanwhile, in other countries, the sector experienced quick growth due to strong investments and technological advances that made the Galician and Spanish sectors lag behind, by international standards. This is the main reason why the sector suffered a deep restructuring process once the Spanish economy opened to international competition at the beginning of the 1960s. The number of companies declined dramatically from 160 in 1965 to 80 in 1985 (Carmona & Fernandez, 2001). Most companies simply closed down or were acquired by bigger companies.

According to data provided by the National Association of Canned Fish Producers (ANFACO, 2013), in 2012 the Galician canned fish industry consisted of 65 companies that employed 11,950 people. That year, the industry processed more than 300,000 tonnes of fish, reaching an economic value of 1.25 billion Euros, which represented 84.4% of Spanish fish production. More than 40% of this production was exported, mostly to other European countries. Tuna is the most significant processed product, constituting around 64% of the total volume of products processed and 50% of the industry turnover in 2010. The second most significant product is sardines, although far less significant than tuna, constituting around 7.8% of the total volume processed and 6.4% in economic terms. Other important species are mussels (4.1% of total volume and 7.5% of total value) and cockles (1.4% of total volume and 5.9% of total value). As can be observed in the previous figures, shellfish species like mussels and cockles, which are typical species

of the Galician “rias” (estuaries) and are historically rooted in the region’s traditional cuisine, usually represent a higher value added than other species.

Data provided by ARDAN (2011), a statistical data provider specializing in firm structure and finance, allows us to see the industry’s internal structure. Through this data, we can see that the industry was dominated by SMEs at the end of the last decade as they represented 71% of all companies (38 firms having a turnover between 2 and 60 million Euros). Only five companies could be considered large companies, understood here as those exceeding a turnover of 60 million Euros. Finally, a small group of 10 micro-companies registered a turnover lower than 2 million Euros. Nevertheless, when it comes to the economic weight of each type of company, we can easily see the dominance of large companies. Thus, the five largest companies registered 63.8% of the total turnover in the Galician canned fish industry, 35.3% is the figure for SMEs and just 0.9% for micro-firms. The sector’s production is therefore strongly concentrated in a small number of companies, most of them already multinational firms with a presence in other countries of the world.

Table 1. The Galician canned fish sector: internal configuration

	Number	% Companies	% Turnover
Large	5	9.4	63.8
Medium	14	26.4	27.8
Small	24	45.3	7.5
Micro	10	18.9	0.9

Source: own elaboration based on data provided by ARDAN (2011) and companies reaching a turnover of 1 million Euros

THE FIELD RESEARCH

Four cases and four strategies to survive

We have carried out field research in order to understand the changes affecting the Galician canned fish industry during recent years as well as the diverse strategies followed by the sector’s firms. In particular, we focus on four companies that were previously selected on the basis that they represent different paradigms within the sector. Such pre-selection was established partially following the insights pointed out by Carmona and Fernandez (2001) as detailed above, also based on the information obtained from different sources which we refer to in the following paragraphs.

The research was conducted as follows: we first compiled information on the industry, making particular use of *Industria Conservera*, the periodical journal published by the National Association of Canned Fish Producers

(ANFACO). We then contacted the technological center of this association (ANFACO-Cecopesca) – which was created in 1949 and is one of the oldest technological centers in Spain – where we interviewed the responsible person at the Department of Technology Transfer. During the interview, we not only approached technological and innovative aspects but also broader aspects related to the industry's evolution during recent decades as well as its current structure.

Based on the information obtained from publications and during this first interview, we identified four types of companies that, overall, are representative of the different strategies followed by this industry. The next paragraphs will be devoted to the description of each of these companies which, as the final stage of our field research, were interviewed in depth. The interviews were semi-structured since we used a questionnaire to specifically address aspects related to the competitive and innovation strategies of each firm.

Company A. Traditional firm

The first company is a medium-size firm that has employed an annual average of 40 people over the last three years and registered a turnover close to 7 million Euros in 2010. Company sales are focussed solely on the Spanish market. The firm was created at the end of the 1960s based on a family tradition of mussel farming; for this reason, they began canning mussels alone, but within a short space of time they began processing other shellfish species such as cockles and clams. Nowadays they process a wide range of products aside from shellfish, and tuna has become their main product (50% of sales). The competitive strategy of Firm A has not suffered significant changes during recent years. They buy their raw fish at local fish markets (shellfish species) and from large fishing fleets (tuna), some of them belonging to other, larger canned fish companies. They sell their products mainly to commercial agents (intermediaries) which supply small and traditional shops and supermarkets. They do not compete on price and their product quality can be considered medium range since their end client is the average consumer.

Company B. Large multinational firm

The second company is a large multinational firm that employs more than 500 people in Galicia and reached an average turnover higher than 300 million Euros over the last three years. The company was created in the mid-1960s and, after an ambitious and successful process of horizontal and vertical integration consolidated during the 1990s, is now one of the world's largest companies in this sector. The provision of raw material is a critical issue for the company and in order to guarantee such provision they have followed two separate strategies. On the one hand, they are involved in fishing

activities by means of participation as shareholders in one of the largest Spanish tuna fishing fleets. On the other, they have established subsidiaries in many different countries (from South-America, Africa and Europe) where they carry out primary processing activities. From the market perspective, they also have a significant international presence that has been achieved by different means such as takeovers or joint ventures with local producers and retailers. Nevertheless, despite its considerable level of internationalization they still sell around 75% of their products within the Spanish market. This is largely due to the competitive strategy followed by this firm, which at the moment is strongly sustained by their agreement with one of the largest Spanish retailer brands, for whom they are sole producers of store brand products (representing about 65% of their sales). Although their strategy is determined by the aforementioned agreement, the group maintains several own brands, some of them in alliance with other companies, in order to attend to specific markets. Finally, the firm has recently diversified their production, entering into the ready-made food market (salads, soups, etc.) and also the pet food market, by means of exploiting by-products.

Company C. Delicatessen firm

Company C is a small firm that employs less than 20 people and has a turnover close to 2 million Euros. Although the firm was created at the end of the 1980s, the founders come from an old canned-industry family that was already involved in this business at the beginning of the 20th century. The founders envisioned a business concept which was different from the standard one at that time in this sector, focusing on a high-end and well-differentiated market segment. Their clients fall into two basic categories: specialized chains of high-standard products (delicatessens and gourmet shops) and restaurants. Despite their small size, their market is equally divided between Spain and other European countries (including Russia). Their competitive strategy is strongly based on product quality and in this sense they benefit from and promote the use of local fish and shellfish which is bought only during the specific biological seasons.

Company D. Ecological firm

Company D is a small firm that employs less than 35 people with an average annual turnover of between 2 and 3 million euros over the last three years. It is a family-run company with a well-established presence in the sector (since the end of 19th century). At the end of the 1970s the company was set to take part in the sector's "boom" period, but due to unexpected family events their plans were thwarted. The firm continued its production without significant changes up until the beginning of the year 2000. At that moment, the owners

decided to abandon the competitive strategy based on prices and sales to large distributors and radically changed it, opting for ecological production. They still maintain a complementary line of conventional canned fish in order to serve their traditional clients in Spain. Nevertheless ecological canned fish – which is sold mainly in the German market – is becoming their main product.

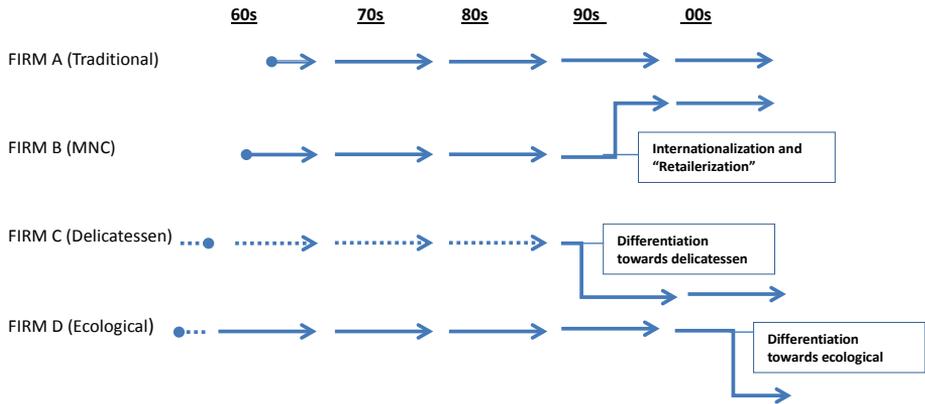


Figure 1. The firms’ competitive time-trajectories

Source: our own elaboration based on the information obtained in the field research.

DISCUSSION

Explaining the firms’ competitive-trajectories

The changes affecting the food system as a whole, in the direction that has already been discussed in section 2 of this paper, explain the structural change suffered by the Galician canned food industry during the last two decades quite well. In particular, the evolution of this industry is clearly determined by the consolidation of the conventional mode of food production where local/national value chains are substituted by global ones and where large retailers exert a strong influence (Wilkinson, 2002; Morgan et al., 2008). As we will argue, this general trend has determined, in one way or another, the strategy of the four companies analyzed in our study.

In the 1990s the multinational firm aimed at following the dominant paradigm in such a way that it initiated a strong expansion of its production scale and an internationalization process to guarantee cheap raw fish and cheap processing as well as new market opportunities. Besides this, the company has sustained such expansion on the exclusive agreement it has with a large Spanish retailer. This agreement is a guarantee of being able

to sell large volumes of produce, but it gives rise to a dependent position which the company faces in relation to the retailer. For example, though the company maintains its own brand, they have strong limitations against selling it in the Spanish market and, as indicated by the person interviewed, *“foreign markets are the ones where the company is able to grow with our own brands since growing opportunities in the Spanish market are very limited due to the exclusivity agreement with the retailer”*. This is a clear example of how a few large retailers and distributors currently dominate the food value chain.

The other three companies were also affected by the aforementioned factors but they chose an alternative strategy to survive, an alternative paradigm of food production. In the case of the conservative firm, the strategy consisted of not varying their traditional strategy, which is based on their lifelong clients and providers and therefore they have resisted adapting to the conventional paradigm. The person we interviewed from this company was very clear about this point when, in arguing why they have avoided market agreements with large distributors and retailers, they pointed out: *“they pay you badly, they squeeze you and they abandon you as soon as they have a chance.”* On the other hand, firms C and D were, in one way or another, forced to change their old competitive strategies as they respectively specialized on delicatessen and ecological products. As pointed out by the owner of company D, *“we changed our strategy since the small and medium-size firms of the sector will eventually have to choose between two ways: either they change their productive paradigm towards a well-differentiated market segment or they will get absorbed by large companies, which control the provision of raw fish”*. Moreover, nature and territory are narrowly linked to the competitive strategy of these two firms. In the case of the ecological firm, the nature connection is not only a market device but a production requirement, while in the delicatessen firm case the connection with the territory and with the regional culture is made explicit in their marketing strategy as a signal of quality and differentiation. As a final remark regarding this strategy, we must refer to the existing trade-off between quality and quantity when dealing with different production paradigms. Thus, the company adopting the ecological strategy argued that this meant a sharp decline in production, as they had an over-capacity of production for the new market.

Therefore we can affirm that the changes in the canned food industry, as indicated by the different strategies followed by the firms within it, have been a response to the general trends affecting the food production system. Such changes have led to a global value chain consolidation dominated by large retailers and, as a response to it, to the emergence of an alternative (and diverse) paradigm where food production is based on a narrow

connection between quality and territory. Nevertheless, as pointed out by the Evolutionary School, such a process of adaptation and change has also required changes in the way in which firms innovate and incorporate new knowledge. This issue will be discussed in more detail in the next section.

Innovation patterns followed by each firm

The firms were also questioned in depth about their innovation strategies. In particular, we asked about three different aspects of innovation. Firstly, about the kind of innovation, they have introduced during the last five years (process, product, market, and organization). Secondly, we asked about the channels of acquiring new knowledge for innovation. Finally, we also enquired about the general reasons or factors explaining the innovation strategy of each firm. In table 2 readers can find a summary of the main results. Of course, we are aware that not all innovations have the same scope. Thus, some of them refer to just incremental innovations or improvements (e.g., changes in the cans opening system) while others have a deeper impact on both firms and markets (e.g., adapting all the production chain to ecological production standards).

Company A. Traditional firm: a conservative (non-innovative) strategy

Firm A, the traditional firm, is not particularly active in terms of innovation in general. They changed the entire plant at the beginning of the 1990s and since that time they have only implemented small improvements in their processing technologies, sometimes just to meet public regulation requirements. In the remaining areas (product, organisation and market), as well as in their general attitude towards innovation, they have been quite conservative and even when explaining why significant changes have not been introduced they indicate that *“the personnel does not like to change their routines, when you want to do it you have problems”*. As the evolutionary theory of the firm indicates, a company’s nature is largely based on routines and, as we can observe, sometimes they are difficult to change as they act as barriers impeding innovation. With regards to their sources of innovation, the company points to the purchase of equipment by their providers as the main channel. They do not give too much importance to contact with clients or other firms from the same industry. Finally, they do not undertake any active R&D projects (R&D expenditure, R&D collaboration, etc.) in line with their poor commitment to innovation. Therefore, this firm can be defined as very conservative regarding innovation and, following the traditional Pavitt’s taxonomy, are essentially dependent on providers for innovation.

Company B. Large multinational firm: innovation dominated by large retailers

As expected, the large multinational company (Firm B) shows a very different innovative profile in comparison with the traditional firm. With regards to the different areas of innovation the company is quite active in all of them, particularly in the area of process innovation since every little improvement, when large volumes are being processed, means important economic gains. The firm possesses a highly technologically advanced plant that is continuously subject to efficiency improvements. Moreover, at the moment they have an ambitious R&D project focussed on the use of by-products which consequently implies processing innovations. Regarding product innovation, they are paying special attention towards developing products “ready to eat, ready to cook,” in order to match new social demands. Another important avenue for product innovation concerns the healthy characteristics of the product (functional foods). Finally, diversifying production towards already-made food, based not only on fish but vegetables, is another direction the company is working on. With regards to market-related innovations, they have been particularly successful in developing new cans with easy-open systems. In terms of organization-related innovations, the company has recently introduced important changes such as the consolidation of their R&D department and the introduction of more autonomous and multidisciplinary working teams (e.g. the entire process of launching a new product is managed by a single team). The company has a well-planned strategy for innovation as indicated by the existence of the R&D department (with a permanent staff of five people) and also by its active external links for innovation. In particular they collaborate with universities and technological centres as well as with other companies from similar, but not the same, industry. They do not collaborate with other firms in their market sector in order to avoid knowledge-leaks to potential competitors.

The most significant feature of the company’s innovation strategy, however, is that it is strongly determined by the exclusive agreement it has with the large retailer for whom they produce products for the Spanish market. As put by the person interviewed: *“Any requirement coming from our partner must be immediately satisfied, we have to sort it out as best we can. At the same time, any new product we develop (even for our own brand) is quickly adopted by the retailer. That is the way it is”*. Besides this, both formal and informal contacts with the retailer are considered as very important channels to incorporate knowledge into the firm, making the relationship an even more dependent one for the processing company. This finding is in line with the arguments defended by Burch & Lawrence (2005) regarding the role of food firms as flexible and innovative manufacturers subject to

retailers' needs and requirements. We could, therefore, affirm that, from the innovation viewpoint also, it is becoming a "retailer dominated" firm.

Company C. Delicatessen firm: territory orientated innovation

Firm C, the "delicatessen" firm, focussed their innovative activities mainly on the areas of product, market and organization. They did not introduce significant changes to their processes because they deliberately went for artisanal canning as a means of adding value to their product. The previous indicates that the alternative food paradigm, which is based on the close connection there is between quality, territory and nature, is not subject to some technological changes and maintaining (or recovering) traditional knowledge, in line with what has been pointed out by Morgan and Murdoch (2000), is a necessary strategy in itself. Nevertheless, this is not an indication that the company has not been innovative. In fact, the company has carried out product innovation, essentially in order to test or develop new recipes for their canned fish products. On many occasions, this is done by means of hiring professional cooks which, apart from being a new channel to incorporate knowledge, constitutes a market strategy since restaurants are one of their main clients. At the same time, attending fairs and exhibitions, as well as their formal and informal contact with clients, are an important resource for knowing the latest advances in their specialized market. With regards to marketing, they care a lot about the external presentation of their brands and for this reason use attractive designs. Moreover, they have been awarded the regional "pescaderias" certificate that guarantees that the products come from the Galician estuaries and have been fished using artisanal methods. Finally, with regards to organization, the company has recently adopted a more professionalized working structure in which the "quality department" has become more relevant to the company.

Therefore, we can affirm that although this company does not have a planned strategy for innovation, as it does not undertake internal R&D and neither does it formally cooperate with external agents or institutions in order to innovate, it does not mean that the firm is not innovative. They have been considerably active in everything related to product innovation, incorporating knowledge from professional cooks and also in the promotion of their links with the local territory and its traditions, as a sign of quality. In other fields, such as process innovation, we have seen how not being innovative is a planned decision to maintain traditional and artisanal production methods.

Company D. Ecological firm: innovation orientated by nature

Finally, the “ecological” firm has a similar innovative profile to the previous one. The launch of their line of ecological products in 2005 has meant an entire change to the company’s production system. Innovations have had to be made with particular regard to the provision of new inputs (raw fish, oil, vegetables, etc.) that must adapt to ecological standards and not so much to the canning process itself, since this has not changed significantly. The introduction of ecological products has also been an important product innovation which has been accompanied by other small improvements to product recipes and also to its external presentation (canning and packing). With regards to organization and market-related innovations, the company has put significant effort into the achievement of ecological certification and recognition from important stakeholders within the environmental movement. The company was one of the first in the industry to obtain the acknowledgment of WWF-Adena, the well-known environmentalist organization. Recently they have been awarded the official ecological certificate of the Galician government (CRAEGA) as well as the regional “pescaderias” certificate, which, as said before, guarantees that the products originate from the Galician estuaries.

As with the case of the multinational firm, client demands are a major motivation to innovate for this company since they work with a specialized ecological distributor in Germany that partially determines their innovative activity, as well as in terms of product differentiation. The entrance into this specific market segment affects the innovation strategy of the firm, since they need to be in close contact with clients and to attend specialized fairs, in order to make sure that they know about the latest innovations of the sector and to (try) to incorporate them into the firm. They do not give too much importance at all to other factors, such as cost-saving or optimizing processes, since they are not large-scale producers.

Table 2. Innovative strategies of canned fish firms

	Innovation strategy	Innovation fields	Knowledge and innovation channels	Reasons to innovate
FIRM A (Traditional)	Conservative and provider-dominated	Only minor process innovations	Providers	Only process optimization and regulations fulfillment
FIRM B (Multinational)	Active in all fields and large retailer-dominated	All fields. Systematized innovation	Systematized R&D strategy, formal and informal contacts with retailer and providers	Diverse, to attend retailers demand. Process optimization and cost savings

	Innovation strategy	Innovation fields	Knowledge and innovation channels	Reasons to innovate
FIRM C (Delicatessen)	Territory-orientated	Mainly marketing and product innovations	Artisan knowledge, contacts with clients and attendance to fairs	Mainly product differentiation and attendance to client demands
FIRM D (Ecological)	Ecological-orientated	Mainly organizational and commercialization innovations	Ecological norms, formal contacts with clients (ecological line) and attendance to fairs	Adaption to ecological production and attendance to client demands

Source: our own elaboration based on the information obtained from the field research

CONCLUSIONS

In this paper, we have explored the competitive and innovation patterns of the canned fish industry in Galicia (Spain). We have seen how the general and global dynamics of the food value chain, as first described by Malassis (1977) and later elaborated upon by Wilkinson (2002), Morgan et al. (2008) and others, have determined the evolution of this industry. In this sense, the increasingly global nature of food production as well as the rising power of large retailers along the value chain, which can be understood as the main features of the dominant paradigm of food production, have acted as the main source of pressure for change in this industry. In a way, changes in the canned fish industry value chain act both as a context of the innovativeness of the Galician industry and also as a trigger for their innovations. Some (few) companies opted to follow the conventional paradigm, becoming large multinational companies, delocalizing part of their activities and signing exclusive agreements with big retailers in order to produce under their supermarket brands. Other firms did not have the option, or did not aim, to follow this path and instead took an alternative route. While some continue to produce within the same paradigm as they always have, others – in order to avoid the dangers of a conservative strategy – have specialized in narrow market niches basing their competitive strategy on quality and differentiation. This strategy, as pointed out by the literature and as observed in our case studies, relies upon a very close relationship between territory and nature.

We have also observed that the above-mentioned competitive strategies have come hand in hand with different approaches towards innovation and the incorporation of knowledge. At least four different innovation patterns

can be found in the industry. The first pattern is a conservative one, found in most industries, where innovation is seen as a risk and therefore maintaining routines is the chosen option. The second pattern, as followed in our case study by the multinational firm, can be defined as “large retailer-dominated” as the exclusive agreement between the producer and the retailer increasingly determines all the innovation activities of the producer. The third pattern we have defined as “territory-orientated,” since product innovation and the incorporation of quality distinctions based on the territory characteristics are the main innovation drivers. We have even seen how “not innovating” in fields like processing is sometimes a deliberate choice in order to emphasize the artisanal character of production. Nevertheless, in other fields, new knowledge is needed as demonstrated by the close connection with professional cooks in order to test and develop new recipes for canned fish products. Finally, we have an “ecological or nature-orientated” innovation strategy that has been followed by some companies where innovation largely focusses on meeting ecological normative requirements and, in similarity with the retailer-dominated strategy, the demands of ecological product distributors.

All in all, our paper is evidence of how industries’ trajectories are influenced by changes in global value chains which act as both the context and the trigger for industry innovations. As suggested by the Evolutionary literature, firms confront their need for adaptation by following diverse, competitive strategies that, at the same time, require different innovative and knowledge acquisition strategies.

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Abstrakt

W artykule dokonano analizy konkurencyjnych i innowacyjnych modeli biznesowych, zidentyfikowanych w przemyśle konserw rybnych w ostatnim czasie. Nasze badanie opieramy na czterech analizach przypadków z branży w regionie Galicia w Hiszpanii, w którym zlokalizowano największą część europejskiego sektora konserw rybnych. W branży wyróżnić można co najmniej cztery różne modele innowacji. Pierwszy wzorzec można nazwać konserwatywnym. Innowacyjność jest postrzegana jako ryzyko, dlatego też wybraną opcją jest utrzymanie aktualnych procesów. Drugi wzorzec określono jako „duży-zdominowany przez detalistów”, wybierany przez firmy, które podpisały wyłączne umowy z dużymi detalistami, którzy w dużym stopniu narzucają określone działania innowacyjne. Trzecia strategia, którą została zdefiniowana jako „zorientowana terytorialnie”, gdyż głównym motorem innowacji (głównie produktowych) są czynniki związane z lokalizacją. Ostatnią z wyróżnionych strategii innowacyjnych nazwano „ekologiczną lub zorientowaną na naturę”, w której spełnienie ekologicznych wymagań normatywnych jest główną siłą napędową innowacji.

Słowa kluczowe: konserwy rybne, innowacje, trajektorie, przemysł spożywczy, łańcuch wartości, detaliści, marki własne, terytorium, produkty ekologiczne.

Biographical note

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Barriers to Sustainable Business Model Innovation in Swedish Agriculture

Jennie Cederholm Björklund¹

Abstract

Sweden's agriculture industry has faced many challenges in recent years. Among the most severe challenges are the decrease in the number of small and medium-sized farms, the decrease in the number of people employed in agricultural activities, and the increase in governmental regulations and legislation governing such activities. At the same time, the demand that agriculture contributes to sustainable social and ecological development has increased. Although research shows that sustainable business model innovation (SBMI) contributes to the creation of sustainable businesses and to the development of a sustainable society, Swedish agriculture has not been at the forefront in the use of SBMI. The purpose of this paper is to examine the barriers to SBMI in Swedish agriculture in order to understand why farmers seldom engage in SBMI. This qualitative study follows the Gioia methodology and data for the analysis were acquired in semi-structured interviews with entrepreneurs at six family farms in Sweden. The paper makes a theoretical contribution to the research on SBMI with its focus on sustainable entrepreneurship in the Swedish agricultural industry. The paper concludes that the barriers to SBMI are external, internal, and contextual.

Keywords: *sustainable business model innovation, barriers, agricultural entrepreneur, sustainable entrepreneurship.*

INTRODUCTION

A sustainable world requires a sustainable agriculture industry that produces enough food to feed the world's population that is said to be increasing annually. The claim is that by the year 2050, global food production will need to increase by 70% (FAO, 2009; Öborn, 2011). Because food sustainability is a global problem, various government institutions and departments have called for more research on business model (BM) innovation in the agriculture industry (Griggs et al., 2013; *Jordbruksverket*, 2017)². There is a grave concern,

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² *Jordbruksverket* is the Swedish national Agriculture Department.

largely based on the environmental challenges posed by climate change, whether many areas of the world will be able to increase their food production sufficiently to meet this challenge. In addition to food shortages, environmental damage, depopulation, and an overgrown countryside are likely consequences if the agriculture industry fails to become more sustainable.

Predictions indicate that Sweden will continue to have a favorable farming climate (*Lantbrukarnas Riksförbund*, 2009)³, and the Swedish government's goal is that its agriculture industry will be globally competitive, innovative, and sustainable by the year 2030 (*Jordbruksverket*, 2017). Moreover, there is a focus on Swedish agriculture on the environment, food safety, and animal welfare (*Lantbrukarnas Riksförbund*, 2009).

However, declining profitability and decreased production in recent years have created severe challenges in the Swedish agriculture industry. Both the number of farms and the number of farm employees have decreased significantly (*Jordbruksverket*, 2017). Increased competition from imported foods and increased administrative and statutory requirements contribute to the difficulties (*Jordbruksverket*, 2017; Tell et al., 2016). In addition, there are inheritance issues as well as management issues because many Swedish farms are family farms inherited from older generations and managed along traditional lines, with relatively constant BMs. If the Swedish agricultural industry is to meet the challenges of a globalized and rapidly changing world, more focus is needed on sustainable business development in this context. This paper answer the question: What is hindering farmers when engaging in SBMI? In order to answer the research question, this paper draws on literature about sustainable business model innovation (SBMI), which can create opportunities for sustainable and successful businesses (Bocken et al., 2014; Boons & Lüdeke-Freund, 2013, França et al., 2017). Further, literature about entrepreneurship and innovation, two key concepts often referred to in the SBMI literature, is used (Schaltegger & Wagner, 2011; Stubbs, 2017), as well as the emerging research field of sustainable entrepreneurship, that addresses innovative ways to achieve sustainable ecological, economic, and social goals (Belz & Binder, 2017).

This paper contributes to the research with its understanding of the development process, an examination and illustration of the barriers, and the relationships between them. It also contributes an explanation of how these barriers can affect the development of both the agricultural and agri-food industry, since agriculture is the first step in the food production value chain. Here, a definition of agricultural entrepreneurship is useful and,

³ Lantbrukarnas Riksförbund is the Federation for Swedish Farmers.

as discussed in the literature (e.g., Pindado & Sàanches, 2017), agricultural entrepreneurship can be defined as the conduct of the non-agricultural businesses by established farmers (Seuneke, Lans & Wiskerke, 2013) or as the production of processes and goods in the agricultural industry (Vik & McElwee, 2011). Both definitions are applicable in this paper.

The next section, literature review, summarizes the literature on sustainable entrepreneurship, sustainable business models, sustainable innovation, and barriers to the creation of sustainable BMs. The research methodology is described next, followed by a description of the six farms, analysis of the identified SBMI barriers and results of the study. Finally, the conclusion section includes implications and suggestions for future research.

LITERATURE REVIEW

Sustainable entrepreneurship research

Sustainable entrepreneurship is an emerging sub-area of entrepreneurship research (e.g., Binder & Belz, 2015, 2017; Gast, Gundolf & Cesinger, 2017; Stubbs, 2017). This sub-area, which is connected to strategic management and organization, focuses on social and environmental sustainability (Kurowska-Pysz, 2016). Sustainability and management researchers generally agree that sustainable development in society is associated with sustainable development of organizations and that BMs are drivers of sustainable entrepreneurship.

The sustainability management literature emphasizes the importance of entrepreneurship and leadership in SBMI (França et al., 2017; Lambert & Davidson, 2013; Schaltegger, Hansen & Lüdeke-Freund, 2016; Stubbs, 2017). Hernández-Perlines and Rung-Hoch (2017) highlight the importance of sustainable entrepreneurship and corporate social responsibility (CSR) in family businesses. According to Jansson, Nilsson, Modig and Hed Vall (2017), this research, in its focus on large companies, often neglects small and medium-sized enterprises (SMEs). However, Schaltegger et al. (2016) claim that CSR and process- and product innovation alone cannot make the changes needed to achieve real sustainability in society, hence creating sustainable value for customers has to include creating value to a broader range of stakeholders. They call for more research on how to change or create BMs at all levels.

Various factors influence internal management processes, strategies, and actions when sustainability is in focus. For example, Sullivan and Gouldson (2017) found that businesses in general only invest in sustainability when it is economically profitable. Jansson et al. (2017) note the importance of working with external and internal perspectives on sustainability at both business and policy levels. Companies that take a long-term growth perspective, instead

of a short-term, can contribute to a sustainable society (Acs, Audretsch, Braunerhjelm & Carlsson, 2012; Evans et al., 2017; Shepherd & Patzelt, 2011) and sustainability should be emphasized when discussing the strategic management of agricultural businesses (Chen, Yueh & Liang, 2016).

Various related topics now appear in the sustainable entrepreneurship literature. For example, Woodfield et al. (2017) examine the issues related to sustaining family businesses. Further, family business research has found collaborative innovation to be an effective way to overcome innovation barriers (Feranita, Kotlar & De Massis, 2017), which is a part of SBMI. Increasingly, studies on the sociology of rural life, family farms, and farm entrepreneurship appear in the Scandinavian sustainability and entrepreneurship literature (e.g., Gaddefors & Anderson, 2017; McElwee, 2008; Tell et al., 2016; Vik & McElwee, 2011; Vesala & Vesala, 2010). However, none of these studies examine the barriers to SBMI in Swedish agriculture.

Business model and business model innovation research

Although definitions of BMs differ in both scope and concept, usually these definitions take an individual company perspective focusing on creating and delivering value (Lambert & Davidson, 2013; Zott et al., 2011). BM innovation (BMI) research typically examines various activities such as selection of suppliers, creation of value propositions, development of customer relationships, and exploration of revenue models (Breuer, 2013; Osterwalder and Pigneur, 2013; Zott, Amit & Massa, 2011).

There is not a great amount of BM research or BMI research related to the agriculture industry. BM and BMI research mainly focuses on media, information technology, and biotechnology industries (Lambert & Davidson, 2013). However, a few studies examine BMI in the agri-food industry as a whole (e.g., Tell et al., 2016). The Swedish Agriculture Department reports a gap in research on strategic development and management linked to the countryside and rural businesses (*Jordbruksverket*, 2006).

The emergent field of sustainable entrepreneurship had begun to address advanced strategies for sustainable development, such as SBMI (e.g., Provasnek, Schmid, Geissler & Steiner, 2017), and emphasize the importance of the long-term perspective when addressing sustainability (Acs et al., 2012; Shepherd & Patzelt, 2011; Stubbs, 2017).

Various researchers have studied BMI as a competitive strategy in the agri-food industry. Baregheh, Hemsworth and Rowley (2014) examined the drivers of innovation in the food sector. Tell et al. (2016) examined SBMI in the agri-food industry. Giannakis and Bruggeman (2015) studied the increased competitive pressure in market-oriented agriculture. McElwee (2008) and Vesala and Vesala (2010) concluded that agricultural entrepreneurs require

more entrepreneurial mind-sets and better entrepreneurial skills. Research by Vik and McElwee (2011) reveals that agricultural activities create opportunities for new product development and innovation in business processes.

A comprehensive review of the early BM literature (Wirtz, Pistoia, Ullrich & Göttel, 2016) emphasizes its focus on change and development but without a linkage to social and environmental sustainability. This is also emphasized by Biloslavo, Bagnoli and Edgar (2018), who try to close the sustainability gap by proposing the “Value Triangle,” a SBM framework with society incorporating the natural environment and a long-term perspective being at the core, and with public, partner and customer value being co-created and co-delivered. However, SBMI research, which emerged in the mid-1990s with e.g., Elkington (1997) stressing the importance of all businesses needing to help society achieve the three inter-linked goals of economic prosperity, environmental protection and social equity, has increased significantly in the last decade (Bocken, Short, Rana & Evans, 2014; Boons & Lüdeke-Freund, 2013; Teece, 2010; Upward & Jones, 2015), and research about SBMs is suggested to be both multi-, inter- and transdisciplinary when developed as an integrative field (Lüdeke-Freund & Dembek, 2017). In this research, nature is identified as a stakeholder (Stubbs & Cocklin, 2008) that links sustainable innovations and BM concepts (Boons & Lüdeke-Freund, 2013).

The Business Model Canvas (BMC) is a well-known practical tool to work with BMI and create an understanding of customers, distribution channels, partners, revenue streams, costs, and core value propositions (Osterwalder & Pigneur, 2013). The BMC has been developed to include sustainability (Foxon et al., 2015; França et al., 2017; Upward & Jones, 2015) and now encompasses sustainability and shared value creation (Lüdeke-Freund & Musango, 2016). The adapted BMC posits that normative values, corporate identity, intentions, networks, and strategic orientation are relevant in the creation of BMs (Bocken et al., 2014; Breuer & Lüdeke-Freund, 2017; Lüdeke-Freund & Musango, 2016).

BMI for sustainability (i.e., SBMI) highlights the importance of intentional choices and changes in philosophy, values, products, processes, and methods. The aim of SBMI is to create social and environmental value in addition to economic return (Adams et al., 2015).

Barriers to sustainable business model innovation

The literature emphasizes the need for organizations to quickly adapt their BMs in response to industry change and the appearance of new opportunities. However, organizations often encounter barriers when they try to respond to such external events. Chesbrough (2007, 2010) observed two cognitive barriers: leadership resistance to innovating operations, and leadership resistance to innovating BMs. Cognitive barriers can cause leaders to miss opportunities

to make BM changes because of either not recognizing such opportunities or because of an unwillingness to make the needed changes (Engelken et al., 2016).

One way to categorize barriers to SBMI is to divide them into internal and external barriers. Internal barriers relate to company leadership, mind-sets, and other human factors while external barriers relate to company environment such as the behavior of competitors, consumers, and governments (Sandberg & Aarikka-Stenroos, 2014).

Another way to categorize barriers to SBMI is to divide them into cultural and structural barriers. Structural barriers arise from unclear policies and regulations or from market and financial issues. Cultural barriers involve behavioral and social issues with, e.g., customers and stakeholders (Laukkanen & Patala, 2014).

Larger companies tend to encounter different barriers than SMEs. It is possible for a company to overcome a barrier, depending on, for example, the efforts exerted, the size of the company, and the nature of the barrier itself (Sandberg & Aarikka-Stenroos, 2014). Because they have more resources, including access to industry knowledge, larger companies may have greater success in overcoming barriers than SMEs (Lüdeke-Freund & Musango, 2016).

Research shows that entrepreneurs find it easier to overcome barriers to innovation if they have certain cognitive abilities. These abilities include sufficient knowledge, access to information, and decision flexibility. Shepherd (2015) found that positive attitudes can influence how well entrepreneurs innovate whereas negative attitudes hinder such activities. Positive attitudes toward work and others can enhance individual performance and creativity, support new relationships, and expand the use of intellectual and social resources.

Innovation in the agriculture industry

The rural context for SMEs can create barriers to SBMI because of the pressure of social norms and local values (Jack & Anderson, 2002). In addition, agricultural entrepreneurs differ from entrepreneurs in other sectors. Some farmers, with weaker entrepreneurial capabilities, tend to be less proactive in making changes and adopting new strategies. These farmers are more likely to be older, established farmers. According to Pindado and Sánchez (2017), however, younger farm entrepreneurs are just as proactive as entrepreneurs in other industries. An SLR of 570 peer-reviewed journal articles categorized barriers to BMI in the agri-food industry and showed that internal barriers on an individual level were the least studied, while recommending that future research should focus on the cognitive barriers of entrepreneurs to enhance the development of BMI (Ulvenblad et al., 2017).

In Sweden, family-owned farms focus on creating socio-emotional wealth and supporting the family. To some extent, farms prioritize these goals above economic goals (Maloni, Hiatt & Astrachan, 2017). Family succession is an important consideration for family farms (Pindado & Sánchez, 2017). For most Swedish farms, the entrepreneurs and their families have influential operational and administrative roles. However, such leadership may be problematic with an unwillingness to make changes and implement new working methods. It is also necessary to strategize around, and scale up, opportunities in agricultural BM development (Torkkeli et al., 2015).

RESEARCH METHODS

Semi-structured interviews with six agricultural farm owners/managers were conducted for 3-4 hours each, aiming to 1) learn how the entrepreneurs had developed their present BMs (and planned their future), 2) understand the entrepreneurs' ideas about sustainability and barriers to SBMI. Swedish advisory groups recommended three of the farms for the study. The other farms were selected from network activities. All six cases demonstrated some degree of novelty (Flyvbjerg, 2006), each of them having a distinctive business focus, to include the main focus of agriculture and avoid the influence of market factors for certain production orientation. Further, they are small family businesses with employees and with developed BMs. Table 1 summarizes the farms' business focus, BM, and sustainability priority.

Because the entrepreneurs had previously developed BMs, it seemed probable that they had the ability and the willingness to innovate their BMs (Chesbrough, 2007, 2010), and that they could describe encountered barriers to SBMI and the efforts they had (or had not) taken to overcome them.

The interview guide was based on the BMC (Osterwalder & Pigneur, 2013) with additional questions related to sustainability (Breuer & Lüdeke-Freund, 2017; Upward & Jones, 2015). The interviews were taped, transcribed, and together with secondary data (e.g., provided documents and webpages, newspaper articles and media), analyzed using content analysis.

A qualitative approach was taken, following the Gioia methodology, where the research process developed from inductive to abductive, considering data and literature in tandem, not knowing the literature in detail too early to avoid bias, while allowing for discovery without reinventing the wheel (Gioia, Corley & Hamilton, 2012, p. 21).

Table 1. The six farms: business focus, business models, and sustainability priority

Farm	Business focus	Create value to customers and stakeholders	Deliver value to customers and stakeholders	Sustainability priority
Adair	Meat producer selling to stores, restaurants and slaughterhouse	Deliver fresh meat all year	Meet quality- and traceability requirements	Economic, Ecological Social
Bethia	Diversified business with crop cultivating, animal farming and breeding, selling to stores and restaurants	Cycle reasoning, use all parts of production, most profitable business partner, cooperative activities	Top quality, fresh meat all year	Economic, Ecological Social
Cullodina	Organic milk and meat producer selling to Swedish and German dairies and Swedish slaughterhouse	Develop breeding with beef	Meet quality requirements	Economic, Ecological social
Dougie	Cultivation business growing vegetables, selling to grocery stores through wholesalers	Control of entire chain, delivery all year	Meet quality- and traceability requirements	Economic, Ecological Social
Edeen	Diversified business with milk, beef and lamb production, forest and tourism activities with lodging, cafe, shop, dairy and bakery, selling to dairy, slaughterhouse and end consumer	Diversification, products without additives, the whole chain on the farm, farm activities	Meet quality requirements, locally produced foods without additives	Economic, Ecological Social
Forba	Organic beef producer developing breeding and social business, selling to demerged sales company	Minimal disturbance of the ecosystem, breed to develop high quality, create socially sustainable environment	Deliver ecologic, grass grazed meat	Ecological Social, Economic

Comparisons of similarities and differences in the interview material were conducted and text elements were categorized to increase the understanding of the perceptions of barriers that was experienced. Barriers to SBMI were identified and categorized as concepts, themes, and aggregated dimensions (Gioia et al., 2012). Figure 1, which exemplifies this analysis, illustrates how entrepreneurs' responses (i.e., using informant-centric terms and codes) lead to the development of researcher-centric concepts, themes, and aggregate dimensions. This tandem reporting shows the links between data and concept development.

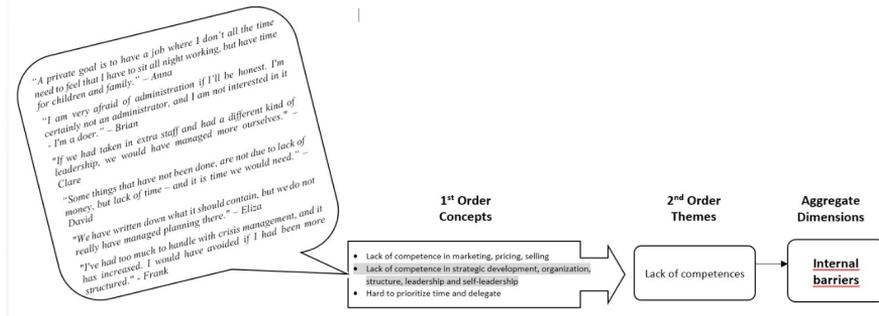


Figure 1. Creation of concepts, themes and aggregate dimensions

Source: Gioia et al. (2012).

Transcribed interviews and secondary data were analyzed in cycles, using content analysis, with meaning units that were condensed and grouped into groups of barriers and challenges. I strived to include all barriers that were found, in order to be able to convey different perspectives, experiences and learnings. After the initial stages of the analysis, a framework about barriers to SBMI (e.g., Laukkanen & Patala, 2014; Sandberg & Aarikka-Stenroos, 2014), family business research (Maloni et al., 2017), and cognition research (Chesbrough, 2010; Shepherd, 2015) were considered in tandem with the data to analyze what barriers could be explained with existing framework and to find what barriers that did not fit into existing theory. Since the most appropriate description of the findings was to use the model of internal and external barriers (Sandberg & Aarikka-Stenroos, 2014) this was expanded to include new knowledge about contextual barriers. Finally, the relations between the different categories were analysed and theory was developed with new knowledge about the interrelations.

As qualitative studies are criticized for being subjective (Flyvbjerg, 2006) reliability is focused on the whole process with detailed explanations, since case study is needed to understand a complicated question like the one in

this study (ibid.). The interview guide ensures that intended parts are covered when collecting data and continuing reviews of the study are performed by other researchers during the process.

ANALYSIS AND RESULTS

The Swedish farms

The six farms in this study are described with fictitious names.

Adair Farm has seven employees and an annual turnover of about 17 million SEK. Its main activities are cattle breeding, production of premium meat, and sawmill work. *Anna* and her husband are the owners. She works primarily with management and sales. The couple are well educated and have work experience in other industries. The farm's main customers are Swedish grocery stores and restaurants that require high-quality products and verifiable product traceability. Under its own brand, the farm promotes safety and environmental/social sustainability. External consultants advise on strategic development.

Bethia Farm has ten employees and an annual turnover of 25 million SEK. The farm grows crops, breeds sheep, pigs and cattle and produces wind energy. The farm sells produce and lifestyle products, under its own brand, to stores and restaurants. *Brian*, who has worked in other industries, has a large network of contacts to consult. The goal is to be a diversified business with long-term sustainable production of high-quality produce. The farm aims to be the qualitative customer's first choice when purchasing produce, and tries to minimize waste and deliver best quality raw materials in accordance with the entrepreneur's ethical philosophy. Economic sustainability is defined as a positive cash flow. Environmental sustainability is achieved through minimization of resource consumption and strategic crop rotation and social sustainability is achieved by participation in local activities.

Culodina Farm has four employees and an annual turnover of 8 million SEK. The farm mainly produces organic milk but also produces meat, forestry products, and crops. The farm rents residential and business machines to customers. *Carl* manages farm operations and *Claire*, with experience from other industries, manages the administrative work. Dairies and slaughterhouses are customers. As far as strategic development is concerned, their aim is to increase annual turnover, maintain a stable workforce, and provide more leisure time for themselves. Outside consultants provide business and financial advice. Customer relationships are maintained through satisfactory deliveries. The entrepreneurs have a large network within and outside the industry, and collaborate with neighbors and other entrepreneurs by land swaps, equipment

loans and rentals. Ecological sustainability is achieved by organic production. Economic sustainability is achieved when the revenues are covering expenses.

Dougie Farm has 20 employees and an annual turnover of 50 million SEK. The farm produces and processes organic premium vegetables and grain via participation in crop rotation with neighbors. *David*, who is in charge of sales and administration activities, operates the farm with his sister, *Diana*, who is responsible for the production. The farm's aim is to control the entire chain – from the farm to wholesaler warehouses to Swedish grocery stores. Some of the produce is sold under their own brand. The entrepreneurs have a large network in the agri-food industry. Strategic issues are discussed with the family and with external advisors. Sustainability means being able to pass the farm on to the next generations.

Edeen Farm has three employees and an annual turnover of 4 million SEK. The farm primarily produces milk although it also produces meat (beef and lamb), has forestry activities and is a tourist destination with accommodation, as well as a cafe, shop, dairy and bakery. *Eric*, who is responsible for crop production and administration, manages the farm with *Eliza*, who is responsible for animal care, the shop, dairy, and bakery. Milk is sold to a Swedish dairy. Most of the meat is sold to a slaughterhouse except for a small amount that is processed on the farm. The farm cooperates with contractors and others in an agriculture network. Strategic development is discussed within the family. The entrepreneurs' goal is to achieve financial sustainability to work less. Environmental and economic sustainability is achieved by crop rotation and care in the breeding of healthy animals. Activities are considered economically sustainable when repayment of loans is possible.

Forba Farm has five employees. [Past annual sales figures are irrelevant because the farm has recently undergone a structural reorganization]. The farm produces organic beef and is engaged in animal breeding. *Frank*, who has previous experience in the slaughterhouse industry, manages the farm. The sales company, which was split off from the farm in 2015, has an annual turnover of about 16-17 million SEK. This company sells organic grass-fed beef that it purchases from 30-35 farms. The farm and the sales company split off in order to develop a socially sustainable agricultural business, to increase sales, and to better manage costs. Today, the sales company is responsible for the farm's sales, marketing activities, and pricing strategies. The sales company has a board of directors, and the farm plans to appoint one. Strategic issues are discussed with network contacts. The entrepreneur's goal is to advance social sustainability in the local area. For the entrepreneur, environmental and social sustainability are connected. Economic sustainability means producing a sufficient surplus that will pay for all development costs.

Table 2 summarizes the barriers, drivers, and solutions used for each farm.

Table 2. Barriers, drivers, and solutions

Farm	Barriers	Drivers	Solutions
Adair	Accepts a farmer's life, liquidity, water protection area, local slaughterhouse closure, administration, lack of competence in marketing and pricing, quick changes, changes in rules, labelling, consumer behavior, workload, safety, time for family	Positive attitude, business focus, possibility oriented	Good communication, have fun, involve family, delegating, synergies, collaboration, minimizing waste, storytelling, focus on core business, cost awareness, strategic board
Bethia	Accepts a farmer's life, liquidity, public procurement, economic and emotional process, business culture and politics, cheap food, lack of market knowledge, administration, low price, no strategic board, time for family	Positive attitude, possibility focus, curiosity, innovative, risk averse, competitive, another future	Time off, entirety fit, cost awareness, focusing on cash-flow, outsourcing, cooperation, strategic network, teamwork, risk diversification
Cullodina	Accepts a farmer's life, liquidity, delegating difficulties, control needs, lack of good consulting, pricing from cooperation, carefulness, geographical location, strategic development, lack strategic work, self-control and influence over production, unknowing consumer, workload, family time, rapid growth	Positive attitude, another future, possibility focus.	Cost awareness, focusing on core business, captured occasions, network
Dougie	Accepts a farmer's life, administration, social media, workload, expansion, self-leadership, large customers pricing, delivery requirements, expensive value chain expensive, eagerness to develop, time for family, quick growth, owner differences, seasonal workforce	Positive attitude, business focus, risk averse, possibility focus, owner differences, competitive, another future	Cooperation, network, cost awareness, strategic network, teamwork, leadership skills, rent land, opportunity to buy packing plant

Farm	Barriers	Drivers	Solutions
Edeen	Accepts a farmer's life, liquidity, price from cooperatives, administration, lack of good consulting, business culture, lack of marketing knowledge, family discipline, small scale, workload, self-leadership, unknowing consumers, sales	Positive, curiosity, willingness to learn, innovative, risk averse	Network, cost awareness, only family employees
Forba	Accepts a farmer's life, lack of good consulting, Swedish support system, impatience, submit to new leader, release control, consumer knowledge	Possibility focus, risk averse, curiosity, sustainability focus	Sustainability focus, cost awareness, focusing on core business

ANALYSIS

The analysis revealed similarities and differences in the nature of the barriers and the approach to them. When reducing concepts into themes and dimensions, consistency with existing theory about External and Internal barriers was discovered to some extent. However, those were insufficient for analysis of the barriers to SBMI in the agricultural context (Pindado & Sánchez, 2017), a third aggregate dimension was needed, and hence theory was developed with the addition of contextual barriers. See Figure 2 for a listing of the concepts and themes related to the three aggregate dimensions, explained in the following text.

External barriers relate to the behavior of competitors, consumers, and governments (Sandberg & Aarikka-Stenroos, 2014). The entrepreneurs explained that the barrier of *resistance or lack of support from actor(s)* was evidenced by several factors. Since the agri-food industry is more adaptive to larger production, small-scale production is more costly than large-scale when measured on the basis of per unit of output. Further, changing consumer behavior, consumers' unawareness of differences between labels, and unwillingness to pay for added value, also create barriers. Consumer ignorance is exemplified by Eliza, saying:

"People demand organic without knowing the meaning of it."

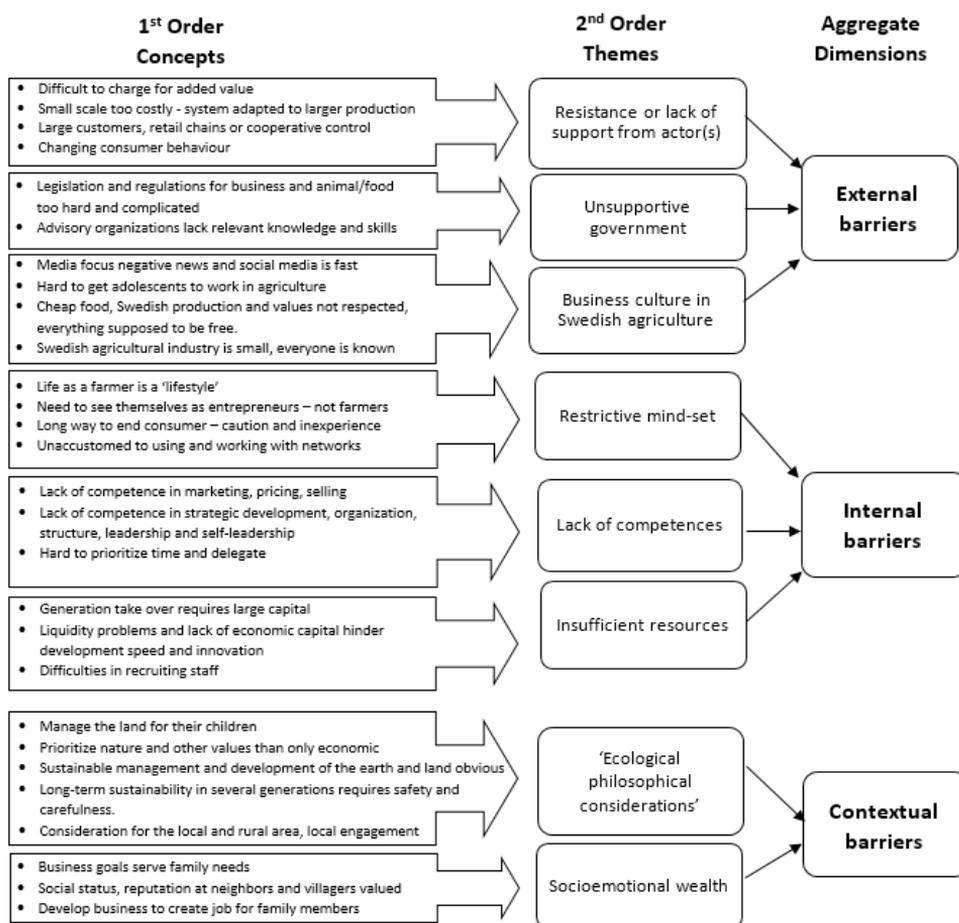


Figure 2. Data structure

Source: Gioia et al. (2012).

Further, Claire illustrates the consumer power:

“If customers would abandon organic, we have to change to conventional...the biggest risk is mainly the milk price and changing consumer behavior.”

The entrepreneurs found *unsupportive government* limiting the scope of changes. First, difficult and complicated legislation and regulations for the

agri-food industry have increased administrative requirements that take time from actual productive work, as expressed by Anna:

“That’s why I am sitting here in the office. If we haven’t had this [the rules], I would not be needed here.”

Although strict rules may drive development and sustainability in new ways (Vik & McElwee, 2011), such rules often limit both development and sustainability when new fees and new requirements are imposed. David express frustration:

“I sometimes feel limited and it has to be enough with written procedures. It is frustrating.”

Second, the governmental advisory groups (with a long history in Swedish agriculture) seem to lack the relevant knowledge and skills for development. The entrepreneurs request advice that is less focused on traditional production and more on strategic business management and new methods, as explained by Eric:

“I’m very skeptical about many of the advisory organizations. I will happily take advice, but they do not have the knowledge I need.”

Frank reflects on the impact of advisory organizations on business development, and states:

“Advisory organizations are slowing down development. If I had not listened to them, I would have progressed much further. They come here to learn.”

The entrepreneurs explain that *the business culture in Swedish agriculture* is a barrier to SBMI, making it difficult to interest young people in farm work and careers. They often feel the need to resist the media pressure to be more competitive and more profitable, as reflected by David:

“Media focuses on negative news as if milk price is lowered a few pennies. If we focus on bad things, we get a Swedish agriculture that is hard to develop.”

Another aspect of this barrier is the pressure of the so-called Law of Jante, a peculiar Nordic unwritten law of behavior that can influence the business culture. Under Jante, individual success and wealth are seen as inappropriate, and sometimes leads to disrespect for hard work and ambition. Therefore,

entrepreneurs may be unwilling to appear more successful than others or to boast about their success, as expressed by David:

“I never talk to anyone about how we are doing - because then we have this Jante.”

Internal barriers relate to human factors (Sandberg & Aarikka-Stenroos, 2014). Individual emotions and attitudes largely influence entrepreneurial processes (Shepherd, 2015), and a *restrictive mind-set* can hinder attempts to make changes to BMs and be damaging to self-leadership (Manz & Neck, 2013). The entrepreneurs realize that they should view their farms as professional companies rather than as traditional, family-run small businesses (Vesala & Vesala, 2010), but traditionally do not, as explained by Eliza:

“Farmers have never seen themselves as entrepreneurs; we are not used to it.”

Because they look at farming as a ‘lifestyle’, they find the leap to a professional’s way of conducting business a challenge. They recognize the difficulties the farming ‘lifestyle’ creates (e.g., never a day off and long hours), but generally they do not see a transition to professional management either as a clear possibility or as a goal. More farm networking might help overcome this mind-set, but such networks are rare in Sweden. Anna explains:

“A goal is to have a job where I don’t have to work all night. It should be a lifestyle, sure – if you go into this profession you have forgotten about holidays long ago.”

More farm networking might help overcome this mind-set, but such networks are rare in Sweden, as Carl reflects:

“My dad and his generation would never network with others.”

The entrepreneurs describe their *lack of competences* with respect to strategic management, organization, and self-leadership that hinder their development and commercialization of innovation (Shepherd, 2015; Laukkanen & Patala, 2014). They also find lack of marketing and sales competence as a hindrance, as illustrated by Eliza saying:

“Producing is easy, but then it will be sold too”

Insufficient resources refer primarily to the entrepreneurs' lack of adequate financing. Lack of capital to finance operations and to preserve the family farm for future generations is a barrier to development (Lüdeke-Freund & Musango, 2016). Many of the farms have liquidity problems hindering them, e.g., to hire qualified employees.

Contextual barriers relate to the setting for the farms. The *ecological philosophical considerations* create barriers, for example, based on inherited cultural and rural values. The entrepreneurs view the world in a way that influences their lives and their businesses. Frank illustrates a picture of the farming considerations, explaining:

“We have a larger universe below the ground than above...and farming is a complex business.”

Nature (i.e., the land) are valued second after financial return, and the land is considered to be managed to pass to the heirs. Brian explains the value and the mind-set saying:

“We have to leave the earth as a better place than it was when we came...I would never have done this for money. It is about completely different values.”

Long-term sustainability through generations requires safety and care. However, this attitude creates a barrier to economic profitability because many decisions do not mean greater production and greater revenue, sometimes with lost financial opportunities as a result (Engelken et al., 2016).

Socio-emotional wealth describes a barrier that is the result of a focus on family needs and values instead of the attainment of financial goals, e.g., achievement of social status and acquisition of a good reputation among neighbors (Maloni et al., 2017). The awareness and restriction are expressed by David saying:

“Numerous talks are being conducted about us at the home of employees; it is both an opportunity and a large risk.”

In fact, some of the farms in this study were specifically developed to create jobs for family members, as for example in the case of Eliza and Eric:

“When our son was being educated to become a baker, the oven was replaced at his school, and he was allowed to take it. Then we build a bakery.”

Figure 3 depicts the overlaps and the intertwining of the three barrier groups, illustrated as transparent circles filled with nets that link the barriers, symbolizing the interconnections and influences. Many of the barrier groups share characteristics and effects each other, which also means that it can be difficult to work with an isolated group of barriers, and that actions in one group affect the other groups. Since cognitive aspects affect how to approach challenges and barriers, internal barriers is a large and important dimension to understand, further discussed below.

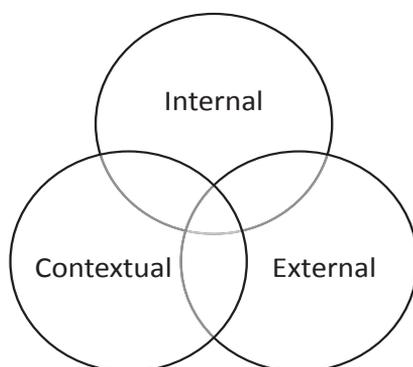


Figure 3. Interrelated barriers to SBMI

DISCUSSION

In general, Swedish farmers seldom engage in SBMI (Tell et al., 2016). The reasons, found in this study, are that they meet different barriers and approach them in different ways. The entrepreneurs in this study have developed their BMs, and hence they have managed to conquer many barriers. This depends on, e.g., the entrepreneurs having a positive attitude, being possibility oriented, being innovative, and using their network (see Table 2). Most of them also have education and work experience from other industries, and have chosen to take over the family businesses, which is likely to affect their approach, motivation and actions. These characteristics and skills are probably not typical of the majority of Swedish farmers. On the other hand, we can learn from studying what challenges they face and how those entrepreneurs approach various barriers.

Barriers to SBMI are examined and illustrated and relations briefly discussed. Since cognitive aspects affect how to approach challenges and barriers, internal barriers are the absolute largest group, largely linked to both external and cognitive barriers, which are also interrelated in different ways (see Figure 3). However, enabling a thorough analysis of the relations and interrelations of the barriers would require a study focusing on the relationships. This study is the first step, contributing with knowledge about why farmers seldom develop their BMs, what the barriers to this development look like, how they can be categorized, how they affect agricultural entrepreneurs, and how the barriers are approached.

The most challenging external barriers are the pressure from large cooperatives, the complexity of ever-changing legislation and regulations, and the lack of relevant governmental and advisory support. The most challenging contextual barrier is the dilemma created by the need to strike a balance between environmental/social sustainability and individual economic stability. The entrepreneurs emphasize that land is loaned from future generations, a philosophy that also creates an internal barrier to SBMI, because it influences nearly all their decisions about internal management processes, strategies, and actions.

Since cognitive aspects affect how to approach challenges and barriers, internal barriers is an interesting and important dimension to understand; intertwined with both external and contextual barriers, which also are interrelated in different ways (see Figure 3). Mind-sets, attitudes, cognitions, etc., affects how the entrepreneurs approach challenges (Manz & Neck, 2013). These characteristics also highly affected if the challenges are transformed into barriers or remains challenges. Working with the internal barriers means that the entrepreneurs need to develop themselves and their cognitive abilities, which in turn requires both maturity, courage and self-awareness, and therefore can be a challenging dimension of barriers to conquer. Those self-leadership processes are individual and take time to change (Manz & Neck, 2013), but since leadership problems hinder the development of BMs (Chesbrough, 2010), and many of the entrepreneurs have minimal leadership/management training and experience, it is important to highlight this dimension. The lack of leadership competence results in the inadequate use of both time and workforce.

Strategic planning is a do-it-yourself exercise or do-it-family exercise. Several entrepreneurs have discussed developing a strategic forum, but seem to lack the drive to make the forum a reality.

Moreover, the pervasive philosophy of farming as a 'lifestyle' is an internal barrier connected to the contextual, caused by respecting cultural farming traditions and rural values, and resulting in a resistance to innovation. The

farmers are inclined to think of themselves as dependent sub-contractors to the large cooperatives rather than as independent contractors.

The entrepreneurs support environmental sustainability through “management and development of the earth and land.” Some entrepreneurs support societal sustainability through “local engagement” with neighbors and the community. Although they are not purely profit-driven, generally, however, they rank economic sustainability above environmental/social sustainability. As one entrepreneur states, “business goals serve family needs.”

CONCLUSION

The entrepreneurs describe barriers to SBMI, but they have not developed many solutions. They understand the necessary change if the farms are to survive in Sweden. Indeed, some farms have begun to diversify by adopting ecological farming methods and by diversifying their traditional farming activities. Such diversification means changing the conservative mind-set that is characteristic of traditional farming to a mind-set aligned with the goals and practices of professional farming. It means developing the professional leadership skills associated with strategic management as well as acquiring knowledge of modern marketing tools and methods.

It will be difficult for these entrepreneurs to prosper if they continue to look at farming as a ‘lifestyle’ rather than as a for-profit business. Food production on their relatively small scale is a challenging activity, especially when competitors are large enough to set prices, control markets, and take advantage of economies of scale. Larger competitors, with greater knowledge and expertise, are also better positioned to understand and comply with new legislation and regulations.

This study contributes to new knowledge about barriers to SBMI in the agricultural sector, specifically with the developed dimension contextual barriers, and the interrelations between the three dimensions; internal, external and contextual. Previous research has shown that cognitive abilities affect intentions, behaviors and actions, which is further confirmed in this study, showing that a significant part of the challenges lies in the entrepreneurs themselves and how they approach different barriers. This study highlights the need to work with leadership and self-leadership, and also emphasize previous research showing the pressure of social norms and local values in the rural context. Significant to this context is the fact that agriculture has a unique challenge in combining the difficulties it means to be both a farmer, entrepreneur and working in the countryside.

Practical and policy implications

This study identifies and illustrates three barrier groups to SBMI for agricultural SMEs in Sweden. In response to the Swedish Agriculture Department's request for research that increases our understanding of barriers to the development of this sector, this study examines and illustrates the barriers. The main goal of this study is to educate policy makers, advisors, legislators, and farm entrepreneurs about these barriers. If the barriers to SBMI are better understood, then it is more likely solutions to overcome these barriers can be found. As explained in Figure 3, the barriers are intertwined, which also illustrates the importance to understand the internal influences. This study's findings can be disseminated into existing national education courses for the development of the agricultural sector.

Future research

An interdisciplinary study examining the internal/psychological processes involved in the relationships and interrelations between the barriers would deepen the understanding. It would also be of interest to compare the barriers for farms without developed BMs, with the barriers identified in this study.

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Abstrakt

W ostatnich latach szwedzkie rolnictwo stanęło w obliczu wielu wyzwań. Do najważniejszych z nich należy spadek liczby małych i średnich gospodarstw rolnych, spadek liczby osób zatrudnionych w działalności rolniczej oraz wzrost regulacji rządowych i prawodawstwa regulującego taką działalność. Jednocześnie wzrosło zapotrzebowanie rolnictwa na zrównoważony rozwój społeczny i ekologiczny. Chociaż badania pokazują, że innowacyjne modele biznesu zrównoważonego (SBMI) mają wpływ na powstawanie zrównoważonych firm i do rozwoju zrównoważonego społeczeństwa, w szwedzkim rolnictwie stosowanie tychże modeli należy do rzadkości. Celem tego artykułu jest zbadanie barier dla wykorzystania SBMI w szwedzkim rolnictwie. To jakościowe badanie jest zgodne z metodologią Gioia, a dane do analizy zostały zebrane w częściowo ustrukturyzowanych wywiadach z przedsiębiorcami z sześciu gospodarstw rodzinnych w Szwecji. Artykuł stanowi teoretyczny wkład w badania nad SBMI, koncentrując się na zrównoważonej przedsiębiorczości w szwedzkim rolnictwie. W artykule zidentyfikowano zewnętrzne, wewnętrzne i kontekstowe bariery dla SBMI, gdzie wewnętrzne są największe i stanowiące największe wyzwanie

Słowa kluczowe: zrównoważony model biznesu, innowacje, bariery, przedsiębiorcy rolni, zrównoważona przedsiębiorczość.

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Testing Students' Entrepreneurial Self-Efficacy as an Early Predictor of Entrepreneurial Activities. Evidence from the SEAS Project

Krzysztof Zięba¹ and Jakub Golik²

Abstract

Over the last forty years, since Bandura (1977) introduced the concept of self-efficacy, there have been a constantly growing number of research publications using this concept. Its early development resulted in the creation of a new construct of entrepreneurial self-efficacy (ESE) proposed for the first time by (Chen et al. 1998). Since then, many different groups of research concerning ESE have emerged - one of them is the study of ESE of students. With regard to this particular group, a recent tendency to study ESE in a pre-post setting can be noticed i.a. Karlsson, Moberg (2013), Shinnar, Hsu, Powell (2014), Ismail, Zain, Zulihar (2015).

Due to the increasing interest in entrepreneurial self-efficacy research and the need to fill the gap in the literature with regard to European post-communist countries (and particularly – Poland) (Drnovsek, Wincent, Cardon, 2010), in this paper we present a brief overview of ESE research and pose the question whether ESE of Polish students can serve as an early predictor of their subsequent entrepreneurial activities, potentially leading them to nascent entrepreneurship.

The research material was collected from the SEAS (Survey on Entrepreneurial Attitudes of Students) Project carried out at the Faculty of Management and Economics, Gdańsk University of Technology. The research sample was composed of 72 students - ESE was measured in a pre-post setting using a single item based on a five-point Likert scale. One of the research conclusions is that ESE manifested by student-beginners seems to influence their later entrepreneurial behavior in a statistically significant way - potentially making ESE a valuable early predictor of future entrepreneurial activities. In the concluding part of the study, limitations are discussed and future study developments are indicated.

Keywords: *self-efficacy, entrepreneurial self-efficacy, entrepreneurship.*

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INTRODUCTION

The notion of self-efficacy has been extensively studied over the last 40 years. The term at the very beginning was deeply rooted in psychological theories. It has gained wide recognition among scientists after the publication of Bandura (1977) who defined it on the basis of his social learning theory as an individual's belief in his or hers capability of performing a given task (Boyd & Vozikis, 1994). Self-efficacy is rooted in social cognitive theory which states that human behavior can be perceived as a function constituting personal, behavioral and environmental determinants (Coleman & Kariv, 2013).

Since Bandura's publication, self-efficacy has been the subject of research and comparison with other psychological constructs. One such construct similar to self-efficacy is the locus of control. The main difference between them is the level of generality. The latter is a more general concept which refers to a wide variety of situations. It consists of internal locus of control, where one's belief is that rewards are based on an individual's behavior, and the external locus of control, where one's belief is that rewards are controlled by outside factors. In contrast to this notion, self-efficacy refers to the specific task and situation. Hence, an individual might be characterized by a strong internal locus of control while having low self-efficacy regarding a particular task (Boyd & Vozikis, 1994). This contextuality of self-efficacy should be stressed as an important feature of this notion, as it leads to the conclusion that self-efficacy cannot be generalized across various fields of application.

In the early stage of development of research concerning self-efficacy, scientists concluded that it is a multidimensional construct. Furthermore, the connection between self-efficacy and notions related to entrepreneurship was found. By applying the work of Bandura to the concept of entrepreneurship, the more specific notion of entrepreneurial self-efficacy (ESE) was created (Coleman & Kariv, 2013).

The main research question of this paper is whether students' entrepreneurial self-efficacy can serve as an early predictor of their current and future entrepreneurial activities. We start by presenting a brief overview of entrepreneurial self-efficacy research which offers a background to the stated research problem. Empirical data gathered within the framework of the SEAS project allowed us to address this question with regard to Polish students.

LITERATURE REVIEW

The formal construct of entrepreneurial self-efficacy was proposed for the first time by Chen, Green and Crick (1998). Their motivation for introducing

the concept was due to the fact that previous research on psychology of entrepreneurs failed to distinguish managers from entrepreneurs on the basis of characteristics such as the above-mentioned locus of control. By presenting entrepreneurial self-efficacy, they intended to find an individual characteristic that is distinctively entrepreneurial (Chen, Green & Crick, 1998). Entrepreneurial self-efficacy was defined as “the strength of a person’s belief that he or she is capable of successfully performing the various roles and tasks of entrepreneurship.” It was a multidimensional construct consisting of five factors: marketing, innovation, management, risk-taking, and financial control.

The work by Chen, Green and Crick (1998) at the same time defined, in a sense, the trend of research of entrepreneurial self-efficacy. They studied among others the relation between entrepreneurial self-efficacy and entrepreneurial intentions. The research was conducted on two groups: among students and small business executives. Many of the following studies on this matter were based on these target groups and measured similar relations.

After the introduction of entrepreneurial self-efficacy, both the general and entrepreneurial self-efficacy notions were discussed in scientific papers with regard to other psychological theories and concepts. For instance, Markman, Balkin and Baron (2002) measured general self-efficacy and regretful thinking on 217 patent inventors and showed that both of these determinants distinguish technological entrepreneurs from technological non-entrepreneurs. On the other hand, Arora, Haynie and Laurence (2011), on the basis of social cognition theory, investigated the relationship between counterfactual thinking and entrepreneurial self-efficacy, implying that “counterfactual thinking for entrepreneurial self-efficacy is moderated by individual differences based on the dispositional attributes of the entrepreneur.” Some works also incorporated the Theory of Planned Behavior as their theoretical research basis for studies regarding prior family exposure to entrepreneurial intent (Carr & Sequeira, 2007) or impact of entrepreneurship education (Maresch, Harms, Kailer & Wimmer-Wurm, 2016). Finally, Hsu, Wiklund and Cotton (2017) contrasted two theories – Self-Efficacy Theory and Prospect Theory in a model determining an individual’s intention to re-enter entrepreneurship following a business exit.

Among many publications regarding entrepreneurial self-efficacy, a group of research concerning relations or mediating role of entrepreneurial self-efficacy can be distinguished. For instance, Oyugi (2015) studied the mediating role of entrepreneurial self-efficacy on the relationship between entrepreneurial education and entrepreneurial intentions of university students. He concluded his research by stating that there exists a significant relationship between entrepreneurship education and entrepreneurial intention. However, self-efficacy only partially mediated these factors. The study on the effects of

emotional intelligence on entrepreneurial intention and self-efficacy made by Mortan, Ripoll, Carvalho and Bernal (2014) showed that emotional intelligence positively affects entrepreneurial self-efficacy. Tsai, Chang and Peng (2016) studied a link between entrepreneurial self-efficacy and entrepreneurial intention involving the previously mentioned Theory of Planned Behavior. There are also many other works involving study on entrepreneurial self-efficacy and entrepreneurship intention i.a., Piperopoulos and Dimov (2015), Wang, Chang, Yao and Liang (2016), Klyver and Thornton (2010).

Densberger (2014) explored the relationship between entrepreneurs' self-efficacy and risk propensity by analyzing data from semi-structured, in-person interviews (49 entrepreneurs from three American cities). Her study indicated that high levels of self-efficacy result in entrepreneurs being comfortable with risk-taking. Another example of exploring different relations is the work by Pollack, Burnette and Hoyt (2012) which studied mind-set impact on self-efficacy in the face of threats to entrepreneurial success.

Other scientists have studied the connection between entrepreneurial self-efficacy and firms' performance. Cumberland, Meek and Germain (2015) carried out a more detailed study using a multidimensional attitude of investigating the impact of five entrepreneurial self-efficacy dimensions (Chen, Green & Crick, 1998) on firms' performance. In particular, the study was focused on a franchise context which is understudied in entrepreneurial literature (Cumberland, Meek & Germain, 2015). Another research by Coleman and Kariv (2013) also used a multidimensional approach to study the entrepreneurial self-efficacy impact on firms' performance.

Entrepreneurial self-efficacy has also been studied in the context of culture (e.g., Wennberg, Pathak & Autio, 2013; Klyver & Thornton, 2010). The former study had a sample of 42 countries while the latter was based on a random sample survey of 51 countries. Some more theoretical works also concerned methodology (e.g., Barakat, Boddington & Vyakarnam, 2014 based on the CAL4INO³ project, or Drnovsek, Wincent & Cardon, 2010).

Finally, the group concerning research of entrepreneurial self-efficacy on students at various educational stages should be mentioned. In this group two subcategories can be distinguished: research concerning primary and secondary school students (e.g., Studdard, Dawson & Jackson, 2013; Lope Pihie & Bagheri, 2011) and research concerning university students (distinguishing students who had an entrepreneurship course and those who did not e.g., Maresch, Harms, Kailer & Wimmer-Wurm, 2016; Setiawan, 2014).

³ CAL4INO stands for Creative Activities in Learning for Innovation. It is a project funded by the European Union whose main focus is to identify the impact of different types of creative learning activities on the innovation potential of its participants. The project is focused on universities in 6 participant EU countries.
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In general, among studies concerning research of entrepreneurial self-efficacy on students, two trends can be noticed. The majority of articles concerns entrepreneurship education – its effects, flaws and possible improvements (e.g., Karlsson & Moberg, 2013; Piperopoulos & Dimov, 2015; Abaho, Olomi & Urassa, 2015; Izquierdo & Buelens, 2011; Shinnar, Hsu & Powell, 2014) or works by Bagheri and Pihie (2011, 2013, 2013). The second recognized group of articles concerns mostly entrepreneurship intention with less attention paid to the entrepreneurship education process (e.g., Yasruddin et al., 2011; Rachmawan, Lizar & Mangundjaya, 2015; Franco, Haase & Lautenschlager, 2010; Carr & Sequeira, 2007 or Krecar & Coric, 2013).

Among this specific group of studies it should be noted that many publications come from Asian countries, for example, Malaysia: Lope Pihie and Bagheri (2011), Yasruddin et al. (2011), and Indonesia (Setiawan, 2014; Rachmawan, Lizar & Mangundjaya, 2015). This fact is of great importance in view of the conclusions of previously mentioned studies of Wennberg, Pathak and Autio (2013) and Klyver and Thornton (2010). They showed that self-efficacy is correlated with cultural practices and cultural legitimacy of entrepreneurship respectively. It implies that there is a need for more locally focused studies in other parts of the world, especially as most studies on this subject seem to be focused on either Asian countries or less developed countries like Uganda (Oyugi, 2015; Abaho, Olomi & Urassa, 2015).

In accordance with what was suggested by Krecar and Coric (2013), that “entrepreneurial self-efficacy is a dynamic construct which changes along with entrepreneurial status”, a recent tendency to study entrepreneurial self-efficacy in a pre-post setting can be noticed i.e., Karlsson and Moberg (2013), Shinnar, Hsu and Powell (2014), Ismail, Zain and Zulihar (2015). Such an approach seems to be necessary in order to measure the development of entrepreneurial self-efficacy of students itself with regard to entrepreneurial education, as well as to study the impact of other relations involving, for instance, prior family business exposure (Carr & Sequeira, 2007). Furthermore, the necessity of pre-post setting studies in this context can also be supported by the characteristic determinants of the life period of being a student. It first and foremost entails gaining a legal personality which enables young adults to start their own business. External factors, such as a dynamic market environment, make the students’ career choice inevitable at this age, thus under particular circumstances, the possibility of being self-employed is deliberated. All of these, combined with internal factors such as the enhanced emotional and intellectual development of students, make the subject of measuring entrepreneurial self-efficacy important in terms of a better understanding and improvement of methodology (Drnovsek, Wincent & Cardon, 2010), as well as formulating guidelines for entrepreneurship

education improvement as suggested by Din, Anuar and Usman (2016). Both of these research directions may improve our understanding of the entrepreneurial intentions of young people and as a result, bring insight to the current trends of creating micro and small enterprises. Our research acknowledges the current research trends in the studies concerning entrepreneurial self-efficacy while at the same time contributing to the literature results based on an example of a European post-communist country which remains an understudied topic (Drnovsek, Wincent and Cardon, 2010).

RESEARCH METHODS

Following the previously mentioned increasing interest in entrepreneurial self-efficacy research and the need to fill the gap with regard to European post-communist countries (and particularly – Poland), we pose the question whether entrepreneurial self-efficacy of Polish students can serve as an early predictor of their subsequent entrepreneurial activities, potentially leading them to nascent entrepreneurship. In order to answer this question, empirical data is needed. We decided to use research material collected within the SEAS Project, which is being carried out at the Faculty of Management and Economics (FM&E), Gdańsk University of Technology (GUT). The data used in the research have been collected and analyzed personally (primary source) as both authors are involved in the project.

The SEAS (Survey on Entrepreneurial Attitudes of Students) Project started in 2008 as a longitudinal study of students' entrepreneurship, its determinants and antecedents combined with career choice study, education process evaluation and other student-related issues. The SEAS Project is realized in a form of an annual quantitative study. Data is collected with the use of a questionnaire which is administered to two groups of students: those who start their studies at FM&E (the incoming sample) and those who are about to graduate (the outgoing sample).

An individual ID is assigned to all new students participating in the SEAS Project, which allows SEAS researchers to compare both samples not only on a general "sample level," but also with regard to individual changes that take place. This is a very important feature of the SEAS Project as such individual changes may be invisible from the sample level⁴.

4 Sometimes individual changes may not be recorded on the sample level, as they are "covered" by similar changes in the opposite direction. Let us consider the following situation: in the incoming sample 40% of students want to start their own business. During their three-year period of studies 20% become discouraged from starting a business, but another 20% get encouraged. Examination of the outgoing sample would show that nothing changed over the time of studies and still 40% of students want to become business owners. Tracing individual decisions would reveal that the composition of the seemingly stable (all the time 40%) group of future entrepreneurs is different and there is no stability here at all.

The incoming sample of management engineering students was examined in 2013 and after three years, in 2016, the same group of students was examined as the outgoing sample. The incoming sample consisted of 147 students. Three years later the questionnaire for the outgoing sample was completed by a smaller number of students, the difference being the result of changes in students status (some gave up, others had to repeat a semester) and limited availability (many students moved to study abroad within the Erasmus framework). 72 properly completed questionnaires were gathered in the outgoing sample and were comparable enough to be used for the purposes of our research.

Entrepreneurial self-efficacy was measured using a single item based on a five-point Likert scale in both the incoming and the outgoing sample and made a dichotomous variable. Using χ^2 as a test of association we checked whether students showing self-efficacy at the time of starting their studies (the incoming sample) are more likely to manifest entrepreneurial activities upon completing their studies three years later (the outgoing group). Looking for an even stronger predictor, we also analysed changes of entrepreneurial self-efficacy over the period of studies and compared the obtained results.

RESULTS AND ANALYSIS

The first analyzed factor was entrepreneurial self-perception of the examined students. Entrepreneurial self-perception is often used to identify potential entrepreneurs (Zięba, 2015) and is related to further entrepreneurial activities, possibly leading to starting an own business. The examined students generally perceived themselves as entrepreneurial individuals. As shown in Table 1, 65% of them share this opinion.

Table 1. Entrepreneurial self-efficacy as an early predictor of entrepreneurial self-perception of students

Entrepreneurial self-perception	ESE				Total:	
	No		Yes			
	[n]	[%]	[n]	[%]	[n]	[%]
No	17	52	8	21	25	35
Yes	16	48	31	79	47	65
Total:	33	100	39	100	72	100

p-value=0,00590 (χ^2 test)

However, entrepreneurial self-efficacy (ESE) examined three years earlier relates to a higher probability of entrepreneurial self-perception. Among students characterized by ESE (ESE group) nearly 80% believe they are entrepreneurial individuals, as opposed to 48% in the other (non-ESE) group. There is also a vast difference between the ESE and non-ESE group with regard to the current occupation of the students. Generally, most of the students (63%) were working (full time or part-time). 33% of students were fully devoted to studying and they were not working. 4% of students (three people) were already business owners – see Table 2.

Table 2. Entrepreneurial self-efficacy and current occupation of students

Current occupation	ESE				Total:	
	No		Yes		[n]	[%]
	[n]	[%]	[n]	[%]		
Not working	16	48	8	21	24	33
Working	17	52	28	72	45	63
Owning a business	0	0	3	8	3	4
Total:	33	100	39	100	72	100

p-value=0,02214 (χ^2 test for “working” and “not working” categories only)

Interestingly, students characterized by ESE were more likely to work (72%) in comparison with their non-ESE counterparts (52%). This may be seemingly surprising as working for someone does not seem very entrepreneurial but a more thorough analysis will show there is no contradiction here. What should be noted is the fact that all business owners belonged to the ESE group.

Having a business idea is a corner stone of the start-up process. Finding and refining a business idea is one of the most frequently taken steps towards becoming an entrepreneur. The data in Table 3 confirm that entrepreneurial self-efficacy favors entrepreneurial thinking and the resulting generation of a business idea. 67% of students who had been characterized by ESE at the time of the start of their studies possessed a business idea when they graduated from the university three years later. The share of non-ESE students having a business idea is significantly lower (less than 40%).

Table 3. Entrepreneurial self-efficacy and business idea generation

Business idea generation	ESE				Total:	
	No		Yes		[n]	[%]
	[n]	[%]	[n]	[%]		
Not having a business idea	20	61	13	33	33	46

Business idea generation	ESE				Total:	
	No		Yes			
	[n]	[%]	[n]	[%]	[n]	[%]
Having a business idea	13	39	26	67	39	54
Total:	33	100	39	100	72	100

p-value=0,02066 (χ^2 test)

Early ESE is also able to explain the future plans of students with regard to setting up their own business. The declared ability to successfully run their own business is manifested through their intention to set up a business: the share of those intending to start own business in the ESE group was twice as big as in the non-ESE group (54% and 27% respectively).

Table 4. Entrepreneurial self-efficacy and plans to set up own business

Plans regarding setting up own business	ESE				Total:	
	No		Yes			
	[n]	[%]	[n]	[%]	[n]	[%]
Not planning to set up own business	23	70	15	38	38	53
Planning to set up own business in a few years	9	27	21	54	30	42
Already owning a business	0	0	3	8	3	44
No answer	1	3	0	0	1	1
Total:	33	100	39	100	72	100

p-value=0,01228 (χ^2 test for "not planning" and "planning" categories only)

Those who planned to start their business in a few years' time can be divided into two groups. The first one was composed of people who state they will start their business in the near future (less than three years), the other one consisted of people who say that they need more professional experience and only after gaining a few years⁵ of experience would they set up own business. Taking this into account it is easy to understand why many students from the ESE group were working at the time of the research (see Table 2). This is simply consistent with their need to gather professional experience before they set up a business.

SEAS participants were also asked about their future career choice. Namely, the students were supposed to say how they imagine their professional situation to be in fifteen years. The results obtained (presented in Table 5) are quite consistent with those in Table 4.

⁵ The respondents choosing this option were asked to specify how many years of experience they would need. The average value was approximately five years.

Table 5. Entrepreneurial self-efficacy and future career choice

Future career choice	ESE				Total:	
	No		Yes		[n]	[%]
	[n]	[%]	[n]	[%]	[n]	[%]
Business owner	10	30	22	56	32	44
Hired employee	16	48	12	31	28	39
Other and no answer	7	21	5	13	12	17
Total:	33	100	39	100	72	100

p-value=0,04346 (χ^2 test for "business owner" and "hired employee" categories only)

Entrepreneurial self-efficacy is, as was mentioned before, a dynamic construct. It may change over time, especially when students are subject to influence consistent with typical sources of self-efficacy, as defined by Bandura (1977). Two sources are, to a large extent, related to one's own experience (i.e., previous success and psychological factors) and the remaining two are related to external factors (i.e., modeling and social persuasion). All those sources are likely to be at play with regard to students. Nevertheless, the changes in ESE within the examined sample are not very significant over the period of three years.

Table 6. Changes in entrepreneurial self-efficacy over time

Initial and final entrepreneurial self-efficacy		ESE				Total:	
		No		Yes		[n]	[%]
		[n]	[%]	[n]	[%]	[n]	[%]
Final ESE	No	22	67	9	23	32	43
	Yes	11	33	30	77	28	57
Total:		33	100	39	100	72	100

p-value= 0,00020 (χ^2 test)

77% of the students belonging to the ESE group at the beginning of their studies were still characterized by ESE three years later. 23% lost their ESE at that time. The lack of ESE is also a relatively stable characteristic. 67% of those lacking ESE as student beginners also lacked ESE upon their graduation. One-third of the non-ESE group gained entrepreneurial self-efficacy during their studies.

Since most of the students did not change with regard to their ESE, we focused on those permanently characterized and permanently not characterized by ESE to check whether persistent presence of ESE as compared to persistent lack of it may be a stronger predictor of entrepreneurial activities of students graduating from the university. As can be seen in Table 7 and Table 8, both entrepreneurial

self-perception and current occupation of students are significantly dependent on the question whether they constantly possess ESE or not.

Table 7. Persistent entrepreneurial self-efficacy and entrepreneurial self-perception of students

Entrepreneurial self-perception	Persistent lack of ESE		Persistent presence of ESE		Total:	
	[n]	[%]	[n]	[%]	[n]	[%]
No	14	64	5	17	19	37
Yes	8	36	25	83	33	63
Total:	22	100	30	100	52	100

p-value=0,00051 (χ^2 test)

Table 8. Persistent entrepreneurial self-efficacy and current occupation of students

Current occupation	Persistent lack of ESE		Persistent presence of ESE		Total:	
	[n]	[%]	[n]	[%]	[n]	[%]
Not working	10	45	5	17	15	29
Working	12	55	22	73	34	65
Owning a business	0	0	3	10	3	6
Total:	22	100	30	100	52	100

p-value=0,04186 (χ^2 test for "working" and "not working" categories only)

Persistent ESE makes a big difference when talking about business idea generation. Among those characterized by permanent ESE, having a business idea was very popular (80%) and conversely, having such an idea was declared by 23% of these students who constantly lack ESE.

Plans to set up own business in the near future, presented in Table 10, are highly determined by a persistent presence or lack of ESE. Those lacking ESE permanently would not start their own businesses in nearly nine cases out of ten. Students characterized by constant ESE planned to set up businesses quite often (63%) and additionally 10% of them already had a business⁶. Nevertheless, a business owner career was clearly more popular among students showing permanent ESE and they were nearly three times less likely to plan their future as hired employees as compared with their counterparts lacking ESE.

⁶ Note that ALL student entrepreneurs were characterized by permanent ESE.

Table 9. Persistent entrepreneurial self-efficacy and business idea generation

Business idea generation	Persistent lack of ESE		Persistent presence of ESE		Total:	
	[n]	[%]	[n]	[%]	[n]	[%]
Not having a business idea	17	77	6	20	23	44
Having a business idea	5	23	24	80	29	56
Total:	22	100	30	100	52	100

p-value=0,00004 (χ^2 test)

Table 10. Persistent entrepreneurial self-efficacy and plans to set up own business

Plans regarding setting up own business	Persistent lack of ESE		Persistent presence of ESE		Total:	
	[n]	[%]	[n]	[%]	[n]	[%]
Not planning to set up own business	19	86	8	27	27	52
Planning to set up own business in a few years to come	3	14	19	63	22	42
Already owning a business	0	0	3	10	3	6
Total:	22	100	30	100	52	100

p-value=0,00007 (χ^2 test for "not planning" and "planning" categories only)

The above-mentioned difference is also visible with regard to future career choice (see Table 11), even though it is less striking mostly due to the fact that quite a lot of students find it difficult to say what kind of career they expect in fifteen years.

Table 11. Persistent entrepreneurial self-efficacy and future career choice

Future career choice	Persistent lack of ESE		Persistent presence of ESE		Total:	
	[n]	[%]	[n]	[%]	[n]	[%]
Business owner	4	18	19	63	23	44
Hired employee	13	59	6	20	19	37
Other and no answer	5	23	5	17	10	19
Total:	22	100	30	100	52	100

p-value=0,00079 (χ^2 test for "business owner" and "hired employee" categories only)

CONCLUSION

Entrepreneurial self-efficacy manifested by student-beginners seems to influence their later entrepreneurial behavior in a statistically significant way. Those who started their studies and believed they would be able to successfully run their own business, upon their graduation three years later were more oriented towards setting up own business in a few years to come (mostly between 3 to 5 years). Since many of them considered professional experience as something necessary to become a business owner, the majority of them started working part-time or full time even before the graduation. ESE also seems to influence the business idea generation process. Those characterized by ESE more often had a defined business idea, which makes their future business venture more feasible. All of that makes ESE a potentially valuable early predictor of future entrepreneurial activities.

The major limitation of the study is the low number of participants, which does not allow for more sophisticated and in-depth analysis. Despite its preliminary pilot character, this research can be useful for showing new paths and developments. Particularly, it would be very interesting to investigate the reasons for losing (and gaining) ESE during the course of studies. On one hand, reducing the number of ESE-characterized students can sometimes be beneficial, as premature ESE can possibly result in serious problems when a business venture fails (Zięba & Ziemiański, 2013). On the other hand, preventing students from losing their ESE could increase the number of successful business ventures. If the education process can influence students, in the sense that they lose or gain ESE, then the consequences of this influence should be investigated thoroughly.

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Abstrakt

Przez ostatnie czterdzieści lat, które minęło od stworzenia przez Bandurę (1977) koncepcji poczucia samoskuteczności, liczba publikacji wykorzystujących tę koncepcję stale rośnie. Jej rozwój doprowadził do powstania skontekstualizowanego konstruktów „przedsiębiorczego poczucia samoskuteczności” - ESE (Chen et al. 1998). Wśród rozmaitych nurtów badawczych zajmujących się problematyką ESE można wyróżnić m.in. ten skupiający się na badaniu ESE wśród studentów. W odniesieniu do tego nurtu daje się zaobserwować w ostatnim czasie wyraźną tendencję do skupiania się na śledzeniu zmian w poziomie ESE zachodzących w badanej populacji np. Karlsson, Moberg (2013), Shinnar, Hsu, Powell (2014), Ismail, Zain, Zulihar (2015).

Chcąc wypełnić wyraźną lukę w literaturze naukowej poświęconej badaniu ESE w krajach post-komunistycznych (a w szczególności w Polsce) (Drnovsek, Wincent, Cardon, 2010) i nawiązując do dużego zainteresowania tą problematyką, prezentujemy w niniejszym artykule krótki przegląd badań nad ESE, stawiając jednocześnie pytanie czy koncepcja ta może służyć jako wczesny predyktor działań przedsiębiorczych polskich studentów, prowadzących ostatecznie do preprzedsiębiorczości (nascent entrepreneurship).

Materiał badawczy został zebrany w ramach projektu SEAS (Survey on Entrepreneurial Attitudes of Students), prowadzonego na Wydziale Zarządzania i Ekonomii Politechniki Gdańskiej. Próba badawcza obejmuje 72 studentów, którzy byli badani

pod kątem ESE na początku oraz pod koniec studiów z wykorzystaniem pojedynczej skali wykorzystującej pięciopunktową skalę Likerta. Przeprowadzone badanie potwierdza, że poziom ESE w momencie rozpoczynania studiów ma istotne statystycznie znaczenie dla późniejszych zachowań przedsiębiorczych, czyniąc ESE wartościowym predykatorem działań przedsiębiorczych absolwentów. W końcowej części artykułu omówiono ograniczenia i potencjalne kierunki dalszych badań.

Słowa kluczowe: *poczucie samoskuteczności, przedsiębiorcze poczucie samoskuteczności, przedsiębiorczość.*

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The Perception of an Entrepreneur's Structural, Relational and Cognitive Social Capital among Young People in Poland - an Exploratory Study

*Paweł Ziemiański*¹

Abstract

The goal of the current paper is to verify how an entrepreneur's structural, relational and cognitive social capital levels are perceived by young people in Poland. The research involved a group of 374 undergraduate business students from a Polish university as participants. Participants completed a survey on entrepreneurial cognitions. It was found that participants assess the level of an entrepreneur's social capital as relatively low. Due to the fact that social capital, and its different dimensions, serve different purposes in the process of venture creation, the result obtained can be considered alarming. Its practical implications are related to the necessity to review and design activities facilitating the development of an entrepreneurial culture in Poland. The value and the originality of the paper lie in the approach that allowed us to investigate which dimensions of an entrepreneur's social capital are seen as particularly weak by people for whom launching a new business is a viable option in the near future.

Keywords: *social capital, entrepreneur's social capital, entrepreneurship, nascent entrepreneurs.*

INTRODUCTION

The issue of social capital has increasingly attracted the attention of entrepreneurship scholars (e.g., Stam, Arzlanian & Elfring, 2014). One of the main reasons for that interest is the fact that establishing an operating venture is difficult and the identification of factors that may increase the probability of success is of great theoretical and practical importance. People who operate in a supportive environment (e.g., an environment in which they can create

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and sustain a high level of social capital) are more likely to start new ventures and become nascent entrepreneurs. This pertains to both developing and developed countries (Kolvereid & Obloj, 1994). Entrepreneurial social capital may be perceived as a factor that is related to one's ability to gather the necessary entrepreneurial resources (Lin, Li & Chen, 2006). Since the seminal work of Putnam (1994), scholars have attempted to identify and verify different dimensions of social capital in different social contexts. One such theoretical proposition that applies strictly to the entrepreneurial context was developed by Nahapiet and Ghoshal (1998) and later used by other scholars including Liao and Welsch (2005). Authors identified three dimensions of social capital: structural, relational and cognitive social capital. The aim of the current paper is to present and discuss the results of exploratory research aimed at the identification of attitudes of Polish students towards entrepreneurial social capital. Its indicators, proposed by Liao and Welsch, were utilized in this attempt. The described goal should be regarded as important, as the difference between perceiving various elements of the environment as supportive, indifferent or even hostile to entrepreneurs, can affect the career choices of young people. Obtaining more detailed information about the perception of levels of different social capital dimensions can also indicate areas in which actions, aimed at its enhancement, should be undertaken. It may therefore be stated that the current article is of both theoretical and practical importance as, apart from advancing what we know about the perception of social capital in Poland where a unique mixture of different developmental stages of capitalism can be observed (Ziółkowski, 2012), it can allow us to develop guidelines for policy makers and educators.

LITERATURE REVIEW

The discussion regarding social capital has been largely influenced by theoretical conceptualizations proposed by Coleman (1988) and Putnam (2000). These authors perceive social capital as resources that are the result of social networks. The relationship between people can be very close (e.g., in a family) or quite loose (e.g., in a community or an entire society). The term social capital refers to a rather fuzzy concept (Liao & Welsch, 2003). Its ambiguity is mainly related to the fact that it has been the object of investigation of scholars with the different theoretical background. For the purpose of the current paper, it is important to indicate its main characteristics that are congruent across different conceptualizations. As the main goal of this article is the investigation of students' attitudes towards entrepreneurial social capital, the description of main theoretical approaches to social capital

will be followed by a brief introduction of its dimensions proposed by different scholars, including those who focused on entrepreneurship research.

Social capital can be perceived as an asset that is embedded in relationships. In his seminal work, Putnam (1994) compared the performance of regional governments in Italy. His main conclusion was that these different levels of performance were related to the quality and quantity of interactions and ties between members of society. In northern Italy, people tended to be more engaged and active in various associations. This tendency was in contrast with typical attitudes and actions of people living in the south of the country who demonstrated lower levels of civic engagement. Putnam perceived this difference as a major source of the higher efficiency of northern governments. He asserted that the social capital embedded in the networks of people allows individuals (as well as governments) to engage in positive collective actions aimed at improving the current state, and to trust each other in the face of dilemmas that are inherently related to collaboration with others (Bolino & Grant, 2016).

Even though social capital is perceived by different scholars as operating on different levels (e.g., on the group level only or on the individual level as well) and may be defined in different ways (Portes, 1998), there is an agreement that it refers to trust, obligations and social norms, in particular to the norm of reciprocity that emerges between people who are related to each other (Walker, Kogut & Shen, 1997; Nahapret, Ghosul & 1997). Coleman (1988) made an attempt to find common ground between different approaches to social capital and asserted that social capital is “a variety of entities with two elements in common: they all consist of some aspect of social structure, and they facilitate certain actions of actors within the structure” (p. 98). An additional crucial aspect is that social capital enables one to obtain resources and achieve goals that would be impossible or much more costly to reach without it.

In general, scholars perceive social capital as a valuable asset that can be used for the benefit of individuals and entire societies (e.g., Fukuyama, 2001). Social capital has also become an important factor in theoretical approaches explaining the differences in economic development (Woolcock, 2001). According to this author, the discourse about economic development during the Cold War era was too large extent dominated by the comparison between two drastically different ways in which countries were governed and the economic consequences of these practices. The role of communities and local and national institutions was overlooked until the last decade of the previous century, when the difficulties faced by transitional economies and the growing number of poor in wealthy societies, could not be addressed without referring to social aspects. The same holds true today with recent

shifts in global politics and unprecedented changes whose impact is impossible to predict. Under such circumstances, social capital can become even more important (Newton & Zmerli, 2011).

It has been argued that social capital cannot be perceived as a unidimensional construct (Ziółkowski, 2012). The fact that, as any kind of capital, it can be used to serve both a positive and negative purpose, has been the starting point for distinguishing dimensions of social capital. Rules of reciprocity and trust can be used to serve the particular interests of a single social group. Such a group can take advantage of its cohesion in order to exploit common resources at the expense of others. On the other hand, social capital can be utilized for the common benefit, as established social norms and trust may become characteristics to interaction across wider networks, even an entire society (Putnam, 2000). This important distinction between two kinds of relationships with others: social ties with those who are similar to an individual and are usually members of the same close group (e.g., family members, close friends) and those who are dissimilar and do not constitute a coherent social group with an individual (e.g., colleagues and associates), was the basis for recognizing two dimensions of social capital: bonding and bridging capital (Gittell & Vidal, 1998; Putnam, 2000).

It is important to state that even though both of these kinds of social capital should be considered an important asset, scholars indicate that bonding capital may be easier to create and is more often available, as people are almost always members of some kind of primary group (Woolcock, 1998). Bridging capital, on the other hand, is not always available to individuals as it requires establishing relationships beyond primary groups. Its lack may have detrimental effects on an individual even in the presence of bonding capital. For example, evidence from Africa indicates that poor entrepreneurs create a very limited network of ties, whereas the networks of those who are more prosperous are much wider (Barr, 1998). The name bridging capital may be perceived as a metaphor that refers to a bridge connecting various social groups comprised of people who are different from one another. Woolcock (1998) proposed adding another level of social capital. He asserted that apart from horizontal relationships that are referred to as bonding and bridging dimensions of social capital, there is also its vertical aspect. The third dimension is the linking social capital that pertains to relationships between people, groups and those in a position of authority and formal institutions. Woolcock (2001, p. 11) described its role stating that "the capacity to leverage resources, ideas, and information from formal institutions beyond the community is a key function of linking social capital." Putnam (2000) contrasted the role of bonding and bridging social capital when he asserted that the bonding capital allows an individual to "get by" whereas the second

one allows an individual to “get ahead.” Linking capital should, in turn, allow people to gain access to resources from formal institutions, for example, banks. This kind of capital also pertains to being objectively informed by the media and receiving fair treatment in courts. The level of social capital possessed by an individual stem from relationships operating in all three dimensions and is related to opportunities that are available to an individual who wants to engage in goal-driven actions, including entrepreneurial endeavors (Szreter & Woolcock, 2004).

A different classification of dimensions of social capital was proposed by Nahapiet and Ghoshal (1998) who distinguished the structural, the relational and the cognitive dimensions of social capital. In a vein similar to the previously presented conceptualization, Nahapiet and Ghoshal (1998) also indicated that social capital should be perceived as a multi-dimensional construct and that as different facets of social capital may be useful in certain situations, the interplay between its different dimensions is crucial for understanding how it influences results obtained by individuals, groups and entire societies. They identified the structural, the relational and the cognitive dimensions of social capital. These dimensions were later adopted by other scholars for entrepreneurial research. For example, the scale developed by Liao and Welsch and used in the research described in the current article was based on this conceptualization.

The structural dimension pertains to the pattern of connections between different actors. As Nahapiet and Ghoshal (1998, p. 244) argued, this dimension describes “who you reach and how you reach them.” As social ties can be used in order to obtain various resources, dense networks of connections may be used to facilitate achieving goals that would otherwise be unavailable or would be possible at a much higher cost. The relational dimension of social capital, in turn, describes personal relationships and is therefore strongly related to norms, obligations and emotions. Identity, trust, respect, obligations and expectations, as well as norms and sanctions, are all facets of this dimension. The cognitive dimension of social capital pertains to “resources providing shared representations, interpretation and meaning among parties” (Nahapiet & Ghoshal, 1998, p. 244). The authors indicate that this dimension was not previously thoroughly discussed in theoretical approaches to social capital and that it includes shared language and codes, but also narratives understood by parties.

This model of social capital was adapted by Liao and Welsch (2005) who discussed how social capital might affect decision making and actions of nascent entrepreneurs. The authors concluded that structural capital increases one’s ability to enterprise as it allows nascent entrepreneurs to gain access to support, information and critical resources. They also

connect this dimension with enhanced levels of innovativeness which can be achieved when information can be obtained from others and exchanged with them. Innovativeness is in turn related to better performance in the initial stages of a venture's existence (Rosenbusch, Brinckmann & Bausch, 2011). Ties that an entrepreneur has with others can also be used in order to enhance a venture's legitimacy that is necessary to obtain access to financing and customers. Relational capital is in turn related to trust, respect and trustfulness. In the case of a nascent entrepreneur, this kind of social capital determines the easiness with which various resources can be accessed (i.e., their availability). Liao and Welsch (2005) describe it as "a precursor" to obtaining knowledge and other resources. Therefore, this kind of social capital is related to the propensity to enterprise. The cognitive dimension of an entrepreneur's social capital might be understood in terms of knowledge, attitudes, narratives and opinions pertaining to entrepreneurship that are shared with others. Communities that respect or admire entrepreneurs (and thus share similar cognitions about them) are more likely to act in a way that supports those who start their own ventures. Items created to measure a perceived entrepreneur's social capital are presented in Table 1.

Table 1. Liao and Welsch's entrepreneur's social capital scale

Structural social capital (SC)	Relational social capital (RC)	Cognitive social capital (CC)
Item 1 SC. Many friends have started new firms.	Item 1 RC. Young people are encouraged to be independent and start their own businesses.	Item 1 CC. Those with a successful business get a lot of attention and admiration.
Item 2SC. Many of my family and kin have started new firms.	Item 2 RC. State and local governments provide good support for those starting new firms.	Item 2 CC. There are many examples of well-respected people who made success for themselves by starting a new business.
	Item 3 RC. Banks and other investors go out their way to help new firms get started.	Item3 CC. The local media does a good job of covering local business news.
	Item 4 RC. Other community groups provide good support for those starting new firms.	Item 4 CC. Most of the leaders in this community are people who own businesses.

Source: Liao & Welsch (2005).

RESEARCH METHODS

The goal of the study is to verify attitudes of Polish students towards entrepreneurial social capital (in particular to identify the perceived levels of different dimensions of social capital of entrepreneurs). The scale proposed by Liao and Welsch and described above was used in this attempt. The current research should be described as exploratory, as only a group of students from a single Polish university took part in the study. Students usually do not have a lot of meaningful entrepreneurial experience and their opinions about entrepreneurship are based on less reliable sources which should also be noted. However, they can still be regarded as an important group as they will need to make a career choice in the near future and starting their own ventures is one of the viable options (either right after becoming graduates or after gaining some work experience). In efficiency driven European economies (including Poland) there is a growing proportion of young people who decide to pursue an entrepreneurial career (Kelley et al., 2015). Therefore, learning about the perception of an entrepreneur's capital among young people can be particularly important for designing actions and policies aimed at developing entrepreneurial attitudes and facilitating venture creation.

Results presented in the article were obtained in a wider survey study on entrepreneurial cognitions conducted with a group of 374 undergraduate students at a business faculty of a Polish university as study participants. Among the 374 people who participated in the study, there were 240 women (64.17%) and 133 men. One study participant did not indicate his/her gender. Participants' average age was 21.57 with a standard deviation of 1.23.

Study participants were asked to indicate the extent to which they agree with statements included in Liao and Welsch (2005) entrepreneur's social capital scale. A Likert scale ranging from 1 ("completely disagree") to 7 ("completely agree") was used. The preparation of the scale involved its translation into Polish and a subsequent back translation. Any discrepancies between the original scale and the result of the back translation were discussed and resolved in discussion with a bilingual person. Three items (Item 1 RC, Item 1 CC and Item 2 CC) were clarified and words "in my society" were added to their content. The final version of the scale before the translation and its Polish version used in the current study can be found in the appendix.

ANALYSIS/STUDY/RESULTS

In the first part of the statistical analysis, the reliability of the Polish version of the scale proposed by Liao and Welsch (2005) was verified. As social capital

is a multidimensional construct Cronbach's alpha was calculated for each of three dimensions separately. The alphas obtained are presented in Table 2.

Table 2. Cronbach's alphas for each for three dimensions of entrepreneur's social capital

Dimension	Cronbach's Alpha
Structural social capital (SC)	0.70
Relational social capital (RC)	0.78
Cognitive social capital (CC)	0.71

The results obtained indicate that the Polish version of the scale, designed by Liao and Welsch (2005), used in this study can be considered reliable. For each of the dimensions of social capital an acceptable reliability level was obtained: Cronbach's alpha at the level of 0.7 and above is satisfactory, in particular when scales are comprised of a small number of items (Bedyńska & Brzezicka, 2007). Additionally, further statistical analysis of the scale revealed that none of the reliability coefficients could be improved by deleting an item or items included. It should be noted however that the reliability pertains only to the scale and not the entire conceptualization of this construct. After the positive verification of the scale's reliability, the next step of statistical analysis involved the examination of relative levels of each of the social capital dimensions.

As each of the three analyzed dimensions of social capital reached a satisfactory reliability level, a single score was calculated for each dimension separately. This single score was obtained by calculating a mean score from answers given by participants to items comprising each of the subscales. Mean scores and standard deviations obtained in the entire sample for each of the three dimensions are presented in Table 3.

Table 3. Mean scores obtained for each of the three dimensions of social capital in the sample

Dimension	Mean Score	Standard Deviation
Structural social capital (SC)	3.24	1.39
Relational social capital (RC)	3.59	1.09
Cognitive social capital (CC)	3.86	1.12

There are no norms that would allow us to draw firm conclusions about the obtained levels of social capital dimensions and their interpretation needs to be done cautiously. It seems however justifiable to state that the participants seem to assess this capital as rather low. As presented in Table 4

the level of each of the dimensions was on average assessed to be significantly lower than the midpoint of the scale used in the current study (i.e., 4).

Table 4. t-Student test values and significance levels indicating differences between mean scores obtained for each of the three dimensions of social capital and the midpoint of the scale used in the current study

Dimension	t –Student test value	Significance level
Structural social capital (SC)	-10.47	p<0.001
Relational social capital (RC)	-7.26	p<0.001
Cognitive social capital (CC)	-2.49	p<0.05

An entrepreneur's social capital is an important asset that can be used in the process of venture creation and the perception of study participants who indicated that its level is rather low can be regarded as alarming. As each of the dimensions of social capital is also believed to serve different purposes, it is important to verify whether the perceived levels presented in Table 3 differ significantly. A statistical analysis was conducted to serve this purpose and the t-Student test for dependent groups was used. It revealed that differences between mean levels of analyzed dimensions of perceived social capital were significant:

- The perceived level of structural social capital (M=3.24) was significantly lower than the perceived level of relational social capital (M=3.59), $t(370) = -4.37$, $p < 0.001$
- The perceived level of structural social capital (M=3.24) was significantly lower than the perceived level of cognitive social capital (M=3.86), $t(370) = -8.32$, $p < 0.001$
- The perceived level of relational social capital (M=3.59) was significantly lower than the perceived level of cognitive social capital (M=3.86), $t(369) = -8.59$, $p < 0.001$

DISCUSSION

The current study revealed that levels of entrepreneur's social capital are perceived as rather low by young people-Polish undergraduate university students. Due to the fact that young people in efficiency-driven European countries (this cluster includes Poland) are likely to consider creating their own ventures in comparison to people from other countries (Kelley et al., 2015), this group seems to be of particular importance in entrepreneurial research. Additionally, a business students' curriculum includes courses that enhance knowledge and skills related to starting and running own business.

The fact that the level of entrepreneurs' social capital is perceived as low by this group can be considered alarming, in particular when the benefits of utilizing social capital are considered.

Liao and Welsch (2005) described different aspects of social capital as serving different purposes. Structural capital is supposed to enhance a nascent entrepreneur's ability to enterprise. It serves this purpose by allowing them to gain access to crucial information and resources. The analysis of the content of items used to measure this dimension suggests that it can also be related to specific norms and is closest to bonding capital (in the understanding of Putnam, 2000). Scale items pertain to a respondent's family and friends and their entrepreneurial experiences. It has long been argued that having family members and friends who are entrepreneurs can enhance one's propensity to start a new venture (Dunn & Holtz-Eakin, 2000). On the one hand, they can be role models, and on the other provide insurance from business risk (Hundley, 2006). It is therefore alarming that the level of this dimension of social capital was assessed as the lowest by study participants. Relational capital of an entrepreneur is, in turn, proposed to be directly related to the ability to gain access to necessary resources. The analysis of the content of items pertaining to this dimension suggests that it can be considered as a construct closely related to linking social capital. The result obtained in the current study suggests that in Poland young people are doubtful when it comes to assessing whether institutions including banks and the government are supportive and encourage starting one's own venture. Liao and Welsh (2005) asserted that this aspect of social capital is related to the propensity to enterprise. The last - cognitive - dimension of an entrepreneur's social capital is related to what people in a community or the entire society think about entrepreneurship and entrepreneurs. The mean score obtained in the researched sample was the highest among all three dimensions. Nevertheless, it was also significantly lower than the scale's midpoint. The results obtained lead to the conclusion that policies should be implemented in order to create an entrepreneurial culture in Poland in which entrepreneurship is supported and valued.

CONCLUSION

As a final point, an attempt to interpret the reasons for relatively low levels of perceived social capital that were discovered in the current studies will be made, together with proposed directions for further research and the limitations of the current study. Growiec and Growiec (2011), who addressed the issue of low social capital levels in Eastern Europe, argued that the speed

of social changes has not matched the speed of the economic development that has been witnessed in recent years. This may be due to these countries' cultural and historical background which is related to distrust in government (that was perceived as hostile and alien during communism) as well as other people (who were perceived as rivals for scarce resources). Even though there are multiple public and private organizations and agencies whose actions are aimed at supporting entrepreneurship in general and nascent entrepreneurs in particular, the opinions of the young people who took part in the current study seem to call for further action. It appears that the intensification of both: actions aimed at enhancing the quality and quantity of support for entrepreneurs and the dissemination of information about them is needed. It is a task in which different entities, including educators, local and national governments, and private institutions including banks and the media, have a crucial role to play.

Limitations of the current study and avenues for future research should also be described. First of all, the current study is exploratory as only one group was included – business students. Even though they are an important research group in entrepreneurial studies, they do not usually have practical entrepreneurial experience. It is important to verify how entrepreneurs who started their ventures view different dimensions of social capital. Additionally, business students should not be perceived as a representative group of young people in a particular country. Further exploration of young people's attitudes is also necessary. What is more, even though satisfactory reliability coefficients were obtained for each of the social capital dimensions, it is not known if they are the most appropriate conceptualization of social capital in the context of Polish culture. Further studies involving the model of social capital used in the current study as well as other models and attempts at verifying their reliability, validity and correlates are needed.

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Appendix

English version of the entrepreneur's social capital scale used in the current study

	Completely disagree	Completely agree
Many friends have started new firms	1 2 3 4 5	6 7
Many of my family and kin have started new firms	1 2 3 4 5	6 7
Young people in my society are encouraged to be independent and start their own businesses	1 2 3 4 5	6 7
State and local governments provide good support for those starting new firms	1 2 3 4 5	6 7
Banks and other investors go out their way to help new firms get started	1 2 3 4 5	6 7
Other community groups provide good support for those starting new firms	1 2 3 4 5	6 7
Those with successful businesses in my society get a lot of attention and admiration	1 2 3 4 5	6 7
There are many examples in my society of well-respected people who made success for themselves by starting a new business	1 2 3 4 5	6 7
The local media does a good job of covering local business news	1 2 3 4 5	6 7
Most of the leaders in this community are people who own businesses	1 2 3 4 5	6 7

Source: Liao & Welsch (2005).

Polish version of the entrepreneur's social capital scale used in the current study

	Całkowicie się nie zgadzam			Całkowicie się zgadzam			
Mam wielu znajomych, którzy założyli własne firmy	1	2	3	4	5	6	7
Wiele osób z mojej rodziny i krewnych rozpoczęło własną działalność	1	2	3	4	5	6	7
Młodzi ludzie w moim środowisku są zachęcani do tego, aby być niezależnymi i zakładać własne firmy	1	2	3	4	5	6	7
Państwo oraz samorządy zapewniają dobre wsparcie osobom rozpoczynającym własną działalność	1	2	3	4	5	6	7
Banki i inwestorzy robią, co tylko możliwe, żeby pomóc wystartować nowym firmom.	1	2	3	4	5	6	7
Inne grupy w społeczeństwie zapewniają dobre wsparcie osobom rozpoczynającym własną działalność	1	2	3	4	5	6	7
W moim środowisku osoby, które osiągają sukces w biznesie, zyskują wiele uwagi i są podziwiane	1	2	3	4	5	6	7
W mojej społeczności jest wiele przykładów szanowanych osób, które osiągnęły sukces zakładając nową firmę	1	2	3	4	5	6	7
Lokalne media rzetelnie prezentują lokalne informacje biznesowe	1	2	3	4	5	6	7
Większość wpływowych ludzi w moim środowisku to osoby posiadające własne firmy	1	2	3	4	5	6	7

Source: own translation of the scale designed by Liao & Welsch (2005).

Abstrakt

Celem opisanego w artykule badania była weryfikacja postrzeganego przez studentów poziomu strukturalnego, relacyjnego i poznawczego kapitału społecznego przedsiębiorcy. W badaniu wzięło udział 374 studentów kierunku związanego z biznesem studiujących na polskiej uczelni. Osiągnięty wynik wskazuje na to, że uczestnicy badania oceniają poziom kapitału społecznego przedsiębiorcy jako relatywnie niski. W związku z tym, że poszczególne składowe kapitału społecznego pełnią różne funkcje w procesie tworzenia przedsięwzięcia biznesowego uzyskany rezultat powinien zostać uznany za alarmujący. Wskazuje on na to, że niezbędne może być zintensyfikowanie działań niezbędnych do rozwoju kultury przedsiębiorczej w Polsce. W artykule omówione praktyczne wnioski wypływające z uzyskanych rezultatów oraz wskazano kierunki dalszych możliwych badań.

Słowa kluczowe: kapitał społeczny, kapitał społeczny przedsiębiorcy, przedsiębiorczość, przedsiębiorcy.

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How Can the Organizational Commitment of Pakistan Railways' Employees Be Improved? The Moderating Role of Psychological Capital

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Abstract

The purpose of this research is twofold: firstly it was planned to examine the relationship and impact of peer-relationship on organizational commitment by means of and without the moderating role of psychological capital. Secondly, the researchers aimed to examine the association of organizational culture and organizational commitment, similarly, by way of and without the moderating effect of psychological capital. This study is cross-sectional by nature in which data were collected from the operational staff of Pakistan railways. While investigating the moderating impact of psychological capital on the association of peer relationship and organizational commitment, it was found that psychological capital strengthens the relationship of peer relationship and organizational commitment; and also strengthens the relationship of organizational culture and organizational commitment as well.

Keywords: *peer relationship, organizational culture, organizational commitment, psychological capital.*

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INTRODUCTION

The importance of operational staff in any organization is unchallengeable, for instance, operational staff are marketers and salesmen for marketing based organizations; lecturers and professors for colleges and universities; similarly drivers, guards and ticket checkers in railway institutions. As operational staff is directly linked to the main operations of an organization, they should be rich in conceptual, technical and human skills. In this context, the retention of talented and knowledgeable workers has become very difficult and challenging as well (Joo, 2010) 43% of the variance in organizational commitment was explained by organizational learning culture and LMX quality. About 40% of the variance in turnover intention was explained by organizational commitment. Thus, perceived organizational learning culture and LMX quality (antecedents, and for the sake of resolution, many organizations attempt to develop employees of choice in this regard. It is no doubt the first priority of every organization to engage the skilled and talented workers in order to establish a positive culture (Sutherland & Dennick, 2002). Furthermore, while taking peer relationships into consideration, a social life sustains an employee in a comfort zone, for instance, Janik, Blaskova & McLellan (2017) expressed friendship, family and sexual intimacy as important in building peer relationships (employee-to-employee relationships) within organizations.

Over the past few decades, intensive research work has been done on organizational culture, peer relationship and organizational commitment. For instance, psychological capital is a predictor of organizational commitment (Shahnawaz & Jafri, 2009) while its moderating role is rarely available. That is one of the reasons why psychological capital as a moderator has been used in this study (see Figure 1).

Peterson and Luthans, (2003) reported a clear link between psychological capital and workplace outcomes. Thus, this study attempts to find the moderating impact of psychological capital. From a practitioner's perspective, when managers and executive officers of Pakistan railways improve the level of psychological capital of operational staff, which can be enhanced by training and development, what will happen to the level of commitment of Pakistan Railways' employees? When there is a tight versus loose control culture, and when there exists social peer relationships among the operational staff of Pakistan Railways, then what will happen to the organizational commitment with, and without, the presence of psychological capital? As customer relationship management always attempts to create and retain customers, which helps them build long-term relationships (Nawaz, Nazir, Jamil, Aftab & Razzaq, 2016), the operational staff of Pakistan Railways has a direct impact on passengers. Thereby, operational staff might have a positive influence on

customer relationship management. The importance of this study in the context of Pakistan railways, is that organizations play a vital part in the development of the national economy of a country (Javed, Ahmed, Nawaz & Sajid, 2016), and similarly, Pakistan railways, with its monopolistic characteristics, can perform a crucial role in the development of Pakistan's economy.

While talking about future direction, Lund (2003) examined the relationship between organizational culture and positive workplace outcomes, e.g., job satisfaction and employee commitment, by focusing on knowledge workers with a high educational level. According to Lund (2003), results vary by the cohorts in different educational levels, and a research call shows that more research is required with participants from different educational levels, and hence it will take in this study with a proposed model (Figure 1). According to Gülerüz et al. (2008), cultural impact has been neglected in the same study as a limitation. Hence, these reasons enhance the motivation to investigate this in this study with following questions.

- 1) Does psychological capital strengthen the relationship between organizational culture and organizational commitment?
- 2) Does psychological capital strengthen the relationship between peer relationship and organizational commitment?

LITERATURE REVIEW

Peer relationships in the workplace and organizational commitment

Avery, McKay and Wilson (2007) also known as engagement. Few empirical studies, however, have examined how individual or situational factors relate to engagement. Consequently, this study examines the interplay between employee age, perceived coworker age composition, and satisfaction with older (older than 55 investigated peer relations and their importance in such a way that, due to social relations in the workplace, employees feel comfortable and employees' feelings of insecurity reduce. Employees' level of understanding increases and, as a result, they share more information with their peers and their level of commitment increases, which eventually reduces their work-related problems. Social life, even in the workplace or in society, has a great deal of concern and importance. Implicit theories by Molden and Dweck (2006) explored how people perceive and then value social interaction, which can then help us to understand the association between peer relationship and organizational commitment. According to these theories, personal characteristics such as attitude, norms, personal attributes and beliefs are unchangeable.

Galliher and Kerpelman (2012) worked on the character improvement and associated procedure of sexual orientation and other social interaction related factors. It resulted that employees' motivational experiences support the association between peer relations and their organizational commitment, which leads them towards their goal achievement. A variety of research has been conducted on multiple combinations of peers' relationships which enhance employees' motivation, satisfaction and commitment towards their work (Ullrich-French & Smith, 2006, 2009).

In the workplace, there is a need to explore peer relationships and their effects on organizational commitment (Ullrich-French & Smith, 2006). Peer relationship has two dimensions: Peer victimizing and peer rejection (Boivin, Fuller, Dennell, Allaby & Petraglia, 2013): a negative peer status is called peer rejection and a negative peer experience is considered as peer victimizing (Boivin et al., 2013). Thus, as per the above arguments, we can propose that peer relationship has a positive relationship with organizational commitment.

Hence, as per the above arguments, we may propose that:

H1: The relationship between peer relationship and organizational commitment is positive and significant.

Organizational culture and organizational commitment

Van den Steen (2003) argued that constant values, beliefs and behavioral patterns define corporate culture. Corporate culture has been preferably discussed in the previous literature, as in the organizations' working environment the tasks are being done through organizational culture. Furthermore, it is evident that culture is a dynamic force which develops the environmental settings through its strong relationship with humans (Binder & Baker, 2017). The concerned dimensions of organizational culture in this study are tight versus loose control culture, which is explained by Hofstede (1998) but parts of organizations may have distinct subcultures. The question of what is the proper level for a cultural analysis of an organization is generally handled intuitively. The organizational culture of a large Danish insurance company (3,400 employees who associates them directly with the phenomenon of control activities and cost.

Tight control culture is purely and extremely cost conscious in nature. Accurate dissemination of the set of information about a budgeting and reporting system is also possible in a tight control culture (Merchant, Van Der Stede & Zheng, 2003). On the other hand, innovative cultures are result oriented cultures. Employees get encouragement from their supervisors which guide them in creating new ideas, and ultimately the organization moves towards progress (Hickey, 2017). As per the acknowledgment by Bergman

(2006)1997 fruitful results cannot be obtained without understanding the nature of organizational culture. Past studies also revealed a positive relationship between organizational culture, commitment and job satisfaction (Yousef, 2017).

Employees' reaction in an organization shows their level of commitment, which most importantly depends upon the culture they have in an organization, and this relationship has been investigated before (Martins & Terblanche, 2003). Studies since the 1980's have been proved to be highly important in minimizing the differences between weak and strong performers, on the basis of an organizational culture which leads employees towards organizational commitment (Kerr & Slocum, 2014). Employees' devotion towards their work is based on the efficiency of organizing their tasks by the organizing committee (Wasti Arzu, 2005) which is well defined by Wright, Gardner and Moynihan (2003) and according to the above study, culture is the variable which defines the level of commitment of the different employees with the different skills at workplace. According to Abdul Rashid, Sambasivan and Johari (2003), a study of corporate culture is very important in finding a strong organizational commitment which may lead to better financial performance. Organizational culture defines the different attributes of the employees, e.g., their emotional intelligence, effective commitment, turnover intention and employee engagement which is discussed by Brunetto, Teo, Shacklock and Farr-Wharton (2012). It has also been found that organizational commitment is positively related to adhocracy and clan culture and negatively related to hierarchical culture (Lund, 2003). Hence, as per the above discussion, we may propose that:

H2: *There is a positive significant relationship between organizational culture and organizational commitment.*

Psychological capital as a moderator

Psychological capital as a core construct is characterized by:

- in order to succeed, persevering toward goals and redirecting paths to goals when necessary (hope);
- to succeed at challenging tasks, having confidence (self-efficacy) to take on and put in the necessary effort;
- "When beset by problems, sustaining and bouncing back and even beyond (resiliency) to attain success" (Luthans, Youssef & Luthans, 2007); and
- making a positive attribution (optimism) about succeeding now and in the future.

Psychological capital is considered as a positive construct and its dimensions are hope, self-efficacy, optimism and resilience. Individuals are considered as having a high level of psychological capital if they have these four cognitive characteristics mentioned above (Luthans, 2002). In various progressions, the term capital is used in many concepts, for example, human capital, in human resource management, cultural capital in organizational behavior and social capital in economics. Thereby, psychological capital has been conceptually identified by Luthans and Youssef (2004), as well as Luthans, Avolio, Avey and Norman (2007). In research, the term psychological capital belongs to employees' motivational properties which are directly related to producing a loose versus tight control culture with the level of employees' organizational commitment. Employees' individual psychological capital produces a type of motivational culture (Lopez & Snyder, 2009) which increases their level of job commitment. Further, Avey, Luthans and Youssef (2010) found that individuals' psychological capital has a great deal of importance as each of its dimensions is required in an organization to moderate the relationship between organizational culture and organizational commitment.

Psychological Capital has four dimensions; optimism, self-efficacy, hope and resilience, which concern a great part of our study. Stajkovic (2006) carefully hoped that psychological capital would have an impact on employees' organizational commitment due to these four facets. Extending this statement, the motivational and intellectual level of employees boosts their level of quality of organizational culture with a high psychological capital which eventually leads them towards a higher level of commitment towards their organization (Luthans et al., 2007). Very little research is available on the above relationship between psychological capital and organizational commitment under organizational culture (see Shelton, Gartland, & Stack, 2011). According to the conservation resource model (Hobfoll, 2001) psychological capital, which is the personal resource of an employee, can moderate the association between peer relationship and their organizational commitment. Cheung, Tang and Tang (2011) further investigated the role of psychological capital as a moderating variable to explain the relationship between organizational commitment and peer relationship.

Hence as per the above studies, we may propose that:

H3a: *Psychological capital has a moderating effect on the association of peer relationship and organizational commitment.*

H3b: *Psychological capital has a moderating effect on the association of organizational culture and organizational commitment.*

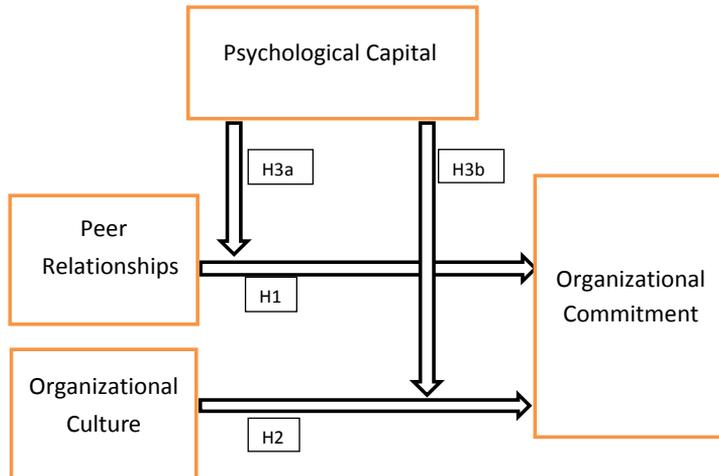


Figure 1. Conceptual model

RESEARCH METHODS

All participants of this empirical research were the operational staff of Pakistan railways that include drivers, guards and ticket checkers having a basic pay scale (BPS-16) from Punjab (Pakistan). 250 questionnaires were circulated and the response rate was 84%. All the participants were men, as females are excluded from being part of the operational staff by Pakistan Railways. Self-administrated questionnaires were distributed. For each item a 5-point Likert scale was used signifying '1' for "strongly disagree" and '5' for "strongly agree" respectively. The scale consisted of 15-items borrowed from Kanning and Hill (2013) to measure organizational commitment.

Organizational culture was measured with an 8-item scale developed by Baird, Harrison and Reeve (2004) which explained one dimension of organizational culture that is tight versus loose control. Further, peer relationship was measured with a 17-item scale developed by Slee and Rigby (1994). Further, to measure psychological capital (work self-efficacy, optimism, hope and resilience) the original 24-item scale developed by Luthans et al. (2007) was used.

HYPOTHESES TESTING AND RESULTS

To check the scale validity of the study variables, confirmatory factor analysis (CFA) was conducted. The results of 4-variables (organizational culture, peer relationships, PsyCap and organizational commitment) demonstrated a comparative fit index.93, a good fit to the data, $\chi^2 (3576) = 7409$, standardized root-mean square residual .060, a significantly better fit ($p < .05$) with root-mean square error approximation .052 than alternative models and single- factor model in which the focal study construct was variously combined. Further, discriminant validity was assessed to ensure that the average variance shared between each construct and its indicators was greater than the shared variance between that construct and each other construct. Consequently, results from these analyses indicated the adequate scale validity (Fornell & Larcker, 1981). In this study, it has been found that Cronbach's Alpha ranged from .655 to .930 for all variables which typifies that all instruments in the research are reliable (Table 1).

Table 1. Reliability analysis

Variables	Items	Cronbach's Alpha	Source
Organizational Culture	8	0.817	Baird, Harrison & Reeve (2004)
Peer Relationship	15	0.655	Slee & Rigby (1994)
Organizational Commitment	15	0.819	Kanning & Hill (2013)
Psychological Capital	24	0.930	Luthans et al. (2007)

There were 210 respondents of this study to analyze the hypothesized relationships. There were (167) male respondents, of whom the majority were graduate (130) then undergraduate (35) and very few were post-graduate (02). On the other hand, female respondents were (37) graduate, (6) undergraduate and lastly, there was no female respondent having post-graduate qualification (see Table 2). The respondents' characteristics revealed that, from the sample, those who were educated could understand the terminologies and language of the instrument.

Mean and standard deviation were calculated in order to better understand the sample characteristics (see Table 3). Psychological capital has a mean (3.1921), which was the highest mean of this study with standard deviation (0.37698). It means most of the respondents have high psychological capacities (hope, confidence, optimism and resilience).

Table 2. Respondent characteristics

Variables	Undergraduates	Graduates	Post-Graduates	Total
Male	35	130	2	167
Female	6	37	0	43
Total	41	167	2	210

Conversely, the low mean score of organizational commitment and peer relationship (2.6917 and 2.2819 respectively) revealed that there is lack of trust level, friendly environment, sharing, helping environment, etc. Further, a low mean of organization commitment revealed that Pakistan Railways' employees lack loyalty and care about the company, etc.

To further test the hypothesis of this study, correlation and regression were deployed. From the correlation table given below all four variables are positively correlated with a significance level of ($p < 0.01$). Peer relationship has much correlation with a significance level as given ($r = 0.531$, $p < 0.01$), while Organizational culture has a comparatively low but moderated correlation with organizational commitment ($r = 0.493$, $p < 0.01$).

Table 3. Descriptive statistics

Variables	Minimum	Maximum	Mean	Standard Deviation
Organizational Culture	1.38	4.63	3.0054	0.72798
Organizational Commitment	1.40	4.07	2.6917	0.51029
Psychological Capital	1.75	4.58	3.1921	0.84176
Peer Relationship	1.73	3.60	2.2819	0.37698

The correlation between psychological capital and organizational commitment is also significant ($r = 0.377$, $p < 0.01$). The correlations and significances of the concerned variable were discussed.

Table 4. Correlation analysis

Variables	1	2	3	4
1 Organizational Culture	1			
2 Organizational Commitment	0.493**	1		
3 Psychological Capital	0.565**	0.377**	1	
4 Peer Relationship	0.253**	0.531**	0.434**	1

** $p < 0.01$

From the correlation table (see Table 4) we can see that there is a significant impact of peer relationships and organizational culture on

organizational commitment. To further check the unit change in the dependent variable from the predictors, we applied regression analysis in this regard. Linear regression (Table 5), i.e., model 1, where organizational culture is the predictor and organizational commitment is the outcome, revealed that one unit change in organizational culture brings a 0.493 unit change in organizational commitment and the model is significant ($\beta=0.493$, $F=66.65$, $p<0.01$, $R^2=0.243$). Further, linear regression in model 2, where peer relationship is the predictor and organizational commitment is the outcome, revealed that one unit change in peer relationship brings about a 0.531 change in organizational commitment; a bit higher than change due to organizational culture, and this model is significant as well ($\beta=0.531$, $F=81.88$, $p<0.01$, $R^2=0.282$).

The model is significant in the presence of psychological capital with a change in the coefficient of determination ($\Delta R^2=0.014$) showing a 1.4% overall change in organizational commitment, when psychological capital is added, in the association of organizational culture and organizational commitment.

Table 5. Linear regressions

Variable	R2	β	F	F-sig
Organizational Culture	0.243	0.493**	66.65	0.000
Peer Relationship	0.282	0.531**	81.884	0.000
Psychological Capital	0.142	0.77**	34.537	0.000

Note: dependent variable - Organizational Commitment.

** $p<0.01$

Thereby, our hypothesis H3a is supported and brings a YES answer to our research question: Does psychological capital strengthen the relationship between organizational culture and organizational commitment?

Similarly, to check whether psychological capital moderates the association of peer relationship and organizational commitment, linear regression was used, which depicts that psychological capital acts as a significant moderator between peer relationship and organizational commitment ($\beta= -0.311$, $p<0.05$). The overall change of 5.1% in organizational commitment occurs in the presence of the moderator psychological capital. Thus, hypothesis H3b is accepted as well.

Furthermore, from Table 7, the interaction term, i.e. Peer Relationships \times Psychological Capital is significant, which revealed that psychological capital has a moderating impact on the association of peer relationships and organizational commitment.

Table 6. Moderation analysis of organizational culture

Variables	Outcome			
	Organizational Commitment			
	β	R2	F-sig	$\Delta R2$
Independent				
Organizational Culture	0.327*			
Moderator				
Psychological Capital	0.118	0.257	0.000	0.014
Interaction				
Organizational Culture \times Psychological Capital	0.011*			

Moreover, the intensity of moderation, with the condition when there is a high level of psychological capital and when there is a low level of psychological capital, can be viewed from the moderation line graph given below (Figure 2).

Table 7. Moderation analysis with peer relationships

Variables	Outcome			
	Organizational Commitment			
	β	R2	F-sig	$\Delta R2$
Independent				
Peer Relationship	1.589			
Moderator				
Psychological Capital	0.801	0.333	0.000	0.051
Interaction				
Peer Relationships \times Psychological Capital	-0.311*			

Accordingly, hypothesis *H3b* of the study was supported. Moreover, the intensity of this moderation, with the condition when there is a high level of psychological capital and when there is a low level of psychological capital, can be viewed from the moderation line graph given below (Figure 3).

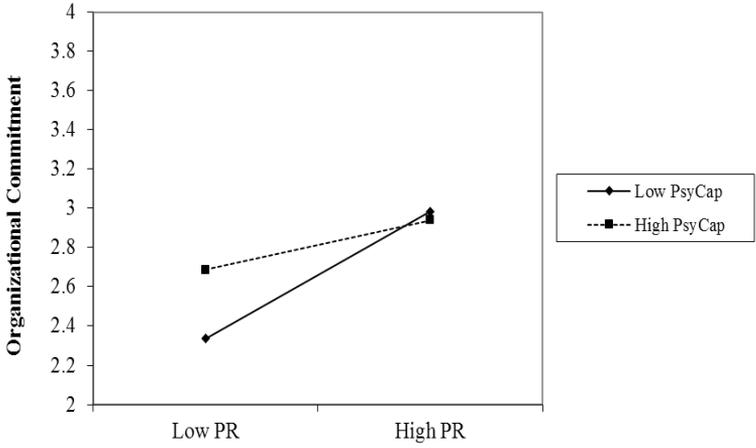


Figure 2. The moderation line graph (1)

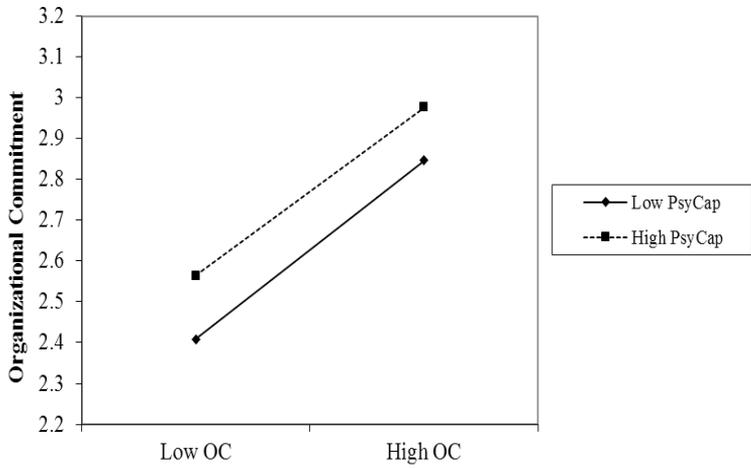


Figure 3. The moderation line graph (2)

DISCUSSION AND CONCLUSION

The organizational commitment of employees has been chosen as the dependent variable in our study. This study concludes that the possible factors are peer relationships and organizational culture which influence the three most common aspects of organizational commitment; continuous, normative and affective. We test the moderation (cross-level interactions) of psychological capital with peer relationships and the organizational culture of the selected candidates on commitment. Moderation findings demonstrate that low psychological capital creates a weak impact of peer relationships on organizational commitment while the high psychological capital creates a strong impact of peer relationships on organizational commitment. Conversely, the condition of high psychological capital acts as an enhancer between the association of peer relationships and organizational commitment. For example, when employees are equipped with psychological capital, then peer relationships enhance employees' level of commitment more and vice versa. Further, a stage comes where even with a high level of psychological capital the employee commitment toward an organization becomes reduced, as compared to when there is a low level of psychological capital in employees, this condition engenders when there exists a high level of peer relationships among employees (See Figure 2, the point of intersection).

Conversely to that, there is no point of intersection between two lines (see Figure 3) which revealed that when there is a tight control culture and when there is a loose control culture at low and high psychological capital, the organizational commitment increases with almost equal intensity and slope. Thus, executive officers and other decision-makers, should be generous in their understanding and acknowledgement of the fact that if their employees are equipped with psychological capital, it means they are equipped with the cognitive states of hope, resilience, self-efficacy and optimism, then the impact of peer relationships of Pakistan railways' operating staff on their commitment to Pakistan railways can be improved to an extent. Furthermore, the executive officers of Pakistan railways should create a tight control culture which produces a higher level of psychological capital in employees, and in return this will increase the commitment of the operating staff of Pakistan railways as well (here low OC revealed a loose control culture and high OC revealed a tight control culture, see Figure 2).

Consequently, organizational commitment leads to more revenue and profit (Pinho, Rodrigues, Dibb & Rodrigues, 2014) as Pakistan Railways has made a loss for almost the last three decades (Khalid, Nasir & Rameezmohsin, 2016) and this could be minimized or converted into a profit using this concept. Managers should try to improve psychological capital to enhance

the impact of peer relationships on their commitment. Since subordinates are on the frontline and have first-hand experience with the customers (Özduran & Tanova, 2017), thereby their opinions should especially be taken into consideration.

It is very likely that subordinates provide critical information to their managers. This information can help them in improving their employees' peer relationships level with the help of psychological capital. Some aspects such as training intervention (Avey, Reichard, Luthans & Mhatre, 2011), creating a supportive climate (Norman, Avey, Nimnicht & Graber Pigeon, 2010), and authentic leadership, is necessary for smaller as well as larger organizations to improve their employees' psychological capital. We recommend that managers should consistently develop clear policies and procedures regarding rewards to employees to create and improve psychological capital. Further, the employees should also be allowed (transformational leadership) to express their feelings and opinions regarding decisions, due to which their quality of work-life can improve, which in turn leads to an improved tight control culture, along with the development of rules and procedures.

RECOMMENDATIONS AND LIMITATIONS

This research study has been divided into three phases. In the first phase, the relationship between organizational culture, peer relationship and organizational commitment was investigated, which depicted that an employee's commitment highly depends upon culture and employees' social interactions with their co-workers (peer relationships). In the second phase, it was investigated whether psychological capital has a moderating influence on the association of peer relationship and organizational commitment. Moreover, in the third phase, the impact of psychological capital was investigated as a moderating variable between organizational culture and employees' commitment. This study is limited, in that the checking of dimension wise relations was not the concern of this study, and thus future studies could investigate dimensions. Furthermore, a moderating role of psychological capital has been verified from the significance of the interaction term, but it would be better if the moderating role could be empirically verified through structural equation modeling (SEM). Thus, future studies could apply SEM while working with the same model in other domains, context, or units of analysis (sample). Therefore, what happens next in Pakistan railways, when employees (operating staff) get committed to their organization, could be an area of interest for future researchers. Future studies should also try

to collect data by means other than a self-reported survey because self-reported surveys cause common method biases.

This study is cross-sectional in nature; it considered specifically targeted employees (operating staff) of Pakistan railways while results may be different for other employees of Pakistan railways. Thus, future studies could check the conceptual model of this study on employees other than operating staff. Furthermore, future studies may adopt a longitudinal method for dealing with such issues. This study is not exhaustive and that is why it could be considered as incomplete. The possibility of other mediator and moderator variables, such as psychological empowerment, challenging stressors and job characteristics, may overwhelm this limitation.

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Abstrakt

Niniejsze badania realizują dwa główne cele. Pierwszym z nich było zbadanie związku i wpływu wzajemnych relacji pracowników na ich zaangażowanie organizacyjne przy dwóch założeniach: uwzględnieniu i braku uwzględnienia moderującej roli kapitału psychologicznego. Za drugi z celów przyjęto zbadanie związku kultury organizacyjnej i zaangażowania organizacyjnego, przy tych samych dwu założeniach. Niniejsze badanie ma charakter przekrojowy, w którym zbierano dane od kadry zarządzającej

kolei w Pakistanie. Podczas badania moderującego wpływu kapitału psychologicznego na związek wzajemnych powiązań i zaangażowanie organizacyjne, okazało się, że kapitał psychologiczny wzmacnia relacje partnerskie i zaangażowanie organizacyjne, a także wzmacnia związek kultury organizacyjnej i zaangażowania organizacyjnego.

Słowa kluczowe: relacje partnerskie, kultura organizacyjna, zaangażowanie organizacyjne, kapitał psychologiczny.

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Personality Traits and Sales Effectiveness: The Life Insurance Market in Poland

*Andrzej Janowski*¹

Abstract

Within organizations in industrialized countries, the quality of human resources tends to become a major issue on the path to achieving a competitive advantage. According to the author's research, the implementation of the five-factor model of Costa and McCrae provides the solution for the abovementioned problem. This article demonstrates the crucial utility of the five-factor model of Costa and McCrae in the context of life insurance industry effectiveness from both the theoretical and practical perspectives based on a case study of the four largest life insurance companies 796 most effective agents. Results imply the existence of a positive correlation between the level of the selected personality traits intensities and the life insurance agent's sales efficiency. Moreover, as levels of the personality traits of "openness to experience," "consciousness," "agreeableness" and "neuroticism" are the predictors of life insurance company effectiveness, there are fundamentals for induction to be appropriate for the whole retail financial sector human resources management system.

Keywords: *competitive advantage, efficiency, human performance, management, organization, personality traits.*

INTRODUCTION

In the sciences of management, the maxim, stating that behavior constitutes the consequence of the characteristics of a person and a situation, is considered as a truism. However, when going beyond the framework of generalization, it continuously constitutes an area of many controversies (Lucas & Donnellan, 2009). There are inveterate causes of this discourse (Judge & Zapata, 2014) and the controversy is based on two of the most frequently quoted criticisms concerning the relation of an individual and

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external determinants: measures of personality traits possess a relatively modest predictive value in the context of the comprehensive behaviours of an individual (Bratton & Gold, 2017). Furthermore, their explanatory value is not supported by an adequate taxonomic process (Funder, 2006). In the case of the latter problem, the claim seems to be justifiable that through research, more significant progress was made in the classification and determination of personality traits rather than of situational factors, and situational variables tested in the research published are almost complete in an ad hoc perspective.

In the same manner, Buss (2009) claims that a nearly total lack of development in the area of the conceptualization of a situation in a non-arbitrary manner constitutes one of the most essential obstacles. Even in the case of uniqueness, no assumption is justifiable that a conceptual foundation that includes a situational context cannot be developed as a predictor of social (Harasym, Rodzinka & Skica, 2017) or organizational behaviors (Joshi & Roh, 2009; Trevino, 1986). Moreover, concerning the previous criticism, some researchers undermine the value of the scientific achievements of the abovementioned perspective. Wirdamulia and Afiff (2013) argue that individual differences represent in fact a modest contribution to the explanation of human behaviors.

At present, approaches to the usefulness of personality traits, in the context of the determination of effectiveness in relation to the previous critical remarks, emphasize that in the 1950s-1960s researchers focused on the validation of the personality inventory (Murphy & Dzieweczynski, 2005) as an index of future professional success, which is also legitimized in the 21st century. Moreover, further deeper analysis allows us to find an internal contradiction among the protagonists of a negative evaluation of personality traits in relation to organizational effectiveness (Hogan, 2007; Ones, Dilchert, Viswesvaran & Judge, 2007; Roberts, 2009), although just in the earlier studies by the present proponents of the theories of traits (Barrick, Mount & Judge, 2001). Criticisms can also be found regarding its validation.

According to the above-mentioned discourse, I have identified major gaps that limit theory development (empirical, methodical and theoretical ones). This paper allows us to enrich the human resource management theory through a contribution that fills these gaps:

- empirical gap: interviews were conducted with insurance agents and sales managers of the most effective global and Polish life insurance corporations. This was the first time, on such a wide scale, that this had happened in the Polish and European market. The respondents were those who possessed the greatest achievements and experience, confirmed through the best sales results and those who possessed the highest authority resulting from the professional

functions performed. The research allowed the opportunity of in-depth insight into, and analysis of, the key drivers that determine the achievement of high effectiveness and competitive advantage. As regards this aspect, the results of this pioneering research constitute an essential contribution to European management science:

- theoretical gap: a summary of the American and European research achievements concerning the determinants that accompany the human resources management process in the areas of recruitment and selection, which creates new research challenges, and also constitutes a contribution to the enrichment of management sciences;
- methodological gap: the development of a formula to identify those factors that are advantageous to the improvement of the effectiveness of solutions for human resources management departments. Particularly in the area of recruitment, selection and retention of individuals with an optimal set of characterizations, ones that enable organizations to obtain the assumed level of effectiveness which is defined by the proposed dynamic measures of effectiveness based on praxeological assumptions.

LITERATURE REVIEW

Coefficients of effectiveness in life insurance companies: a praxeological approach

As a result of an analysis of the indicators concerning the effectiveness of the operational activities of life insurance companies that have been functioning to date, it was possible to identify solely a quantitative and static perspective of effectiveness taking into consideration solely aggregated financial information whose values are established by law (Insurance Act, 2015). There was an exclusion of those factors that emphasize the significance of a qualitative perspective of effectiveness, which constitutes the results of the activities undertaken by insurance agents, and the significance of the value of relations created by them with customers for the effectiveness of insurance companies. Therefore, another conception for the effectiveness measures of life insurance companies was proposed. The conception accepted combines the praxeological (Gasparski, 2013) perspective of the effectiveness assessment of the activity of life insurance companies through the effectiveness of the professional activeness of insurance agents. Therefore, the author suggests that the effectiveness of life insurance companies needs to be characterized by other quantities connected indirectly or directly with the premium volume obtained from the sale of life insurances by agents, particularly by the number of appointments (relation agent – client) necessary to close the insurant contract (purchase policy). It should be emphasized that this solution highlights the significance of the individual activeness of single

persons: entrepreneurs. In the context of the effectiveness of the whole organization, this is related to life insurance companies, which constitutes in a direct manner a reference to the praxeological assumptions, and also points to the defectiveness of statutory indexes based on a strictly statistical effectiveness perspective (Janowski, 2015).

Personality profile of an effective life insurance agent: FFM implementation

An increase of the effectiveness level of first contact personnel in service organizations, whose operational activity is based on sales personnel, constitutes the subject of scientific research and special emphasis by managing personnel in the abovementioned companies (Verbeke, 2011). As a result, the scientific environment and its practitioners worked out a consensus that such factors as; knowledge connected with sales, adaptation sales, cognitive abilities, perception of the seller's role and motivation; decide about the effectiveness of the sales process. Although critical opinions do also appear, namely that these conclusions were inferred from statistical interactions between the seller and the customer (Evans, 2012).

Those life insurance companies where effectiveness is realized in the praxeological context constitute those companies where, in accordance with the laws of the Austrian school of economics, the personality traits of first contact personnel, insurance agents, are one of the main factors that determine the effectiveness of the sale of insurances. Hence, in order to conducted research, a model of the effectiveness assessment of the system of human resources management based on the fundamentals of the five-factor theory was implemented, and consists of five personality dimensions:

Openness to experience: this is understood as a manifested tolerance towards difficulties appearing during stress causing professional situations, curiosity of innovative solutions, and low sensitivity towards the working environment which is characterized by a high amplitude of emotional strains (McCrae & Costa, 2009). Individuals with a high level of openness frequently use external assessment tools that enable them to learn fast (Busato, Prins, Elshout & Hamaker, 1999). Empirical research confirmed that openness is positively correlated with adaptability (LePine, Colquitt & Erez, 2000). When employees go beyond organizational barriers, they do not use any unique processes or systems from the previous states of balance (Groysberg & Lee, 2004), ones which they could find helpful in the present – a new organizational state. “Open” people are not set in traditions and norms established by social conformism (Judge & Iles, 2002), and they tend to make changes and adapt easily to the social group in which they function (Wanberg & Banas, 2000). Accordingly, I predict,

Hypothesis 1: Life insurance company effectiveness will be positively associated with openness to experience.

Conscientiousness, in accordance with the opinion formulated by Costa and McCrae (2003), constitutes a trajectory of motivation to achieve goals, which to a significant degree extends the scope of individual adaptability (Pulakos, Arad, Donovan & Plamondon, 2000). It was also found, in the empirical research, that conscientiousness is negatively correlated with absence from work, and it is reflected in self-discipline and a sense of responsibility (Wayne & Musisca, 2004; Colquit & Simmering, 1998; Ilies, Scott & Judge, 2006). Therefore, this is a feature that determines the effectiveness of the use of time, organizational skills, an active approach to problem-solving and, consequently, a smaller susceptibility to stress at work (Wayne & Musisca, 2004); it expresses the degree to which an individual maintains care and responsibility (Barrick & Mount, 1991), which simultaneously enables an inspection of effects connected with the work of stressors in spite of previous negative experiences (Colbert et al., 2004). When a conscientious employee experiences negative stimuli, they refrain from non-productive behaviors to a greater extent than less conscientious people (Ilies, Scott & Judge, 2006). Thus, I hypothesize,

Hypothesis 2: Life insurance company effectiveness will be positively associated with conscientiousness.

Agreeableness: individuals with a high level of this trait are compliant and oriented towards positive social interactions (Sherman, Nave & Funder, 2015). They manifest channeled emotional reactions (Finch, Okun, Pool & Ruehman, 1999). Ward et al. suggest that a tendency to compromise is a feature that determines the occurrence of depressions and the generation of a high level of stress in the context of challenges in the working environment. Furthermore, empirical research results demonstrate that a conciliatory manner is positively correlated with adaptability (Ward, Leong & Low, 2004). Mount (see Marks, Zaccaro & Mathieu, 2000) maintains that a tendency to compromise may lead to higher effectiveness at work as it supports interpersonal communication in the working environment, which is of key importance in an environment with a high amplitude of organizational changes, particularly in new situations. Many complex tasks in institutions require a high level of communication between employees, direct confrontation, solution of conflicts that are to settle a compromise: a consequence of a tendency to compromise (Gist, Stevens & Bavetta, 1999).

Hypothesis 3: Life insurance company effectiveness will be positively associated with extraversion.

Extraversion: in the opinion of Hogan (2007), this is a construct whose components include sociability (including exhibitionism and expression) and ambition (including initiative and impetus). Individuals with a high level of extraversion demonstrate a high level of sociability which enables them to obtain support from their friends to solve complex problems in their working environment (Wilt & Revelle, 2009). As a consequence, they develop effective interpersonal relations that facilitate for them active membership in task groups (Rottinghaus & Borgen, 2005). It was also identified that extraversion constitutes a factor that reduces the sensitivity of an individual to growing threats connected with their position at work, through a decrease in the level of counter-productive reactions to stressors (Robinson, Meier & Vargas, 2005).

Hypothesis 4: Life insurance company effectiveness will be positively associated with extraversion.

Neuroticism: this includes anxiety, annoyance, hostility, depression, impulsiveness and sensitivity (Komarraju et al., 2011). It exerts a strong negative influence on psychological and socio-cultural adaptation, it accompanies depression and the individual's increasing problems (Widiger, 2009), while a lack of adaptation, which is characteristic of this trait, may constitute a consequence of a deficit in abilities and its negative impact on the efficiency of specific domains (Collings & Mellahi, 2009; Eaton & Bradley, 2009). People with high levels of neuroticism lack motivation in the majority of professions, and their work is characterized by a low level of effectiveness (Judge & Iles, 2002). Therefore, it is close to a negative attitude (Watson & Clark, 2000) that is displayed in ineffective techniques that are copied to stress causing situations (Eaton & Bradley, 2009). These authors claim the number of professions where the mentioned assumption are valid, is limited (excluding life insurance agent). In this context, an analysis was conducted on the personality profile of agents-entrepreneurs, based on the assumptions of the model referred to above.

Hypothesis 5: Life insurance company effectiveness will be positively associated with neuroticism.

RESEARCH METHODS

The inductive method was implemented in the research because this utility is particularly useful and adequate as the conceptual base cannot determine identifiable dimensions in a simple manner (Williamson, Karp, Dalphin & Grey, 1982). It requires an expert approach to an analysis of the sample content, is based on a post hoc factor analysis (Anderson & Gebring, 1991; Kerlinger, 1986), and also asserts a correct categorization of factors (Ford & MacCallum, 1986). Additionally, a comparative analysis of the subject literature increased the level of research results validation (Eisenhardt & Graebner, 2007). The case study was constructed through the use of an iteration process, which was based on a consonance of theoretical assumptions and empirical evidence (Araujo & Dubois, 2004; Dubois & Gadde, 2002). The implementation of a case study in the context of theory development enhances inductive research through the creation of an adequate theory that creates scientific progress and is testable (Gibbert & Ruigrok, 2010). The purpose of the conducted research was to identify whether the personality trait intensities of an effective life insurance agent are related to organizational effectiveness, perceived as his sales performance, in the example of life insurance companies.

Participants and procedures

The sample consisted of 812 of the most effective life insurance agents (according to the collected premiums for the 5 years preceding the research), whose results placed them in the top 10% of the whole workforce of each of the four companies (AVIVA, AMPLICO, NN, PZU and their Lithuanian branches), which possess the largest share in the market (combined 68.09%) according to the acquired premiums in years 2011-2014. The sample was complete (every agent who met the criteria was covered by the research). The agents completed the 48 item Five Factor questionnaires constructed by P. Costa for this study. Each questionnaire was anonymous and put in an envelope when given to the researcher. A total of 812 sets of questionnaires were returned, with 16 being excluded due to extensive missing data or irregular patterns. The final response was 94.70%. Background information: 39% male, 61% female, the majority of agents were aged between 30 – 50 years (74%); 59.80% had a college degree, 40.20% a graduate degree.

Measures

A personality questionnaire of the five-factor model constructed by Costa and McCrae (2003) based on the five-degree Likert scale was implemented in the research, ranging from 1 (strongly disagree) to 5 (strongly agree). The effectiveness of a life insurance company was measured by the number of

agent's appointments with the customer prior to the purchase of the policy (this value was taken from the monthly reports of unit managers) for each company separately. This conception of the effectiveness is a determinant of human activity based on the Austrian School of Economics thinking. It reflects the relation between individual performance and organizational effectiveness (Von Mises, 2014). Territorial scope of the research: Poland, Lithuania (Polish branches) and duration of the conducted research: 2011-2014.

ANALYSIS/STUDY/RESULTS

Data analyses

The hypotheses were tested regarding the number of agent's appointments necessary to sell the life insurance policy. Independence tests related to the research, point to the occurrence of a statistically significant connection between the numbers of appointments held by the agent with the customer prior to the purchase of a policy. In the context of the determinants referred to above, an analysis was conducted on the personality traits of agents-entrepreneurs who completed the FFM questionnaire, together with their gender, age and education level. To test hypotheses, a multiple regression was conducted, with the individual number of agent's appointments (NONA) as the dependent variable, and personality traits, gender, age and education, as the independent ones. All the hypotheses were tested complex, excluding the redundant describing variables.

RESULTS

Test of agent's performance – the differences between life insurance companies

The results of the abovementioned research are confirmed by an analysis of the average values of the number of the agent's appointments with the customer prior to the purchase of the policy: they differ significantly ($\chi^2=131.15$, $\chi^2_{HR}=137.91$). AVIVA agents need on average 1.50 appointments for the conclusion of the contract with the customer. This result is statistically significantly higher than in the case of the remaining companies: PZU: 2.09, NN: 2.19 and Amplico: 2.32 (Table 1).

Table 1. Sales efficiency of life insurance agents

Life insurance company	market share [%]	[n]	*	SD	Mdn	LSD**			
						AVIVA	AMPLICO	NN	PZU
AVIVA	20.18	311	1.50	.78	1	-	.00	.00	.00
AMPLICO	7.04	62	2.32	.74	2	.00	-	.43	.14
NN	9.55	144	2.19	1.50	3	.00	.43	-	.38
PZU	31.32	279	2.09	1.29	4	.00	.14	.38	-

Note: * average number of appointments necessary to sell a life insurance policy (NONA), $\chi^2=131.15$, χ^2 HR=137.91, ** Bonferroni adjustment was implemented.

Tests of personality traits of FFM

The aim of this test was to find the level of trait intensities (Openness to experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism) which characterize an effective life insurance agent (The maximum that trait intensity could reach was 100, the minimum – 0). Descriptive statistics and correlations for the variables can be found in Table 2.

Table 2. Descriptive statistics and correlations

Variables	M	SD	O	C	E	A	N
O	41.41	19.49	-				
C	57.18	21.95	.37	-			
E	61.75	20.36	.52	.38	-		
A	51.89	21.65	.22	.16	.16	-	
N	29.04	19.29	-.22	-.50	-.46	-.27	-

$p < .0001$

For age, gender, and education level there was implemented p-level. Hypotheses were tested with a series of least squares multiple regression. Table 3 includes the results for all hypotheses testing including the control variables.

Table 3. Openness to experience, conscientiousness, extraversion, agreeableness, neuroticism, age, gender and education level as predictors of job performance

Variables	SE	P
O	.195	.000
C	.981	.000
E	-.017	.086
A	.131	.001
N	.295	.006

Variables		SE	P
Age	.011	.007	.320
Gender*	.149	.112	.171
Education Degree			
College	.269	.118	.023
Technical college	.372	.090	.000
University	.345	.080	.000
Technical University	-.145	.115	.207

= average bootstrapped regression coefficient, SE - bootstrapped standard error of , *female=0, male=1, n=796, significant p <.01.

According to the trait „*Openness to experience*,” results suggest that the intensity level of trait „O” is positively associated with the agent’s performance (= .195, p=.000). This supports Hypothesis 1. Referring to „*Conscientiousness*”, the mentioned trait intensity had a significant positive effect on an agent’s effectiveness (= .981, p=.000). This supports Hypothesis 2. On the contrary to abovementioned ones, based on the results (= -.017, p=.086), trait „E” should not be taken into consideration in the context of a life insurance agent’s effectiveness (statistically insignificant). It does not support Hypothesis 3. Whereas, a relation of „*Agreeableness*” intensity and agent’s performance level is positive but weak (= .131, p=.001). It supports Hypothesis 4. Finally, in the context of the trait „*Neuroticism*”, results prove that the intensity level of trait „N” is positively associated with an agent’s performance (= .295, p=.001). This supports Hypothesis 5. Moreover, it is particularly important to recruit individuals with a technical college (= .372, p=.000) or university (= .345, p=.000) degree to achieve the competitive advantage.

DISCUSSION

The main purpose of the study was to provide a confirmatory analysis of the relation between the personality traits of life insurance agents and their job performance by only including scales that were explicitly designed to measure the Big Five personality dimensions. The results were highly consistent with the original paper of Barrick and Mount (1991), in that “conscientiousness” was identified to have the highest validity of the Big Five dimensions of overall job performance. Conscientious sales representatives are more likely to strive for accomplishments (Bratton & Gold, 2017). It is also noteworthy that there is almost a directly proportional dependence between life insurance sales effectiveness and the traits of openness to experience

and neuroticism. These findings correspond to the recent analyses of Funder (2006), Behling (1998) and Uppal and Mishra (2014). Personality is likely to be the critical dispositional basis for determining how the person interacts or is motivated once an individual has chosen an environment, that is consistent with one's interest (Judge & Ilies, 2002). The authors claim that people high in Conscientiousness and Neuroticism (Emotional stability) are more likely to set goals, have higher expectations that their efforts will determine favorable consequences, and think they can do more (have higher self – efficacy) than those low in these cited traits. Enhanced performance motivation, in turn, is expected to be an important predictor of performance (Ilies, Keeney & Scott, 2011). There are criticisms also. Furnham (2008) claims that agreeableness, neuroticism, and an openness to experience, were not found to be positively correlated with sales performance. The mentioned results were conducted in the FMCG market. A life insurance policy, according to Rogozinski (2012), is not a physical product but is a promise of payment of cash benefits in the case of death or reaching retirement age; hence, decision-making criteria concerning its purchase are different in the case of policies. Contrary to expectations, the analysis showed that the level of extraversion intensity is not correlated to sales efficiency. According to the previous research of Barrick (2001), Bing and Lounsbury (2000) and Vinchur et al. (1998), it was found that Extraversion was a valid predictor of performance in jobs characterized by social interaction, such as sales personnel and managers. However, these authors did not take life insurance agents into consideration in their research. Hence, it is difficult to relate, in an explicit manner, their conclusions to the specificity of the life insurance market.

Between the traits of Conscientiousness (Hobfoll & Wells, 1999) and Agreeableness (McCrae & Costa, 2003), the determinant of effectiveness by their occurrence is perceptible only and solely in the situations of strictly defined intensities which, if exceeded, may cause its abrupt reduction.

The research results also reveal that age and gender are not statistically significant for life insurance company effectiveness. Referring to education level, a legal regulation exists which obliges a person who is applying for work as an insurance agent to possess secondary education as a minimum. Nevertheless, in order to recruit people with a higher potential probability of successful professional achievement, seeking people with a secondary technical education or higher education is justifiable.

Implicitly or explicitly, the model of Costa and McCrae developed and tested in this study, received general support. A direct comparison of the variables comprising theoretical explanations suggested that the trait activation theory may be relatively important in explaining when and how personality trait intensity is predictive of job performance. While some have

questioned the practical relevance of personality variables for human resource selection decisions (Joyce & Slocum, 2012; Murphy & Dzieweczynski, 2005), the results imply, when there is reason to believe that the trait is relevant to the job context, that validities cannot be characterized as “disappointingly low” (Schmitt, 2004) to any but the most captious observer. In responding to Morgeson’s (2007) critique of the personality–performance literature, Tett and Christiansen (2007) claimed, “The ideal situation for any worker is one providing opportunities to express his or her traits...such that trait expression is valued positively by others” (Judge & Zapata, 2014, p. 1168).

CONCLUSION

The five-factor model is limited in this study to the degree to which personality trait intensities express themselves in job performance. Beyond job analysis, little is known about the situational determinants or what variables are useful when comparing one situation with another (Judge & Zapata, 2014). Today, a framework for characterizing the psychology based aspects of a situation is a key factor method for assessing the above-mentioned variables. Moreover, future researchers must examine the process through which personality affects behavior at work. As claimed earlier, researchers must take into account the characteristics of a work environment. This is a little removed from the degree to which personality expresses itself, and to which it expresses itself in behavior. While this approach was appropriate given the goals of the study, it is also important for future research to link how situations impede or activate the expression of traits, and how these traits are manifest in specific job behaviors that, in turn, lead to effectiveness. There are situations, for example, that influence the degree to which an extravert premiums or behaves like an extravert, just as there are situations that an extravert may find more motivating, or more likely to produce assertive behaviors than others. These sorts of expressions are distinct from (but often related to) job effectiveness, and the situational traits that lead to these kinds of expressions may be different from those which lead to effectiveness. As a consequence, this study has some limitations that require discussion. It does not exhaust the list of trait-relevant cues that might moderate personality - job performance relationships. In the study, the focus was on the job, or task-based cues, but there are other factors that may be relevant, such as human resource systems, and organizational culture (Judge & Zapata, 2014). Future research might study those variables as situational moderators as well. The next issue future researchers should focus on is measurement problems. If it is not possible to guarantee the highest degree of precision, the results

obtained will always be disputable. In this context, it is important to accept an assumption concerning the permanence of personality traits (McCrae & Costa, 2003), and the response to items on a personality inventory, at any one moment, is determined by many traits, states and features of the immediate situation. Consequently, traits usefully predict behavior only when it is aggregated (Pacini & Epstein, 1999), either over a category of behaviors (e.g., counterproductive behavior) or across time (annual performance or longer). It is also important to underline that the global traits (e.g., BIG FIVE) are best for explanation and theory development; however, prediction of narrower and more specific behaviors at work will require correspondingly narrower trait constructs (Brown et al., 2016). Effective measurement considers addressing both of these concerns; therefore it is reasonable to claim that personality traits can explain behaviour at work, particularly when it is aggregated across time and job situation. Personality indicates impressive consistencies over time even if a person's life situation changes (McCrae & Costa, 2003), in a manner that can provide valuable information about what the individual is likely to do at work.

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Abstrakt

W organizacjach w uprzemysłowionych krajach, jakość zasobów ludzkich stanowi główny problem na drodze do uzyskania przewagi konkurencyjnej. Implementacja modelu pięcioczynnikowego Costy i McCrae'a dostarcza rozwiązania dla wzmiankowanego problem. Celem niniejszego artykułu jest ukazanie kluczowej roli implementacji modelu pięcioczynnikowego Costy i McCrae'a dla efektywności zakładu ubezpieczeń na życie zarówno z perspektywy teoretycznej, jak i praktycznej. Badanie w tej pracy oparto na stadium przypadku czterech największych zakładów ubezpieczeń na życie. Próbę stanowiło 796 najbardziej efektywnych agentów ubezpieczeniowych. W badaniu posłużono się kwestionariuszem modelu pięcioczynnikowego. Wyniki wskazują na istnienie pozytywnej korelacji pomiędzy poziomem natężenia niektórych cech osobowości i skutecznością sprzedażową agentów ubezpieczeniowych. Poziom natężeń cech „otwartość na doświadczenie”, „sumienność”, „ugodowość” i „neurotyzm” stanowi korelatę efektywności zakładu ubezpieczeń na życie. Co więcej, wyniki badań wskazują na istnienie podstaw do ich indukcji do systemów zarządzania całego sektora finansowych usług detalicznych.

Słowa kluczowe: *przewaga konkurencyjna, efektywność, skuteczność ludzka, zarządzanie, organizacja, cechy osobowości.*

Biographical note

Andrzej Janowski - Doctor of Economic Sciences in the field of management sciences. Specialization: human resources management, insurance; sales director and insurance broker of Nord Partner Ltd. Scientific interests: human resources management effectiveness, particularly in the context of talent management in life insurance organizations. The author of the integrating talent management model in Europe.