Abstract: In the context of the present economic crisis, entrepreneurship has re-emerged as a topic of interest both for policy makers worldwide as well as for academic research. A wide range of psychological, economic and sociological factors influencing entrepreneurial activity is presented by the existing literature. The aim of this paper is to identify the economic and institutional factors that influenced entrepreneurial activity both before and during the crisis. Data for 27 countries worldwide from Global Entrepreneurship Monitor, World Bank World Development Indicators and World Bank’s Worldwide Governance Indicators international databases were collected for the years 2007, 2009 and 2012. A three stage empirical research was conducted: a comparative analysis of the distribution of the selected variables for the three years, principal components analysis in order to provide an image of the intensity and direction of the relationship between the variables and to characterize the statistical units and econometric modelling to describe the variation of entrepreneurial activity in relation with its economic and institutional determinants. Contrary to expectations, the research findings show that before the crisis, the variation of entrepreneurial activity is explained by the negative influence of the perceived confidence in the rules of society and during the crisis it is negatively influenced by the perceived government effectiveness. The limitations of the research are also presented.

Keywords: entrepreneurial activity; total early-stage activity (TEA); crisis; Principal Component Analysis method (PCA); econometric model.

JEL classification: C10; L26; M13; O40.
are studies exploring the relationship between cultural dimensions and entrepreneurial behaviour (Lee and Petersen, 2000).

The economic perspective brings forward the idea that the economic factors are the ones which mostly influence entrepreneurial activity (Wennekers et al., 2005). The relationship between variables of the macroeconomic environment and the rate of entrepreneurial activity has been extensively explored in literature. The burden of regulations such as, high costs of entry, and bureaucracy costs were proven to be obstacles to entrepreneurial activity (Klapper et al., 2004). Institutional features such as, the tax environment, government size, the level of trust, corruption, the level of financial development (Giannetti, 2003), market conditions such as size and growth (Davidsson et al., 1994) also impact upon the level of entrepreneurship development. The relationship between unemployment and entrepreneurship is an ambiguous one: some researchers argue that unemployment has a positive effect on entrepreneurship (Martinez-Granado, 2002) while others demonstrate that higher unemployment levels are associated with low entrepreneurial activity (Storey and Johnson, 1987).

The aim of this paper is to identify the economic and institutional factors that influence entrepreneurial activity both before and during the crisis. Section 2 describes the research design and methods and in Section 3 we present and discuss the research results. The last part of the paper briefly summarizes the conclusions.

2. Data and methodology

2.1. Data

To measure the level of entrepreneurial activity this paper uses Total Early-Stage Entrepreneurial Activity (TEA) from Global Entrepreneurship Monitor (GEM) (http://www.gemconsortium.org/key-indicators), as the dependent variable. The variable describes the percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business.

Data for the independent variables describing the economic context – GDP growth (RGDP, annual percentage growth rate of GDP at market prices based on constant local currency), Total tax rate (TTR, the amount of taxes and mandatory contributions payable by businesses after accounting for allowable deductions and exemptions, as a share of commercial profits), Unemployment (UR, the share of the labour force that is without work but available for and seeking employment) and Inflation (IR, the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services) – were collected from the World Bank, World Development Indicators (WDI) database (http://data.worldbank.org/indicator).

The data for the institutional environment – Government effectiveness, Voice and accountability, Control of corruption, Regulatory quality and Rule of Law – were retrieved from the World Bank’s Worldwide Governance Indicators (WGI, http://info.worldbank.org/governance/wgi/index.aspx#home) database. They reflect (Kaufmann et al., 2010):

- Government effectiveness (GEF): perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies.
- Voice and accountability (VA): perceptions of the extent to which a country’s citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and a free media.
- Control of corruption (CC): perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests.
- Regulatory quality (RQ): *perceptions of the ability of the government to formulate and implement sound policies and regulations which permit and promote private sector development.*
- Rule of Law (RL): *perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.*

Data are registered at the level of years 2007, 2009 and 2012. Data are processed in SPSS (Jaba and Grama, 2004: 98-111, 232-259).

2.2. Sample

Our sample includes 27 countries worldwide, selected based on data availability for the three years mentioned above: Argentina, Belgium, Brazil, Chile, China, Colombia, Croatia, Denmark, Finland, France, Greece, Hungary, Israel, Italy, Japan, Latvia, Netherlands, Norway, Peru, Romania, Russia, Slovenia, Spain, Switzerland, United Kingdom, USA, Uruguay.

2.3. Methods

The empirical research has three stages. The first step is to **analyse the distributions of the considered variables** followed by testing the equality of the average level of a phenomenon between the considered moments in time. The analysis of the distributions of the considered variables consists in identifying the outlier points using box-plot diagram and checking normality of distribution, which is a prerequisite of many methods and statistical techniques. Student-t test is most often used to check the equality of the average of two paired samples (Bluman, 2004: 431-492). Applying this test is appropriate if the distributions of the sample are normal or approximately normal. The normality of the sample is observed if certain conditions are met: i) the population distribution is normal; ii) the sample data are symmetric, unimodal, without outliers, and the sample size is less than 15 observations; iii) The sample data are slightly skewed skewed, unimodal, without outliers, and the sample size is 16 to 40 observations; iv) sample size is greater than 40 observations. We also use the nonparametric Wilcoxon test (Siegel, 1991: 99). Wilcoxon test is less restrictive than Student-t test, assuming only the following conditions: i) the analyzed variables are continuous; ii) there are no restrictions on the distribution of deviations between the values of the two paired samples; iii) subjects may belong to different populations.

The second part of the research is **Principal Components Analysis (PCA method).** Considering data dimensionality, a synthetic image of the intensity and direction of the relationship between them can be obtained with PCA (Pintilescu, 2007: 30-109). The results obtained by applying PCA for the three years show that the application of this method is adequate for analysing the considered variables.

The last part consists in **elaborating an econometric model** to describe the variation of Total Early-Stage Entrepreneurial (TEA) in relation to the independent factors identified by correlation analysis and using the information obtained with PCA. The model will be validated by testing the significance of the regression parameters and of statistical hypotheses (Maddala, 1999: 197-291; Gujarati, 1995: 319-446; Jula and Jula, 2010: 163-250): the normality assumption (Kolmogorov-Smirnov test), absence of autocorrelation (Durbin Watson test), errors’ homoscedasticity (Correlogram squared residuals), multicollinearity hypothesis (VIF and TOL indicators).
3. Empirical results
3.1. The analysis of the distributions of the considered variables
The comparative analysis of the distribution of TEA for the three years (Figure 1) highlights the following aspects: there are differences in the average level of the phenomenon, with increases from 2007 to 2012; the distributions for 2007 and 2009 display outliers and all distributions are positively skewed.

![Figure 1: The comparative representation of the distribution of TEA in 2007, 2009 and 2012](image)

The normality of the distribution of TEA is checked with Jarque Bera test. The results are presented in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>JB</th>
<th>Probability</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEA_2007</td>
<td>15.925</td>
<td>0.000</td>
<td>Hypothesis $H_0$ is rejected</td>
</tr>
<tr>
<td>TEA_2009</td>
<td>5.622</td>
<td>0.060</td>
<td>Hypothesis $H_0$ is not rejected</td>
</tr>
<tr>
<td>TEA_2012</td>
<td>3.892</td>
<td>0.143</td>
<td>Hypothesis $H_0$ is not rejected</td>
</tr>
</tbody>
</table>

TEA follows a normal distribution only in 2009 and 2012. In 2007, the distribution is affected by strong outliers, leading to failure of normal distribution law.

Further, we check whether the differences between the average level of TEA for the years considered are statistically significant. Student-t test is most often used to check the equality of the average of two paired samples. The assumptions of Student-t test are met by the distributions of TEA for 2009 and 2012, but not for 2007, which displays outliers and a strong positive skewness. Consequently, the Student test can be applied to check the equality of the average level of TEA for 2009 and 2012. For the other comparisons we can use the nonparametric Wilcoxon test.

The results of Student and Wilcoxon tests are presented in Table 2.
Table 2: The results of the tests on the equality of the average levels of two paired samples, for TEA, in 2007, 2009 and 2012

<table>
<thead>
<tr>
<th>Variables</th>
<th>Statistic test</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEA_2007 &amp; TEA_2009</td>
<td>Wilcoxon Z*</td>
<td>Hypothesis $H_0$ is not rejected</td>
</tr>
<tr>
<td></td>
<td>-1.194 (0.233)**</td>
<td></td>
</tr>
<tr>
<td>TEA_2007 &amp; TEA_2012</td>
<td>Wilcoxon Z</td>
<td>Hypothesis $H_0$ is rejected</td>
</tr>
<tr>
<td></td>
<td>-2.273 (0.023)</td>
<td></td>
</tr>
<tr>
<td>TEA_2009 &amp; TEA_2012</td>
<td>Student t</td>
<td>Hypothesis $H_0$ is rejected</td>
</tr>
<tr>
<td></td>
<td>-2.006 (0.055)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wilcoxon Z</td>
<td>Hypothesis $H_0$ is rejected</td>
</tr>
<tr>
<td></td>
<td>-2.185 (0.029)</td>
<td></td>
</tr>
</tbody>
</table>

* For samples greater than 25 observations, the distribution of Wilcoxon statistic tends to the normal distribution Z.

** In parentheses are shown the probabilities attached to the calculated values of the tests.

The distribution of TEA shows no statistically significant variations between 2007 and 2009. The differences are significant between 2009 and 2012 and, more pronounced, between 2007 and 2012.

We check if the variables considered registered significant variations between the moments "before and after" the economic crisis. The results for the five variables (RGDP, CC, GEF, RL and VA), the most representatives for the present research, are presented. In the same manner as presented above for the analysis on TEA, we check if the independent variables meet the normality assumptions required by Student-t test. With the exception VA variable, which does not follow a normal distribution, displaying outliers, negative (figure 3) and having the value of JB statistics higher than the critical value $\chi^2_{\alpha, 2}$, all the other variables are normally distributed.

![Figure 2](image1.png)  ![Figure 3](image2.png)

**Figure 2.** The comparative representation of the distribution of RGDP, in 2007, 2009 and 2012  
**Figure 3.** The comparative representation of the distribution of VA, in 2007, 2009 and 2012

Testing the equality of the average levels of the independent variables considered, corresponding to the paired samples 2007-2009, 2007-2012 and 2009-2012, shows
significant differences only for economic growth rate, which can be also visualised in the box plot diagram above (figure 2).

3.2. Principal Components Analysis (PCA method)

The value of the Correlation Matrix determinant is close to zero and shows that there are strong relations between the statistical variables.

The computed value of $\chi^2$ statistic and its associated probability ($\chi^2_{2007} = 261.201$, $Prob_{2007} = 0.000$; $\chi^2_{2009} = 260.962$, $Prob_{2009} = 0.000$; $\chi^2_{2012} = 2685.109$, $Prob_{2012} = 0.000$) allows us to reject the null hypothesis and accept the existence of significant relations between variables.

The same results are indicated by the value of KMO test-statistic which shows that PCA is adequate: $KMO_{2007} = 0.789$; $KMO_{2009} = 0.800$; $KMO_{2012} = 0.793$.

The share of the variance of the variables extracted by factorial axes shows the correlation of the variables with the axes. For all variables we obtained high values for the extracted variances. The values of the extracted variances of TEA are satisfactory: $\sigma^2_{extr, 2007} = 0.374$; $\sigma^2_{extr, 2009} = 0.623$; $\sigma^2_{extr, 2007} = 0.567$.

The first two factorial axes meet the Kaiser criterion and cumulatively explain an important share of the total variance: 2007 – 74.1227%; 2009 – 73.607%; 2012 – 73.879%. We made an option to keep only the first two factorial axes for an easier interpretation of the results.

The representation of variables on the two first factorial axes allows us to identify the direction and the intensity of the relation between them (figures 4 and 5).

![Figure 4: Variables’ positions on the first two factorial axes, 2007](image)

![Figure 5: Variables’ positions on the first two factorial axes, 2012](image)

Analysing the contribution of the variables $X_j$, $j = 1, 10$, to the formation of the factorial axes, we found the following:

- In 2007, the first factorial axis is explained by all the analysed variables; the second factorial axis is explained by unemployment rate (UR), total tax rate (TTR) and economic growth rate (RGDP);
- In 2012, the first factorial axis is explained by all institutional factors, which are situated in the opposite quadrant with unemployment rate (UR) and total tax rate...
(TTR); the second factorial axis is explained by economic growth rate (RGDP), TEA, UR and CC.

Figure 6: Countries’ position on the first two factorial axes, 2007

TEA and the institutional factors are situated in opposite quadrants, being negatively correlated. TEA and RGDP are situated close to each other, so they are strongly positively correlated. Between 2007 and 2012, the institutional factors have slightly modified their position on the map while the macroeconomic indicators (UR, IR, RGDP) and TEA register significant modifications.

Figure 7: Countries’ position on the first two factorial axes, 2012

Countries’ position on the first two factorial axes highlights the following aspects: i) on the right side of the map we notice mostly the developed (ex. Norway, Sweden, Finland), with good institutions (high values for the institutional factors) ii) the developed countries register low values for TEA; iii) on the left side of the map there are the less developed countries, with high level of TEA showing that entrepreneurship is supported and it is seen as a factor of development; iv) in 2012, compared to 2007, countries’ positioning indicates their migration towards the institutional factors, which shows a positive trend of these indicators.
3.3. Econometric modelling

The first step in elaborating an econometric model to explain the variation of TEA consists in identifying the independent variables which influence it. We applied Pearson correlation analysis and we considered the results obtained above with PCA. Taking into account the significance of the correlation coefficient, for the years considered, TEA is negatively correlated with all institutional indicators and positively correlated with economic growth rate. This aspect was also noticed in the maps obtained in Figures 4 and 5 with PCA. TEA is not correlated with unemployment rate, inflation and total tax rate. We estimate the regression model using Backward method.

The estimated equations of the three models are:

2007 - \( TEA_i = \beta_0 + \beta_1 RL_i - 10.981 - 3.384 RL_i \)

2009 - \( TEA_i = \beta_0 + \beta_1 RGDP_i + \beta_2 GEF_i = 13.349 + 0.539 RGDP_i - 2.966 GEF_i \)

2012 - \( TEA_i = \beta_0 + \beta_1 RGDP_i + \beta_2 GEF_i = 10.695 + 0.981 RGDP_i - 2.129 GEF_i \)

At the level of 2007, the variation of TEA is explained by the negative influence of the variable rule of Law (RL). The regression model has the same form for 2009 and 2012, the predictors of TEA being the economic growth rate (RGDP) with positive influence and government effectiveness (GEF), with negative influence.

The coefficients of the regression model are statistically significant for a significance level of 5%, except for the coefficient of GEF which, in the model for 2012, is significant if accepting a risk of 10%.

The standardised regression coefficients from the multiple models corresponding to 2009 and 2012 allow establishing a hierarchy of the variables within the model. So, in both models, the variable RGDP has a stronger influence on TEA than the variable GEF.

The coefficient of determination (R-squared) shows that, in 2007 the variation of TEA is explained to a small extent by our model (28.6%). In 2009 and 2012, 51.5% and, respectively, 44.4% of the variation of TEA is explained by the cumulative variation of RGDP and GEF.

The validation of the regression model is done by testing the hypotheses of the regression errors.

According to Kolmogorov-Smirnov test, the regression errors display a normal distribution: \( \text{Prob}_{2007} = 0.910 > (\alpha = 0.05) \); \( \text{Prob}_{2009} = 0.953 > (\alpha = 0.05) \);

\( \text{Prob}_{2012} = 0.937 > (\alpha = 0.05) \), for a risk of 5%.

The absence of autocorrelation is checked with Durbin-Watson test. The computed values for each of the three models \( (dw_{2007} = 1.593; \ dw_{2009} = 1.913; \ dw_{2012} = 2.011) \) are located in the range where the null hypothesis can be accepted and, consequently, the errors are not autocorrelated.

The homoscedasticity assumption is checked with Correlogram squared residuals (Figure 8 and 9). It can be noticed that the autocorrelation function does not display significant peaks. The squared residuals, representing their dispersions, are not autocorrelated and the homoscedasticity assumption is accepted. The Correlogram squared residuals for the model corresponding to 2009 has the same characteristics.
The multicollinearity of the independent variables from the regression models is verified by analyzing the indicators VIF (Variation Inflation Factor) and TOL (Tolerance). All the values registered for VIF, corresponding to the independent variables in the models for 2009 and 2012 are low (VIF2009=1.043; VIF2012=1.050), and the values for TOL are high (TOL2009=0.959; TOL2012=0.953). This leads to the acceptance of the null hypothesis that there is no collinearity of the independent variables.

To conclude, the regression models are validated. TEA dynamics is significantly, but to a small extent, explained by variables such as economic growth rate, rule of law and government effectiveness.

4. Conclusions

This paper aimed at identifying the factors which influence entrepreneurial activity in times of crisis. Statistical analyses were performed for several moments in time, in order to provide an image of these factors and their dynamics before and after the appearance of the economic crisis.

Entrepreneurial activity, measured with the percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business, shows no statistically significant variations between 2007 and 2009. The differences are significant between 2009 and 2012 and, more pronounced, between 2007 and 2012. We can say that the crisis has impacted upon entrepreneurship development.

Out of the independent variables only economic growth rate registers significant variations in the analysed period. The results reflect the reality of the crisis which hampered the possibilities for economic growth and brought significant decreases in the GDP growth rate at its beginnings and slight increases starting with 2010.

Entrepreneurial activity is positively correlated with economic growth rate. Also, between 2007 and 2012, the institutional factors have registered only slight variations while the macroeconomic indicators, unemployment rate and inflation rate, registered significant variations.

When characterizing the countries included in the sample, we notice that the developed countries (Norway, Sweden, and Finland) register low levels of entrepreneurial activity and high values for institutional quality. The opposite situation characterizes the less developed countries. This result can be explained if taking into consideration the fact that the countries with very good governance impose heavy taxation.
Contrary to expectations, the findings show that in 2007, before the crisis, the variation of entrepreneurial activity is explained by the negative influence of the Rule of law, i.e. the perceived confidence in the rules of society and the quality of contract enforcement, and property rights. In the same manner, in 2009 and 2012, entrepreneurial activity is negatively influenced by the perceived government effectiveness.

When interpreting the results we should be aware of the limitations of the research which come from the sample size and representativeness due to data availability.

References


