Authors: Tomasz Groszkowski, Tomasz Stryjewski

An econometrical analysis of entrepreneurship determinants in Polish voivodeships in the years 2004-2013.

Abstract

Entrepreneurship is undoubtedly one of the fundamental economic development factor, through its influence on creating new products, new markets, creating jobs and raise the social welfare in general. It is noticeable that some areas are growing fast thanks to the creation of new companies, when others are far behind. This article shows the research results, describing and clarifying the differences in the level of entrepreneurship between Polish voivodeships. In entrepreneurial research one of the common problems is to identify factors that determine entrepreneurial activity. For the analysis was used measures including economic and socio-demographics factors.

The type of analyzed data, constrained a limitations in very narrow definition of entrepreneurship as the number of formal registered companies. Presented conclusions are based on the literature and the database of Central Statistical Office of Poland. For the analysis of the issues posed in this article, the space-time variables were used of the period from 2004 to 2013, about 16 Polish voivodeships.

To confirm the expected results which may indicate structural type of changes in the entrepreneurship, the panel data model with *fixed effect (FE)/random effect (RE)* was used. Research methods show that the used entrepreneurship indicator is characterized by high autocorrelation, and therefore, an important element of the analysis was identifying, appropriate instrumental variables, to use modeling panel *(FE)/(RE)*. To generate instrumental variables a dynamic panel model was used, while all calculations was performed with the econometric software GRETL.

The analysis showed and confirmed the thesis posed in the article. Level of entrepreneurship is varied in Polish voivodeships, and the type of this differentiation is structural and permanent. It is very important information, that should have consequences in the regional and local policy. Panel model also confirmed the expected determinants of entrepreneurship. The main factors affecting the level of entrepreneurship include the amount of income and autoregressive factor. Both of these factors have a positive impact on the rate of entrepreneurship, which means that their growth also causes the increase of dependent variable. The results are in some way in

accordance with the theory of economics which says, that the level of entrepreneurship is dependent on the economic condition of particular area.

Key words: entrepreneurship, development determinants, rural, econometric.

Introduction

The concept of entrepreneurship is a complex issue and it is permanently inscribed on the various sciences. A wide range of studies have shown that the large and still growing number of classifications and descriptions of entrepreneurship, causes the lack of a unified theory of entrepreneurship and as well as the measurement associated with it, which implies difficulties in their assessment[1]. Entrepreneurship is multidimensional and consists of many elements that should be taken into account in determining the characteristics of entrepreneurship[2].

Management sphere pays particular attention to this aspect, mainly because of functional reasons, describing it, as the process of organizing and running a business in the conditions of the risks associated with these activities[3].

Entrepreneurship can therefore be considered as process which create or identify opportunities and then they are used very often regardless of possessed at this time resources. Entrepreneurship understood like that, is an executioner for creative entrepreneur who finds the energy to initiate and build a company or organization. Therefore the entrepreneur is not only a passive observer of the situation in which he is situated (Jeffrey A. Timmons and Howard H. Stevenson) [4]. Entrepreneurship can therefore be described as an organized process of successive phases, which are located in specific conditions in order to use innovative ideas to achieve certain benefits, in the same time taking into account the risk of this process[5].

Entrepreneurship is one of the basic factor for economic, social and cultural development. It is concerned with activities of different types of businesses, from microenterprises throughout the all SME sector up to large national and international enterprises. There is no doubt that companies play an important role both in the Polish as well as European economy. They create a place of occurrence and concentration of human skills and entrepreneurial attitudes as well as

---

[1] Szarecki A. *Przedsiębiorczość jako forma kultury*, „Problemy Zarządzania", nr 2. 2008, s. 181
[2] Kalkan M., C. Kaygusuz, The Psyhology of Enterpreneurship [In] Entrepreneurship – Born, Made and Educated, Ed. T. Burger-Helmchen, Rijeka, 2012.
[3] R. W. Gryffin, *Podstawy zarządzania organizacjami*, PWN, Warszawa 1997, s. 730-731.
[4] Timmons J., *New Venture Creation*, Irvin, Boston 1990, s. 5.
[5] Adamczyk W., *Ewolucja form i typów przedsiębiorczości*, Zeszyty Naukowe Akademii Ekonomicznej nr 236, Poznań 1995, s. 9-10.

innovation and employment source. The experience of developed countries shows that entrepreneurship plays a large role in the economy, creating economic growth, affecting employment and delivering goods to the market. Companies are therefore a very important factor for economic growth of the particular area. Entrepreneurship and businesses are also stimulating factors for growth, and the number of enterprises is often considered as indicator of economic development.

Entrepreneurship factors

Each community also at the local level, is characterized by entrepreneurial individuals who, when the appropriate conditions are created, will be stimulated to action, build businesses, create new jobs and additional sources of income for themselves and the local population.

But the answer for question about the factors which influence on entrepreneurial behavior is not so clear and obvious. In a numerous studies of entrepreneurship, frequently appearing problem is the selection of factors that affect the level of entrepreneurship. This article focuses on economic factors, describing the structural and economic determinants of entrepreneurship and quantitative aspects of that issue.

Entrepreneurship, is determined by the certain socio-economic and political factors, which affect with varying intensity in time and space. That factors may act in two ways. Giving positive effects for the economy as incentives to business and economic growth stimulators or, contrary, as a means constraining or even inhibiting the creating new and development already existing business entities. These factors are classified according to various criteria[6].

They can influence positively or negatively on the recovery of the particular area, through the potential to create conditions of formation and development of entrepreneurship. Care about suitable conditions for the development of entrepreneurship should therefore be one of the most important priorities for the regional development by vary level government authorities[7].

---

[6] Chrapek G, Przedsiębiorczość osób fizycznych na obszarach wiejskich Podkarpacia, [w:] Rola przedsiębiorczości w kształtowaniu społeczeństwa informacyjnego, Seria Przedsiębiorczość – Edukacja, Zakład Przedsiębiorczości i Gospodarki Przestrzennej Instytutu Geografii Uniwersytetu Pedagogicznego w Krakowie, Warszawa-Kkrwków 2009, s. 321.

[7] Jezierska-Thole A., Zmiany poziomu infrastruktury i jej wpływ na rozwój przedsiębiorczości na obszarach wiejskich na przykładzie województwa kujawsko-pomorskiego i pomorskiego, Acta Acientum Polonorium, Oeconomia 9 (3) 2010, s. 129.

Processes concerning entrepreneurial behavior take place in specific socio-economic circumstances. GDP, economic situation, revenues, investments are examples of some macroeconomic indicators affecting the enterprises development.

Considering the entrepreneurship development conditions, attention should be paid, that any company is working in a neighborhood with which it interacts.

In the article, it was decided to use the division into areas called regions, which can be defined as a territorial unit singled, with a relatively large surface area and population, in which the single economic policy is leading.

Polish economic realities allow identify region with the voivodeship. It is permit because of the factors such as, self-deciding on their policies, independent local authorities, own budget. The specificity of each voivodeship allow to create endogenous development potential, which affects the existence of opportunities and barriers in the development and growth of enterprises in that region.

According to the subject of the article, it is noteworthy to emphasize the individual features of the region that have a direct influence on the investment level and the profitability of the business[8]. If the region is understood as environment of humans, other companies and institutions that have certain features that may or not, be attractive to new businesses, it is important to present and future entrepreneurs should have knowledge and access to information related to the conditions occurring in the region, which will affect the company's position.

Research metodology and the analysis results

The main part of the space-time analysis of entrepreneurship in Poland used in this workbook is to get information about the factors which determine appropriate indicators and the reasons for their differentiation. To examine such specified targets, panel models FE / RE (fixed effect / random effect)[9] are suitable.

The analysis was made for annual data in the period from 2003 to 2013 for 16 Polish voivodeships. Starting from consistent modeling methodology, first stage of the study was to examine the internal structure of processes[10]. The analysis showed the importance of linear

---

[8] Godlewska H., „Lokalizacja działalności gospodarczej", Dom Wydawniczy ELIPSA, Warszawa, 2001, s. 14.

[9] Greene, W. H. (2005). Econometric Analysis, Prentice Hall, New York.

[10] Talaga, L., Zieliński, Z. (1986), *Analiza spektralna w modelowaniu ekonometrycznym* (Spectral analysis in econometric modeling), PWN, Warszawa.

trend in all tested processes and autoregressive relationships over time. But due to the small sample size in the researched period, only first-order autoregression describtions are taken into account.

The main problem in the use of this class of models is that they belong to a group of static methods. Using dynamic relationship in that methods causes that use of estimators based on OLS and GLS gives loaded parameters evaluation[11]. Analysis of the internal structure of processes in the parts of their autocorrelation showed the dynamic nature of these relationships.

Thus, if in the FE / RE models, using lag of the dependent variable is not allowed, so not to lose the information value of the model, it was necessary to find appropriate instrumental variable. It should be noted that the search for the instrumental variable, from a specified group of variables did not return the positive result. Therefore, it was necessary to create "artificial" variable corresponding to the character of the instrument.

Instrumental variable for the entrepreneurship indicator was estimated by using a dynamic panel model based on basic models as showed below:

$$y_{it} = \alpha_0 + \alpha_1 y_{i,t-1} + \alpha_2 y_{i,t-2} + \alpha_3 t + \eta_{it}$$

Where: y_{it} - spatial entrepreneurship indicator in period t, t - the time variable, α_0, α_1, α_2, α_3, - evaluation parameters η_{it} - random spatial component in period t.

After a two-step estimation method[12] (2-step method) the following model is obtained.

Table 1. The dynamic panel model estimation using 2-step method

Dependent variable: wskpz

	Coefficient	Std. Error	z	p-value	
wskpz(-1)	0.983455	0.0384516	25.5764	<0.00001	***
const	1.47559	5.04465	0.2925	0.76990	
time	0.453335	0.112804	4.0188	0.00006	***

Source: Authors' own work.

---

[11] Wooldridge, J.M. (2010). *Econometric analysis of cross section and panel data*, Massachusetts Institute of Technology.
[12] Ibidem.

The theoretical values obtained from the above model created an instrumental variable to substitute a dynamic relationship in FE / RE models.

Further research is focused on the identification of determinants and spatial differences described by so-called neighborhood matrix. For this purpose a group of potential exogenous variables was specified and then, the estimation of the model hypotheses was made. After bringing the model to the only relevant variables (Table 2), next by using appropriate tests, the hypothesis about the correct of using the FE / RE model in opposition to "no effect" model was verified (Table 2).

Table 2.

Dependent variable: wskpz

	Coefficient	Std. Error	t-ratio	p-value	
const	4.65273	3.59303	1.2949	0.19779	
urbanizacja	−16.5172	4.61591	-3.5783	0.00050	***
turyst_1	0.0624735	0.030029	2.0804	0.03958	**
doch per capita	0.00904603	0.0018206	4.9687	<0.00001	***
time	−0.433895	0.193242	-2.2453	0.02655	**
yhat17_1	0.9631	0.0297482	32.3751	<0.00001	***

Mean dependent var	149.7844	S.D. dependent var	25.96056
R-squared	0.982392	Adjusted R-squared	0.981671
Log-likelihood	−339.4414	Akaike criterion	690.8827
Schwarz criterion	707.9949	Hannan-Quinn	697.8355
rho	0.369602	Durbin-Watson	1.085559

Source: Authors' own work.

Table 3. Panel model diagnostics[13]

F test statistic (Fixed effect)		
the null hypothesis that the pooled OLS model is adequate, in favor of the fixed effects alternative	F(15, 107) = 2.62918	p-value = 0.00206261
Breusch-Pagan test statistic (Random effect)		
the null hypothesis that the pooled OLS model is adequate, in favor of the random effects alternative	LM = 1.77137	p-value = prob(chi-square(1) > 1.77137) = 0.183213
Hausman test statistic		
the null hypothesis that the random effects model is consistent, in favor of the fixed effects model	H = 14.5289	p-value = prob(chi-square(5) > 14.5289) = 0.0125771

Source: Authors' own work.

As tests presented in Table 3 show, appropriate model panel is a fixed effects - FE model. This means that the spatial differences in the level of entrepreneurship index are structural and permanent.

Therefore the next step of the study, is estimation and validation of the FE model. The model presented in Table 2 has become a model hypothesis. After verification, the FE model was presented in table 4.

Table 4.

Model 29: Fixed-effects, using 128 observations

Included 16 cross-sectional units

Time-series length = 8

Dependent variable: wskpz

	Coefficient	Std. Error	t-ratio	p-value

---

[13] Ibidem.

const	31.9812	9.33634	3.4255	0.00086	***
dochodymieszk	0.00906773	0.00166157	5.4573	<0.00001	***
yhat17_1	0.700387	0.0728127	9.6190	<0.00001	***

Mean dependent var	149.7844	S.D. dependent var	25.96056
Sum squared resid	1127.241	S.E. of regression	3.201194
LSDV R-squared	0.986830	Within R-squared	0.742696
LSDV $F(17, 110)$	484.8430	P-value(F)	4.79e-95
Log-likelihood	−320.8560	Akaike criterion	677.7120
Schwarz criterion	729.0486	Hannan-Quinn	698.5703
rho	0.274151	Durbin-Watson	1.193454

Joint test on named regressors -

Test statistic: $F(2, 110) = 158.755$

with p-value $= P(F(2, 110) > 158.755) = 3.75442e\text{-}033$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(15, 110) = 3.58505$

with p-value $= P(F(15, 110) > 3.58505) = 4.84817e\text{-}005$

Source: Authors' own work.

FE model has better statistical properties than model panel. First of all, in the FE model it was was able to significantly reduce the first-order random component autocorrelation. At the same autocorrelation indicates the inadequacy of the identified reasons for the entrepreneurship index. However, the study showed, that the entrepreneurship survey through the so-selected index is burdened with some defects. First of all, this indicator is strongly autoregressive, which

shows the autonomous of entrepreneurial process and may indicate that not suitable measures was used.

But model results presented in Table 4 confirm the economic theory about the entrepreneurship development index. The main determinants remains the entrepreneurship indicator from the previous period and the municipal revenues per capita. Both of these processes have a positive influence on the rate of entrepreneurship, but the autoregressive process is much stronger.

Conclusions

Entrepreneurial activities research through its index showed three main conclusions.

First, the analysis showed that the problem of entrepreneurship development in Poland is a structural problem. This means that differences in the levels in individual regions are stable and result from internal conditions, as well as the regional polarization processes. Therefore this problem is not possible to solve it locally, but only as part of a coherent regional policy at national or european level.

The second conclusion of the analysis concerns the identification of the entrepreneurship index determinants in the researched period. These determinants: the municipal revenues per capita and the entrepreneurship index in the previous period indicate that the main reason for the dependent variable formation is the regional economic situation (autoregressive process) and public revenues. In the case of public revenue they exhibit both; economic situation and they turn into public expenditure, which often affect small, local companies conditions.

Thirdly, an important part of the study is to pay attention to the choice of measures. In the case of used indicator showed, a high degree of autocorrelation, which made difficulties in identifying other determinants. In the course of further research, one should consider the exploration and selection of other measures well describing the investigated process.

References:

1.   Adamczyk W., Ewolucja form i typów przedsiębiorczości, Zeszyty Naukowe Akademii Ekonomicznej nr 236, Poznań 1995.

2. Chrapek G., Przedsiębiorczość osób fizycznych na obszarach wiejskich Podkarpacia, [w:] Rola przedsiębiorczości w kształtowaniu społeczeństwa informacyjnego, Seria Przedsiębiorczość – Edukacja, Zakład Przedsiębiorczości i Gospodarki Przestrzennej Instytutu Geografii Uniwersytetu Pedagogicznego w Krakowie, Warszawa-Kkrwków 2009.

3. Godlewska H., „Lokalizacja działalności gospodarczej", Dom Wydawniczy ELIPSA, Warszawa, 2001.

4. Greene, W. H. (2005). Econometric Analysis, Prentice Hall, New York.

5. Gryffin R. W., Podstawy zarządzania organizacjami, PWN, Warszawa 1997.

6. Jezierska-Thole A., Zmiany poziomu infrastruktury i jej wpływ na rozwój przedsiębiorczości na obszarach wiejskich na przykładzie województwa kujawsko-pomorskiego i pomorskiego, Acta Acientum Polonorium, Oeconomia 9 (3) 2010.

7. Kalkan M., Kaygusuz C., The Psyhology of Enterpreneurship [In] Entrepreneurship – Born, Made and Educated, Ed. T. Burger-Helmchen, Rijeka, 2012.

8. Szarecki A. Przedsiębiorczość jako forma kultury, „Problemy Zarządzania", nr 2. 2008.

9. Talaga, L., Zieliński, Z. (1986), Analiza spektralna w modelowaniu ekonometrycznym (Spectral analysis in econometric modeling), PWN, Warszawa.

10. Timmons J., New Venture Creation, Irvin, Boston 1990.

11. Wooldridge, J.M. (2010). Econometric analysis of cross section and panel data, Massachusetts Institute of Technology.