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A predictive model of innovation in rural entrepreneurship

Harpa Elena, Moica Sorina, Dana Rus

“Petru Maior” University of Tirgu-Mures, Faculty of Engineering, 1 Nicolae Iorga, Tirgu-Mures 540088, Romania

Abstract

The present research started from the declared objective of increasing the visibility of rural entrepreneurship conceived in a new manner, which should highlight the innovative potential of local entrepreneurs as a condition of success and as a condition of accomplishing the level of well-being. The approach is justified by the identification of the role of innovation in shaping the profile of local entrepreneurs, the need for theoretical models which should illustrate conceptually and practically the relation between the level of innovation and the successful development of the business. The study started from underlining the main factors which determine economic development in the rural environment. The main objective of the study is to define a predictive model in the scope of sustaining innovative development among the investigated entrepreneurs.

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1. Introduction

The entrepreneurs provide added value in rural areas involving resources in the process, which are coming from the same area. This is the reason why rural development is more inter-related in rural areas than in urban areas. For this reason, rural entrepreneurship is mainly based on the community, strong family ties and has a relatively large impact on the rural community.

There is relevant evidence supporting the reality that, especially in low and medium income economies, as well as in the transitional ones, current and future competition as well as the sustainable growth can best be improved by
innovation. Innovation is the premise of alternative income and of employment opportunities, it favors the economic diversification of countries and regions and may lead transitional economies to sustainable growth [1].

The European Union is beginning to pay greater attention to the development of rural areas, by offering more than agricultural support. As the idea that the creation of new businesses and development may constitute the best strategy for rural development, new reports from different international sources are now questioning the benefits of the entrepreneurial support for the economic development of rural areas.

1.1. Research methodology

The study completes the statistic results which are available in the Mures county and was performed based on an survey which used the questionnaire.

The survey contains information regarding the perception of the entrepreneurs regarding different fundamental elements of the innovation process, such as: the regional development, business development strategies as well as the importance and the relationship with the business environment. There were no previous hypotheses which should answer the question of innovation regarding the innovation in the rural environment. All the studies were performed at a national and regional level, without any delimitation between the urban and the rural environment. Thus, the objective of the quantitative research was to add a descriptive background regarding innovation at a macro level, in the rural environment, ant to contextualize the information obtained.

The questionnaire was distributed to a number of 500 entrepreneurs, including micro-enterprises, small and medium firms as well as certified natural persons, individual enterprises and familial enterprises from the Mures county. With an answer margin of 47.4%, the final sample of the study contains 237 entrepreneurs.

In order to test the existence of relations between the different types of variables we used both the analysis of the ANOVA variation, the correlation analysis and finally, in order to determine the effect level between these variables, we used dependency techniques. This variable was explained by other independent variables and we tried to identify the predictive variables forming the model proposed in the analysis. In this respect, we used two statistical methods: multinomial logistic regression and the multiple hierarchical method.

1.2. Research hypothesis

In order to meet the main objective of the paper, we formulate the following hypothesis whose test and ratification will be detailed in the body of the paper.
Operational hypothesis: the characteristics of the entrepreneur, internal and external features of the company as well as the importance of the location are indicators predicting entrepreneurial innovation.

1.3. Determinations of variables

Innovation, the main element of the present research, is described by four variables considered to be dependent: types of innovations (process, product, marketing, organizational), level of novelty, entrepreneur’s level of innovation resulted from the strategy of the company, level of novelty resulted from the innovation strategy and the level of excellence corresponding to the process of generation adoption of innovation by the entrepreneur.

The dependent variables are influenced, to a greater or lesser extent, by independent variables, whose values will determine the result. The independent variables are grouped in four main analyzing categories: location, the characteristics of the entrepreneur, the internal characteristics of company, the external characteristics of company – business networks. Each of these is formed, in its turn, formed of several variables which influence innovation.

The conceptual model used for structuring the variables can be seen in figure 1.

2. Process and interpretation of results

The analysis and interpretation of the data collected through the survey in order to test the hypothesis and in order to determine the predictive model for the improvement of innovation in rural entrepreneurship were structured in the following stage: verification of the internal consistency of the items, descriptive data analysis, identification of the
most significant variables, evaluating the reliability of the measurement scales and the degree of accuracy of the collected data.

The procedure used to verify the internal consistency of the items permits the verification of the reliability conditions of the questionnaire. The coefficient we used for this purpose was Cronbach Alpha and it measures the co-variation between the values of the items. From a theoretical point of view, the coefficient may register values between 0 and 1. Consequent to the evaluation of the internal consistency of the terms, we obtained three categories of values for the Cronbach Alpha coefficient which indicates good internal consistency of the items and thus a minimal condition of item fidelity was fulfilled 1. Coefficients with adequate values: 0.706 at the scale MOTV and 0.697 at the scale DEZO; 2. Coefficients with very good values: 0.821 at the scale NIAN, 0.813 at the scale GINS and 0.876 at the scale PGIN and 3. Coefficients with excellent values: 0.904 at the scale STKH.

The descriptive data analysis contains a set of techniques / methods of organization and synthetic presentation of the collected data in order to shape a general image about the main features of the individual variables, by analyzing the frequencies and using the mean influence score – based on the weighed arithmetic average.

The characteristics of the entrepreneurs who constitute the object of the present sample was determined by analyzing a representative number of companies in the rural environment of the Mures county, from different sectors and with diverse activities. The classification of the sample according to the domain of activity can be seen in Table 1.

Table 1 Domain of activity

<table>
<thead>
<tr>
<th>DACT</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry</td>
<td>81</td>
<td>34,2</td>
</tr>
<tr>
<td>Commerce</td>
<td>47</td>
<td>19,8</td>
</tr>
<tr>
<td>Services</td>
<td>12</td>
<td>5,1</td>
</tr>
<tr>
<td>Industry</td>
<td>35</td>
<td>14,8</td>
</tr>
<tr>
<td>Construction</td>
<td>18</td>
<td>7,6</td>
</tr>
<tr>
<td>Administration, education, health</td>
<td>8</td>
<td>3,4</td>
</tr>
<tr>
<td>Tourism</td>
<td>8</td>
<td>3,4</td>
</tr>
<tr>
<td>Crafts</td>
<td>19</td>
<td>8,0</td>
</tr>
<tr>
<td>Another domain</td>
<td>9</td>
<td>3,8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>237</td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

According to the dimension of the company, 161 of the respondents belong to the category of micro-enterprises, 56 are small enterprises and 20 are medium-sized enterprises.
From the point of view of their legal form, 51% of the respondents have no legal personality, being authorized natural persons, individual enterprises, familial enterprises, while a number of 116 of the respondents are commercial companies, mainly limited liability companies.

The independent variable related to company seniority, a factor which is considered to be relevant in the process of innovation by several authors [3, 4, 5], is very diverse, starting from 47 companies which have below 10 ten years of activities and up to companies with a seniority of 22 years.

According to the entrepreneur’s schooling level (the SCOL variable), we present below in graphic form its frequency among the entrepreneurs who were interviewed. Thus, it may be observed that a percentage of 31,3% of the entrepreneurs graduated vocational school, followed by 21,7% who are high-school graduates while the lowest percentage - 8,4% is represented by university graduates. This confirms statistic evidence from studies which identify a low level of schooling for the population in rural environments. Also, the CSFM variable – Training courses – supports this, with a percentage of 83,5% of the entrepreneurs who did not attend any training course.

![Fig. 2 Level of schooling](image)

One of the variables included in the category of the features of the entrepreneur is motivation. The question which describes this factor has as answer variants a Likert scale, with 5 answer scales. Thus, the motivation which determined the entrepreneurs to start a business, as it follows from the research, reveals the fact that the most consistent group of the interviewed subjects regard entrepreneurship as a source of income, followed by those who regard it as a new, innovative idea. Another category of entrepreneurs is constituted of what we may call “authentic entrepreneurs”, whose motivation lies in their desire to continue a family tradition.

From the point of view of the external features of the company, the independent variables proposed in the analysis were analyzed according to the entrepreneur’s relationship with the business environment. These external relationships and their importance for the innovation process are identified by analyzing the belonging to certain clusters, by the stakeholders’ importance and the collaboration with public and private regional institutions. The importance of these relations was tested in several studies [5, 6, 7] which ratified the effect of these positive relations on the result of innovation. The importance of these variables which are significantly relevant for the innovation process indicates the fact that in the Mures county 68,35% of the respondents do not belong to clusters and 75,53% of them did not collaborate with companies, universities or research institutions in order to develop their business.

Regarding the access to funds used to develop business, a high percentage of over 68% never resorted to external financing. Also, it was noted that over 75% of the respondents never resorted to consultancy services in order to access funds or to expand businesses.

The investments imply low costs.42% of the entrepreneurs used their own funding resources while 19% used national funds and 18% use European funds for investments. The CHIV variable – investment costs – shows that in the last year, almost 60% of the interviewed entrepreneurs did not make investments to develop or modernize the business. 21% of them invested up to 100,000 lei and 25% of them allotted over 100,000 in investments.

As for the innovation type, as they are described in the Oslo manual and in Schumpeter’s vision, it is described in figure 3. Compared to the INS report (2014) [8], according to which almost 80% of the small and medium-sized enterprises are non-innovating, one may note that 42,6% of rural entrepreneurs did not perform any innovating activity. This leads us to believe that innovation is better represented among small entrepreneurs.

As in the INS report, the greatest percentage of innovation (20%) is organizational. A greater percentage is
represented by the process innovation (13.5%) and product innovation (12%).

\[ \begin{array}{|c|c|c|c|c|c|}
\hline
& Product & Process & Organizational & Marketing & Non innovation \\
\hline
Number & 29 & 32 & 48 & 27 & 101 \\
\hline
\end{array} \]

Fig. 3 Types of innovations

Innovation is determined by the three dependent variables: NIAN – level of entrepreneurial innovation – GINS – level of novelty of the innovation strategy and PGIN – the process of innovation generation and adoption. These elements are identified as important in other previous studies and analyses [5, 9, 10].

The data corresponding to these items generated three categories or levels of innovation: low level, medium and high level of innovation.

The level of entrepreneurial innovation was determined by three sub-categories grouped in product, process and organizational innovative activities. The results obtained from the survey regarding the innovation process are synthesized as follows: from the point of view of the entrepreneurial innovation level, the greatest percentage (45%) belong to the category of a medium level of innovation. A significant percentage (39%) have a low innovation level and are considered to be “non-innovative”. One important objective following the present research is that, by different measures of support, this category of the “non-innovative” entrepreneurs should be helped to improve the level of innovation in their businesses.

From the point of view of the level of novelty of the innovation strategy, the proportion remains the same: only 20% of the respondents are situated in the category of the highly innovative entrepreneurs.

\[ \begin{array}{|c|c|c|}
\hline
& Low level & Medium level & High level \\
\hline
Number & 92 & 107 & 38 \\
\hline
\end{array} \]

Fig. 4 Level of entrepreneurial innovation

3. Determining the predictive model based on the multiple regression analysis

In order to meet the main objective of the research – the elaboration of a predictive innovation model in rural entrepreneurship with the purpose of improving the level of innovation, this phase of research is essential. This phase was intended to demonstrate the predictive importance of the entrepreneur’s features, of the internal and external characteristics of the company and of location in assessing innovation in entrepreneurship.

The predictor variables are composed of the entrepreneur’s features, of the internal and external characteristics of the company and of location. The criterion variable is represented by innovation, which is analyzed from the following perspective: types of innovations, level of entrepreneurial innovation, level of novelty of the innovation strategy and the process of innovation generation and adoption.
The influence of predictors on the criterion can be assessed by means of different statistical procedures called regressions. “The variable whose values we want to predict is called a criterion, and the variable whose values we use to predict the values of the criterion is called a predictor”[11].

The statistical methods used in the elaboration of the predictive model are: multinomial logistic regression and hierarchical multiple regression.

3.1 Hierarchical multiple regression

The method is used to identify the predictors which were identified as numerical variables. This type of procedure allows the researcher to decide the order in which he/she uses the list of predictors by associating the predictors or the groups of predictors in variable blocks [12].

The stages of this analysis method are:
- Descriptive analysis – the condition of normal distribution – indexes Skewness and Kurtosis
- Correlations between the criterion and predictors – orthogonality conditions
- Descriptive indexes contained in the predictive model
- The contribution of predictors in the dynamics of the criterion
- The ANOVA test – the test of significance F
- Analysis of the regression coefficients – ”B”, ”Beta” “t” and ”Sig”

In the three levels of the hierarchical multiple regression, the potential predictors of the innovation components (NIAN – Level of entrepreneurial innovation, GINS – Novelty level of the innovation strategy, PGIN – process of innovation generation and adoption) were organized in blocks. The first block, “Motivation”, contains the variables: Higher income, Hobby, New idea, Fill a void in the market, Family tradition. The second block, “Development”, contains the variables: Support from non-reimbursable funds, Increased competitiveness due to new technologies, Increased product quality / local services, Creation of business consultancy centers, Cooperation between companies and associations, Increased professional competence through training.

The two variables explained by the results of the hierarchical multiple regression are highlighted as predictors and the percentages in table 2 explain the proportion found in each criterion which was analyzed:

<table>
<thead>
<tr>
<th>Predictor</th>
<th>NIAN</th>
<th>GINS</th>
<th>PGIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEZO</td>
<td>52,7%</td>
<td>67,2%</td>
<td>34,6%</td>
</tr>
<tr>
<td>MOTV</td>
<td>49,8%</td>
<td>46,3%</td>
<td>29,5%</td>
</tr>
</tbody>
</table>

3.2 Multinomial logistic regression

In order to identify the predictors determined as nominal (categorical) variable, we will use multinomial logistic regression. This type of regression “identifies the variables which distinguish, at a collective level, the cases which belong to the different categories of a nominal or categorical variable. Thus, we identify the groups of variables which classify with precision the persons according to their belonging to the different categories of the nominal variable”[12]. Multinomial logistic regression is used when there are three or more categories of the nominal variables.

The stages involved by this analysis method are:
- The distribution of the criterion and predictor variables
- The order and power of prediction
- Prediction adjustment – 2 Log Likelihood, ChiSquare, Pseudo R-Square
- Power of prediction of variables

Figure 5 presents in a graphical form the predictors and their proportions determined by means of this method.
4. Predictive model design

The idea of a model is quite a large concept. When speaking about innovation models in entrepreneurship the spectrum of interventions is very generous – from good practice models presented to entrepreneurs to diverse programs which, once presented, turn into models of good practice. Similarly, one may perceive a model as public policy developed as a complex model. Finally, the structured intervention models which have been tested may anticipate problems, have a tendency of generalization or even of becoming public policy. [14].
The predictive innovative model in rural entrepreneurship is elaborated based on an efficient transdisciplinary approach, starting from a theoretical background which is completed by the empiric study of the present research, by involving all relevant regional actors (entrepreneurs, organizations of business support, regional agencies for economic development, academic environment, research institutions, local public authorities).

The implementation of the proposed model depends on the cooperation of all the stakeholders implied in the public and private sector by increasing the support of economic, social and environment development. Innovation is one of the essential elements leading to increased competitiveness in a certain region. Thus, the implementation of the model among entrepreneurs and the support of their innovating activities may lead transitional economies towards sustainable growth.

The components of the model are grouped in two main sections: innovation, analyzed from the perspective of four criteria (types of innovations, level of innovation, degree of novelty of innovation and innovation generation process) and entrepreneurship, determined from the perspective of the entrepreneur’s profile, internal and external features of the company and location. Predictive variables from the four entrepreneurial characteristics (represented in the model with the same color) were determined for each criterion-variable. Thus, the following predictors correspond to the TINV variable: Motivation and Funding programs (entrepreneur’s features); clusters, associations, collaborators, consultancy and external funding (external features) and regional development (location).

5. Conclusions

The predictive model of innovation in the rural environment is preponderantly centered on the concept of innovation. It implies the identification of the level of innovation within entrepreneurs in the region which constituted the location of the research as well as the identification of the relevant factors which can lead to the significant improvement of innovation. Based on the results in the specialized literature and of the reports from recent studies, we proposed a series of predictors analyzed by means of the questionnaire.

The long-term impact of the predictive model will lead to the creation of rural development strategies and efficient partnerships, to a more balanced labor market, the motivation of young people to start businesses in the rural environment.

The results of the study proved the rural entrepreneurs’ difficulty in adjusting to the requirements imposed by the challenges of the modern world to any actor in the economic domain. Their practical intelligence and native versatility adapted to the rural environment is confronted with a challenge which is hard to overcome in the context of the globalizing economic practices which imply the observance of a set of standard rules which rural entrepreneurs find difficult to meet in the absence of some support mechanisms.

References

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