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Small and medium enterprises led-growth in two Adriatic countries: Granger causality approach

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ABSTRACT

This paper investigates causal relationships between gross domestic product (GDP) and the number of small and medium sized enterprises (SMEs) controlled for unemployment rates (UNR) within Slovenia and Croatia. Macro-economic time series data on GDP, SMEs and UNR are analysed in a unit root framework and applied regression analysis. These processes are known as the Johansen co-integration test and Granger-Causality-test. The results show that UNR, GDP and SMEs did not have causal relationships in Croatia between January 2008 and December 2013. UNR and SMEs have a bidirectional relationship in Slovenia with a greater number of SMEs per capita than in Croatia. During their economic recovery period between January 2014 and December 2017, Slovenia and Croatia have experienced the causal unidirectional relation from SMEs to GDP as a positive signal under seen to policy makers on usefulness of investment in SMEs during economic prosperity. The results of a vector autoregressive model suggest a 1% change in the number of SMEs in Croatia decreases GDP in the time of crisis by almost 1.8%. For Slovenia, there is no statistically significant cointegration vector pertained to SMEs-led growth. Finally, the unidirectional causality relation from SMEs to UNR is statistically significant for Slovenia.

1. Introduction

Prior to the collapse of former Yugoslav economy, gross domestic product (GDP) declined and recession continued in Slovenia and Croatia at the beginning of the 1990s. During this time, the two western Adriatic countries introduced measures for transition from a centrally planned, or self-management system, to a market economy which aimed to join the European Union (EU) (Bojnec, 2000, 2002; Uravić & Šugar, 2009; Cohen, 2018).

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The focus of this paper is to investigate the cyclical nature of economic development during the most recent economic-financial crisis and the recovery period of the aforementioned countries. The cyclical nature in economic development is analysed in association with labour market changes and entrepreneurial involvements following economic liberalisation and market deregulation (Južnik Rotar, 2019). This study aims to investigate causalities between growth of GDP, the number of small and medium enterprises (SMEs), and rates of unemployment (UNR) using advanced econometric research methods (Gričar & Bojnec, 2012; 2018; Popović & Erić, 2018).

Thus far, there is no previous study to focus on SMEs-led growth of GDP in Croatia and Slovenia, controlled by UNR during times when economic and policy shocks appear in macro-economic, i.e., GDP, time series. Slovenia and Croatia are export-oriented economies with exports representing more than 70% of GDP (Trošt & Bojnec, 2015).

Additionally, we introduced a consumer price index (CPI) as an external variable for stable and normality-modelled model in the data vector (Juselius, 2009). The scientific contribution of the article exists within the analysis of dynamic interactions between macroeconomic variables and the number of SMEs. This is achieved by applying the vector autoregressive model (VAR) and Granger causality co-movements.

The goal of our research is to connect the ideas of two similar countries in one survey, using secondary data and applied advanced econometric methods on time series. As the applied techniques in both countries are rare, the results contribute to the theory of an economic view on SMEs and external environment in which SMEs are operating in both countries. Moreover, the policy makers would have access to the information basis and background for new ideas and view why investing in SMEs during the expansion period is crucial. The theoretical point of view considers neglecting the SMEs advantages in reducing unemployment rates during crisis and the role of SMEs in economic recovery.

The data cover two sub periods; it starts with the economic crisis in 2008 and concludes with economic expansion in 2017. Moreover, the article includes December 2007 to reduce problems with the degree of freedom when time series data are in the model. Relative data are interpreted on a base period from January 2008 = 100 using the chain base method, whereas December 2007 is an obligatory section.

The paper is structured as follows. The next section presents an overview of previous empirical researches, in conjunction with developed hypotheses. In the following sections, we will also discuss the data, introduce the applied methodology, present inference/results from the study and argue their implications for GDP growth. The final section demonstrates the main conclusion and possible direction for further research.

2. Literature overview

Following the collapse of former Yugoslavia in 1991, Croatia and Slovenia became independent. Kukar (1996) indicated that the former Yugoslavia was one of the most heterogeneous European countries regarding historical, geographical, national and cultural points of view. Vitić and Ringer (2008) highlighted that Croatia and Slovenia

share a common history from former Yugoslavia. Since 1991, the development trajectory of each country has proved divergent. Slovenia joined the EU in 2004, whereas Croatia followed later in 2013 (Platt, 2018; Božić & Rajh, 2016).

Prior to the disbanding of former Yugoslavia in 1989, a *big-bang* macro-economic stabilisation programme with liberalisation was introduced. The aim of this programme was the privatisation and restructuring of the economy (Bojnec, 1996). The number of SMEs has increased and represents the basis of national economy, research, development, product innovation (Bojnec, 2001) and expansion of SMEs entrepreneurship is an essential EU priority (European Commission, 2018a)

Significant attention within the literature draws attention to the changes and effects of macroeconomic environments on business revenues (Tomas Žiković, 2016). However, the role of economic growth based on SMEs has been neglected (Bojnec, 2001). Therefore, our aim is to underline the role of SMEs in economic growth using macroeconomic data. Our study contributes to literature on researches, which initially started in Singapore (Tilak & Meng, 2002) and later applied to other countries (Cahyadin, 2017; Mahadea & Kaseeram, 2018) including Central European (Nölke & Vliegenthart, 2009), and Adriatic-Mediterranean economies (Kaynak, Altuntas, & Dereli, 2017; Čengić, 2017).

This article aims to augment the research literature by investigating the dynamic causal relationship between real growth of GDP and the number of SMEs, which is controlled by UNR. Table 1 demonstrates recent literature and previous empirical results based on the theme discussed in this paper. The data for analysed macroeconomic variables is obtained from secondary data sources for Croatia and Slovenia.

The recent paper by Popović & Erić, 2018 investigates links between SMEs development and investments, taking into account former Yugoslav countries excluding Slovenia, while Kontošić Pamić and Belullo (2018) investigated Croatia. Our focus on SMEs development fills the gap in time series analysis and relevant literature regarding Slovenia.

According to Organisation for Economic Co-operation and Development (OECD, 2015) SMEs in Slovenia are creating new jobs with high value added.

Baric, Franic, and Polak (2016) argued the importance of informal entrepreneurship and undeclared work in Croatia's SMEs. According to the actual and credible data sources, CEPOR (2018) and SORS (2018), the number of SMEs and SMEs per capita in Croatia are less than in Slovenia. However, SMEs constitute the most dynamic sector

Table 1. Literature review.

Authors	Content
Aboal et al. (2015)	Employment and innovation, developing countries
Božić and Rajh (2016)	The factors constraining innovation performance of SMEs in Croatia
Cahyadin (2017)	The relationship between macroeconomic variables and small-and-medium-enterprises in Indonesia
de Elejalde, Giuliodori, and Stucchi (2015)	Employment and innovation: firm-level evidence from Argentina
Gričar and Bojnec (2018)	Granger Causalities, Slovenia
Gričar et al. (2016)	Granger Causalities, Slovenia and Montenegro
Mahadea and Kaseeram (2018)	GDP, unemployment and entrepreneurship
Mamman et al. (2019)	SMEs, GDP growth and unemployment
Nelson and Winter (1982)	GDP growth theory
Potočan and Nedelko (2014)	SMEs in Slovenia
Ramadani and Dana (2013)	Entrepreneurship in the Balkans
Vitić and Ringer (2008)	Historical path of Slovenia and Croatia

of their economies, relative to large enterprises. Generally, the SME sector comprises of relatively younger, more leveraged, more profitable and faster growing enterprises and flexible operations (Klapper, Sarria-Allende, & Sulla, 2002; Širec & Močnik, 2016).

Enterprises of all sizes seek to innovate in order to gain competitive advantages. In turn, this creates positive economic flows and market dynamics that support employment, as well as the creation and entry of new enterprises. Therefore, taxation of labour on job creation and unemployment is crucial (Kosi & Bojnec, 2006).

Modern enterprises, including SMEs, face at least two important challenges: (a) how to satisfy customer requirements and (b) how to make their business requisitely innovative to maximise customer satisfaction with their organisation, products and services more than their competitors (Lafley & Johnson, 2010; Mawson & Brown, 2017). Consequently, SMEs should create and implement a holistic development similar to, or greater than, the bigger enterprises.

Meeting these requirements depends on influential persons, not only on the institutional order alone (Potočan & Nedelko, 2014), although business policy matters (Dankova, Valeva, & Štrukelj, 2015). Romero and Martinez-Roman (2012) discerned that education appears as a key factor, one with an impact on innovation that comes through two main sources: its effect on self-employed motivations, and its influence on the management style of small enterprises. SMEs can encourage the sustainable development of different concepts in new economy, such as a promising creative economy, which inter-relates creativity, knowledge and innovation economies (Dabič, Potočan, & Nedelko, 2017).

Several recent studies (Ramadani & Dana, 2013; Yordanova, 2015; Dachs, Hud, Koehler, & Peters, 2017) have discussed the importance of entrepreneurship. Nevertheless, seldom are studies conducted that discuss the rank of impact on independent macroeconomic time series variables on GDP growth contributed by SMEs in Slovenia and Croatia. In recent years, a supportive environment has improved in analysed countries. A multitude of new measures have helped SME growth, including: the reduction of administrative burdens to establish a company, subsidies for the innovative start-ups, a voucher system for training potential entrepreneurs and rising enterprises, business incubators, technology parks and business accelerators with financial, mentoring, consulting and infrastructural products in one place. The authorities in Slovenia are already replacing investment subsidies by offering low cost loans to enterprises. Structural reforms, public policies and programmes related to insolvency of SMEs can create a business environment that helps entrepreneurs to develop viable businesses and create new enterprises and employment opportunities.

In contrast to Slovenia, Croatia maintains barriers to SME development (European Commission, 2017). Božić and Rajh (2016) discussed 94 examples of SMEs, based on the barriers of developing innovative performance in Croatia. They discerned three factors where the most significant impact has financial limitations and the less expanded are organisational restrictions. Whereas in Slovenia the most explosive barrier is external financing. In addition, Močnik and Širec (2016) argue for further increases in female entrepreneurship in Slovenia. This outcome resonates with findings in Indonesian regarding female SMEs by Tambunan (2007). According to the

Growth Competitiveness Report, none of the countries, i.e., Croatia and Slovenia, can be considered as either technologically developed or globally competitive.

de Elejalde, Giuliodori, and Stucchi (2015) in particular quantified the effect of economic growth on employment growth and skill composition. Their results show that product innovations of SMEs have a positive effect on employment growth biased towards skilled labour. There are no heterogeneous effects in technology intensity and size. Most of the contraction in employment in this period was explained by non-innovators. Some findings echo previous research by Rodica, Starc, and Konda (2014). They studied developing potentials and innovations of Slovenian enterprises. Micro level results demonstrate that the enterprises studied have jointly agreed that the employees' innovations should be collected in the enterprises. Moreover, Južnik Rotar (2014) discuss that entrepreneurship contributes to the decline of youth unemployment where there is a need for independence, achievement and problem solving, which are the primary incentives towards entrepreneurial tendency. Aboal, Garda, Lanzilotta, and Perera (2015) argue that the effect of SMEs growth on employment is positive. Our focus is on the pattern of development in the number of SMEs.

We have developed five hypotheses regarding causalities between the number of SMEs, GDP growth and UNR: SMEs-led GDP growth, bi-directional causal relationship and no relationship between SMEs and GDP growth, and between SMEs and UNR.

H1 *The first causal hypothesis for Slovenia and Croatia indicates a one-way relationship between SMEs-led growth to GDP growth. When this cannot be rejected, a greater attention to SMEs development can increase GDP growth.*

Mahadea and Kaseeram (2018) argue that economic growth and entrepreneurship can be viewed endogenously as a virtuous circle where innovations and economic advancement, in turn, create more entrepreneurial opportunities. Consequentially, they claim that such growth generates incentives for potential entrepreneurs to become alert, thus creating wealth and leading to sustained economic growth.

H2 *The reverse causality exhibits a causal nexus from GDP growth to SMEs' expansion. The GDP expansion may enhance SMEs growth.*

Nelson and Winter (1982, p. 206) discuss the 'prediction and illumination of the macroeconomic patterns of growth to the fruitful integration of understanding what happens at micro level. The key ideas of evolutionary theory have been laid out. Enterprises at any time are viewed as possessing various capabilities, procedures, and decision rules that determine what they do given external conditions'.

H3 *The two-way causal relationship exists in the reciprocal hypothesis. The latter benefits both SMEs expansions and GDP growth by exerting a dynamic interaction in both areas for the analysed countries.*

The increasing acknowledgement of SMEs contribution in economic growth and reducing unemployment motivates necessary research into understanding the role and impact of the SMEs policy and outcomes (Mamman, Bawole, Agbebi, & Alhassand, 2019). Entrepreneurship, in all its complexity, is crucial for economic growth at various local and geographical levels, as argued by Kontošić Pamić and Belullo (2018).

H4 *There is no relationship between SMEs and GDP growth in either Slovenia nor Croatia. Under special conditions, SMEs and GDP growth do not have significant consequences on each other. In this case, SMEs growth or GDP expansion may not bring anticipated outcomes.*

Neoclassical theory has provided a way of looking at certain macroeconomic patterns of growth. However, it has been unsuccessful in adapting to the phenomena of technological change. Relatedly, that theory stands as an obstacle in thinking about SMEs phenomena and macroeconomic phenomena within the same intellectual frame (Nelson & Winter, 1982).

H5 *The rate of growth in SMEs is important for reduction of unemployment in the analysed countries.*

Regarding the H5, micro enterprises that are part of SMEs can be important for increasing employment and the reduction of unemployment. The micro enterprises in question achieve this by providing over one third of all jobs in Slovenia. Slovenian SMEs employ on average 3.2 people, slightly below the EU average of 3.9 (European Commission, 2018a). Overall employment growth in Croatia was encouraged primarily by a strong growth in small enterprises, employment within which increased by 22.7% during the period 2012–2016 (European Commission, 2017). de Elejalde et al. (2015) found that SMEs have a positive impact on employment growth.

3. Data sample

For the analysis we used time series data. The data vector varies for the economic crisis period between January 2008 and December 2013. These variables are in conjunction with the economic recovery period up to available dates, i.e., December 2017 for the following three variables: the number of SMEs, UNR and growth of GDP. We decided on credible results, therefore using seasonal and cyclically unadjusted data. Such data demonstrate the data contents or, what does data tell us (Gričar & Bojnec, 2016). The latter means that we clearly, without losing information, recognise the statistically significant structural changes, e.g., stochastic trends. This is a crucial step in the unit root time series analysis. Otherwise, if the stochastic tends are not recognised we cannot check or recognise the economic policy measures, the government decisions, environmental or social change in enterprise models (Dwyer, 2018). The adjusted data usually lead to deterministic trends, which contrasts stochastic trends. A deterministic trend in unit root time series provides spurious results where no autocorrelation, normality and stability are performed. The latter are crucial steps in unit root time series analysis and therefore also presented in our survey.

The frequency of secondary time series data varies. Certain macroeconomic variables are reported only on a quarterly basis, such as with GDPs. In other cases, other variables are annually, as is the case with a number of SMEs (Figure 1). However, there are other macroeconomic aggregates that are available on a monthly basis, e.g., UNR and CPI. The GDP quarterly time series data are in current prices obtained from Eurostat. UNR is in percent value per month and obtained from Eurostat. CPI indices are obtained from the Eurostat as index change to previous months where 2015 = 100 (Eurostat, 2018).
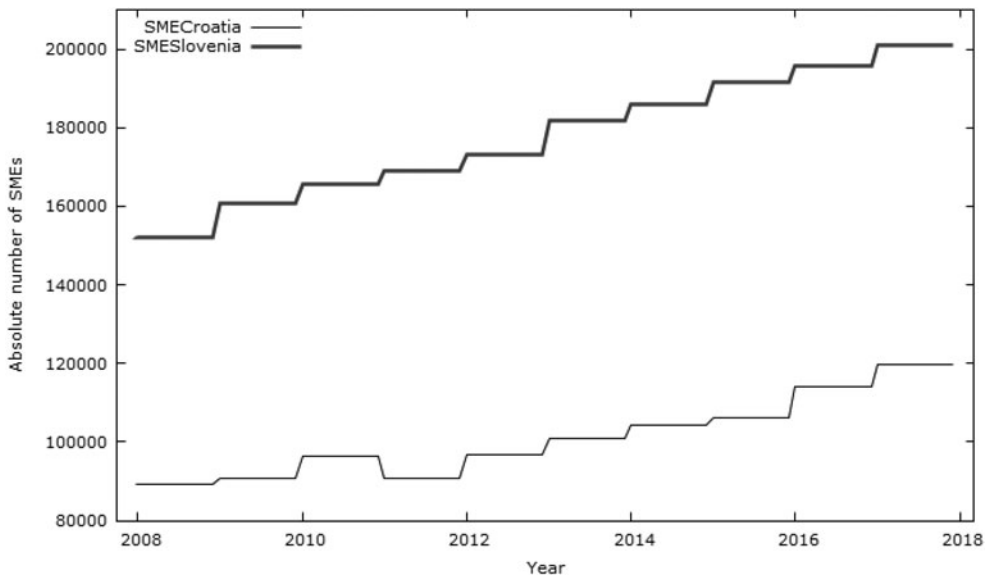
Figure 1. Number of SMEs in Croatia and Slovenia, January 2008–December 2017.

The annual data of SMEs are reported as the number of SMEs – micro, small, and medium size enterprises – with up to 250 employees (number of employees was the limitation for determination of the size). Data for the number of SMEs in Slovenia is obtained from the Statistical Office of the Republic of Slovenia (SORS, 2018). While the number of SMEs in Croatia comes from the Centre for Development of SMEs and Entrepreneurship (CEPOR, 2018).

Time series studies should use the lowest frequency of the included variables. In order to do this effectively, we convert the data from annual and quarterly into monthly to match the frequency of monthly data.

4. Methodology

The macroeconomic time series variables are analysed with regression analysis and the causal relationship using Granger causality test. With the multiple regression analysis, we aim to find function $y = f(x)$, which best captures the mutual relationships between the analysed variables:

$$Y_t = \alpha + \beta_i \cdot X_{tj} + \varepsilon_{Hi}, \tag{1}$$

where Y_t is a dependent variable for growth of GDP, X_{tj} are explanatory variables for a/the number of SMEs and UNR, α is an investigating constant, Hi is hypothesis analysed, t stands for time T and ε are undefined errors.

UNR is taken as a determinant to capture the employment capacity of SMEs. We expect that a greater number of SMEs with higher growth of GDP reduce UNR. This hypothesis is formulated through the understanding that improving SMEs can improve the capacity to absorb workers (Cahyadin, 2017).

The Granger Causality test is applied to the analysed time series variables. To test the causality between the variables, we specify a VAR time vector of related time series variables. As part of this process, CPI is introduced as an exogenous (*ex*) variable proposed by Gričar, Bojnec, Karadžič, and Rakočević (2016). Therefore, we can write:

i) for Slovenia (SI):

$$\sim_N^{I(1)}[CPI_{ex}][UNR \ SME \ GDP_Q]_{SI,t}^{T(\sum_{i=1}^{j=0} x_{t-1})_{t\to\infty}}, \tag{2}$$

The abbreviations of the variables are: N is the number of observations (after the unit root test implied), $\sim I(1)$ are the theoretical assumption variables that are integrated at most of first order; Q indicates 'quarterly data', $\sum_{i=1}^{j=0} X_{t-1}$ represents time series in stochastic process, and T represents 'time dependent approach', where $t = 1, \ldots T$, and

ii) for Croatia (HR):

$$\sim_N^{I(1)}[CPI_{ex}][UNR \ SME \ GDP_Q]_{HR,t}^{T(\sum_{i=1}^{j=0} x_{t-1})_{t\to\infty}}. \tag{3}$$

4.1. Unit root test

The unit root test results of the empirical studies may vary substantially depending on various factors. These may include: the sample period, the number of variables included in the model and the statistical techniques used. It is understood that some time series variables may have a unit root in the levels (Juselius, 2009). The proposed solution is performed on the coefficients of co-integrated VAR (CVAR) processes with variables if at least one coefficient matrix is unrestricted under the null hypothesis.

One of the assumptions based on the use of the Granger (1969) Causality test in the analysis is the stationarity of a VAR time series representation. In order to mitigate or eliminate non-stationarity problems, it is possible to use several methodological approaches. A unit root test, for example, is a formal method used for testing the stationarity in time-series data. Alternatively, it is possible to apply what is known as the Augmented Dickey-Fuller (ADF) test. With help from Tau (τ) statistics, the ADF test can determine the validity of the null hypothesis (Trošt & Bojnec, 2015, 2016).

4.2. Co-integration test

In testing the null hypothesis of non-stationarity, the Johansson's (1988) Trace Test is applied to detect long-term relationships between analysed variables in the data. The two-step procedure, formed by Engle and Granger (1987), assumes the existence of only one co-integrating relationship. The general procedure proposed by Johansen (1988) has the advantage of testing all the possible co-integrating relationships. Granger (1969) and Engle and Granger (1987) noted that if two time-series variables are co-integrated, then at least one directional Granger-causation exists. The existence of a stable and long-running relationship (co-integrating relationship) between GDP

growth, number of SMEs and UNR implies that two variables are causally related in at least one direction. The Granger causality tests were performed in order to explain the direction of causation.

4.3. Granger causality test

The causality tests are applied to identify whether a one-time series set causes another time series set, or whether the series are mutually determined by each other. The most widely used is the Granger (1969) causality test (Lütkepohl & Krätzig, 2004). The Granger (1969) causality test is applied to examine whether one variable precedes the other variable, or whether they are contemporaneous. The Granger causality question is whether $x_{t,n}$ causes y_t, to see to what extent the current value of the second variables can be explained by past values of the first variable. The null hypothesis is constructed so that the time series $x_{t,n}$ does not cause the Granger causality y_t, where n is a number of time series included in the analyses.

The Granger causality test can be written in equation as follows, where y_{1t} represents GDP_{t-1}:

$$y_{1,t+h|\Omega_t} = y_{1,t+h|\Omega_t \setminus \{y_{2,s}|s \leq t\}}, \quad h = 1, 2, \ldots \tag{4}$$

The time series with t variables indicate important information in the Ω area with designate space $y_{1,t+h|\Omega_t}$, where $h = i - j$, $t \to \infty$. We can assume that y_{2t} represents Granger non-causality for y_{1t}. Non-causality is assumed only when the results of Equation (4) are satisfied with the same conditions of h. In our example, y_{2t} shows observation of SME_{t-1}. Regardless of the fact that the choice of time lags is a matter of a judgment, the investigation usually starts with a large number of time lags and with the same number for both time series. The number of time lags becomes smaller by omitting those which are not relevant (Lütkepohl & Krätzig, 2004).

E Views runs bi-variate regressions for all possible pairs of series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \ldots = \beta_l = 0. \tag{5}$$

The null hypothesis suggests that variable x does not Granger-cause time series y in the first regression. Secondly, it implies that y does not Granger-cause x in the second regression:

$$y_t = \propto_0 + \propto_1 \cdot y_{t-1} + \ldots + \alpha_1 \cdot y_{t-1} + \beta_1 \cdot x_{t-1} + \ldots + \beta_l \cdot x_{-l} + \epsilon_t, \tag{6}$$

$$x_t = \propto_0 + \propto_1 \cdot x_{t-1} + \ldots + \alpha_1 \cdot x_{t-1} + \beta_1 \cdot y_{t-1} + \ldots + \beta_l \cdot y_{-l} + u_t. \tag{7}$$

We illustrate Granger causalities using a data vector for testing SME-led growth hypotheses for Slovenia and Croatia.

5. Results

5.1. Descriptive statistics

The results of descriptive statistics for the period between January 2008 and December 2017 follow the idea of non-stable macroeconomic variables (Gričar & Bojnec, 2016). The non-normality is expressed by skewness and kurtosis. The results are away from the i.i.d. zero and three, respectively. The results of descriptive statistics in Table 2 demonstrate that Slovenia has a greater number of SMEs than Croatia. The maximum number of Slovenian SMEs in an analysed period is 181,759, whilst in Croatia it is 100,841. The highest unemployment rate in Croatia was around 18%, whereas in Slovenia it was around 11%. The biggest growth rate of GDP in Slovenia was 4%, whereas Croatia demonstrated a 5% growth.

5.2. Regression analysis

We have made a graphical inspection of the variables to determine whether they are explanatory or dependent. The visual inspection yields to the decision whether or not time series variables are normally distributed.

The regression equation for the period between January 2008 and December 2017 for Croatia is:

$$GDP_t = -54.7 - .21 \cdot UNR_t \underset{(-2.98)}{} - .5 \cdot SME_t \underset{(-2.539)}{} + 2.27 \cdot CPI_t \underset{(3.20)}{} + \varepsilon, \tag{8}$$

where Durbin-Watson statistics (D-W) is 0.72 and adjusted deterministic coefficient (R^2) is 0.06. The t-statistics of Student's t-distribution are displayed beneath the t symbol in parenthesis.

The regression equation for the same period in Slovenia is:

$$GDP_t = -130.5 - .07 \cdot UNR_t \underset{(-3.09)}{} - .3^{-1} \cdot SME_t \underset{(-3.09)}{} + 1.5 \cdot CPI_t \underset{(4.18)}{} + \varepsilon, \tag{9}$$

where D-W is 0.9, and R^2 is 0.12.

Table 2. Descriptive statistics and unit root test.

	Mean	Median	Minimum	Maximum	Skewness	Kurtosis
			Slovenia, number of Inh is 2.07 million			
GDP	101.29	100.20	90.59	113.14	0.58	−0.78
UNR	131.75	132.84	75.49	176.47	−0.18	−1.27
SMEs	167.97	164.30	100.00	190.76	−0.63	1.24
CPI	109.27	111.37	99.91	114.76	0.58	1.10
			Croatia, number of Inh is 4.14 million			
GDP	108.23	109.71	93.79	122.90	0.03	1.80
UNR	166.13	171.28	89.36	231.91	−0.49	−0.63
SMEs	123.50	118.95	100.00	146.99	0.55	−0.71
CPI	110.83	113.44	100.00	116.47	0.55	1.14

Note: all variables are expressed in indices with base period January 2008 = 100 using chain base method; GDP – gross domestic product; UNR – unemployment rate; SMEs – small and medium enterprises; CPI – consumer price index; Inh – inhabitants or citizens of the analysed countries and foreign citizens living in the analysed countries, N = 120, T = January 2008–December 2017.

The comparative regression equation for this period between Croatian and Slovenian SMEs is:

$$SME_{tHR} = 4.76 + .026 \cdot SME_{t\ SI \atop (26.85)} + \varepsilon, \tag{10}$$

where D-W is 0.28, and R^2 is 0.85.

Low D-W statistics indicate spurious results, whilst low R^2 results have no explanatory meaning. Figure 2 shows stochastic breaks. Therefore, the unit root test is needed.

5.3. Unit root test

The ADF tests were applied to find the presence of the unit root in the analysed time series. Table 3 demonstrates that all analysed variables for UNR, CPI, SMEs and GDP for Croatia and Slovenia were not stationary in their levels. This is with the exception of Croatian GDP which is stationary in level. In conclusion, there is a presence of the unit root in the variables at levels in the raw data. Therefore, all variables were analysed in the first difference. The ADF test reveals that each analysed variable was stationary in the first difference, or integrated within the order one, i.e., $I(1)$. Moreover, Table 3 indicates that Slovenian SMEs in the crisis period between January 2008–December 2013 variable is integrated near second order, i.e., $I(2)$. Therefore, the time series is transformed by using a logarithm to become stationary in its first level, i.e., $I(1)$. The same procedure is applied for variables CPI for Slovenia and SMEs of both countries between January 2014–December 2017.

The hypothesis of the co-integration rank was investigated by the Johansen (1988) trace test. In order to identify co-integration between variables, the constant is incorporated in the model. The test was made for two sub-periods: (i) period of global
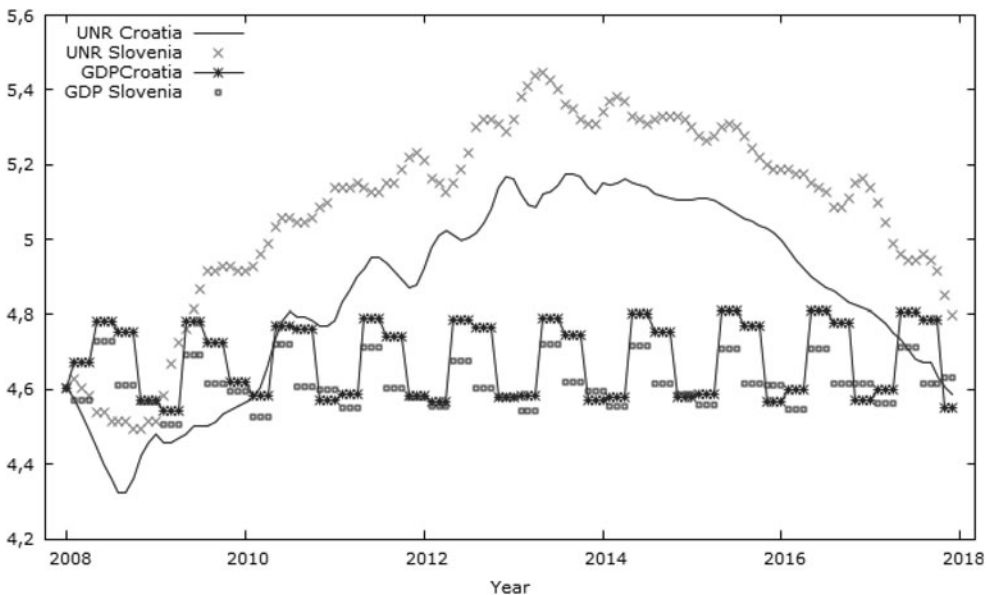

Figure 2. Stochastic trends in times series of SMEs in Croatia and Slovenia, January 2008–December 2017.

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Table 3. Unit root test.

	ADF τ	ADF 1st level	ADF τ	ADF 1st level
	January 2008 – December 2013		January 2014 – December 2017	
	Slovenia			
GDP	−2.13**	−18.4***	−0.07	−36.80***
UNR	−0.87	−5.04***	2.45	−6.03***
SMEs	−0.74	−1.41*	−0.77	−1.52
CPI	−0.56	−6.83***	−1.35	−0.64[1]
	Croatia			
GDP	−4.06***	−5.91***	−3.00***	−19.14***
UNR	−0.10	−6.25***	1.44	−3.71***
SMEs	−1.04	−8.37***	−0.08	−1.22[1]
CPI	−1.45	−5.50***	−4.11***	−4.76***

Note: About variables, see note to Table 2. ADF – Dickey–Fuller test; *, **, *** significance level at 10%, 5%, and 1%, respectively; τ – Kendall's tau coefficient; 1 – has no autocorrelation only when the second order of integration is performed (x_{t-2}).

crisis January 2008–December 2013, and (ii) recovery period between January 2014 and December 2017. Therefore, the co-integrated vector, beta, is normalised on β with exogenous variable CPI_{t-1} for Slovenia during the period of global crisis between January 2008 and December 2013:

$$\prod_{t=08-13}^{n_{SI}} :GDP_{t-1} = -.22 + .2^{-3} \cdot SME_{t-2} \underset{(.37)}{} + .7^{-2} \cdot UNR_{t-1} \underset{(.66)}{}, \tag{11}$$

and the recovery period between January 2014 and December 2017:

$$\prod_{t=14-17}^{n_{SI}} :GDP_{t-1} = -.49 + 8.73 \cdot SME_{t-2} \underset{(3.47)}{} - .5^{-2} \cdot UNR_{t-1} \underset{(-1.27)}{}, \tag{12}$$

where t-statistics of student t-distribution are in parenthesis.

Regarding Slovenia (11), there is no statistically significant association between the analysed variables in the period of global crisis. Therefore, the determinants that are not analysed cause GDP growth. During the recovering period there was extreme growth in Slovenian SMEs (12). These results are consistent with the European Commission (2018) report, stating that the outlook for Slovenian SMEs between 2016and 2018 is optimistic: SMEs added value is predicted to increase during this period. A key issue to be addressed by policy-makers is the lack of a qualified workforce, particularly given the country's predicted economic growth. Special focus should be given to improving the skills of the labour force as one of the main drivers for increasing SMEs productivity (European Commission, 2018a).

We repeated the calculations for Croatia. When analysing the data for Croatia, the results are: for the period of global crisis between January 2008 and December 2013:

$$\prod_{t=08-13}^{n_{HR}} :GDP_{t-1} = .04 - 1.75 \cdot SME_{t-1} \underset{(-149.4)}{} - .7^{-2} \cdot UNR_{t-1} \underset{(-.02)}{}, \tag{13}$$

and the recovering period between January 2014 and December 2017:

$$\prod_{t=14-17}^{n_{HR}} \colon GDP_{t-1} = .6^{-3} - 36.30 \cdot SME_{\substack{t-2 \\ (-2.41)}} - .8^{-2} \cdot UNR_{\substack{t-1 \\ (-.6)}}, \tag{14}$$

The results of VAR (13) for Croatia are as follows: SMEs had a negative impact on GDP growth, but not vice versa during the period of global crisis.[1] For the explanation, there is a 'strong' decrease of SMEs in 2011, observed as a transitory shock. Moreover, the subsequent recovery has been slow with long-term economic effects (Popović & Erić, 2018). Therefore, the results and implications are consistent with the European Commission (2017): 'overall progress SMEs implementation policy has been relatively limited and needs to be significantly intensified'.

Regarding Croatia, the following results are of high statistical significance: when there is a 1% increase in the number of SMEs, the GDP decreases by almost 1.8% in time of crisis. There is not a statistically significant association between GDP and UNR for Croatia however. During the recovering period, there was a deepened regress process on negative impact of SMEs on GDP in Croatia. The result of only 10% level is statistically significant. This inverse relationship between the number of SMEs and GDP growth for Croatia suggests that net entry (entry – exit) of SMEs was during GDP decreases or a recession period. However, a net exit of SMEs during GDP increases throughout the recovery period (on market selection with enterprise entry and exit see Bojnec & Xavier, 2004). In contrast, the Croatian SMEs environment has started to change, as reported by the European Commission (2017). An example of this would be that Croatian SMEs are still recovering from the economic crisis. Moreover, entrepreneurship is particularly weak in Croatia, whilst the public procurement stands out with a score well above the EU average. Recently, progress has mostly been made in the area of responsive administration, but much needs to be accomplished for Croatia to become an SMEs-friendly business environment. However, SME growth is predicted to continue (European Commission, 2017).

In the recovery period between January 2014 and December 2017, GDP was statistically significant in positively determining growth of SMEs in Croatia:

$$\prod_{t=14-17}^{n_{HR}} \colon SME_{t-2} = .5^{-3} + 3^{-3} \cdot GDP_{\substack{t-1 \\ (4.63)}} - .1^{-4} \cdot UNR_{\substack{t-1 \\ (-.17)}}. \tag{15}$$

For Croatia, there is no significant impact of UNR on the growth of SMEs, or that UNR is decreasing when SMEs are increasing. The reason could be that Croatian SMEs are larger than average for the EU, employing 4.8 people on average. This is in comparison with a general average of 3.9 in the EU (European Commission, 2017). Therefore, there is place for new start-ups or micro SMEs.

As argued by the European Commission (2018), Croatia's performance on entrepreneurship has been moderate, although significant policy efforts have been undertaken since 2008. However, the aggregated results of these efforts are still not sufficient. Over recent years, policy measures have included the adoption of several significant national strategies and several acts aimed at entrepreneurship development.

5.4. Granger causality test for the period of global crisis between January 2008 and December 2013

The Granger (1969) causality test was applied to test the SME-led growth hypothesis. In addition, we checked whether there was a causal relationship between the first difference variables for UNR, SMEs and GDP. Table 4 presents the Granger causality test results for Croatia and Slovenia.

5.4.1. The results for Slovenia

There is a statistically significant bi-directional causality between UNR and SMEs for Slovenia. Therefore, the H5 cannot be rejected for Slovenia. All other hypotheses for Slovenia are rejected. The rate of SMEs growth in Slovenia is important in the reduction of unemployment with job creation.

The prolonged bi-directional causality between UNR and SMEs in Slovenia has major policy implications if SMEs create employment. Therefore, employment growth is dependent on SMEs, suggesting that negative administrative shocks towards SMEs may depress unemployment rates. Such findings on the importance of SMEs development for the Slovenian labour market are consistent with previous studies by Južnik Rotar (2012).

5.4.2. The results for Croatia

There is no statistically significant causal relationship for Croatia. Therefore, only H4 cannot be rejected for Croatia (that there is no relationship between SMEs and GDP growth). All other hypotheses for Croatia are rejected. The results indicate that there are some other drivers of GDP growth than SMEs-led growth.

Table 4. Granger causality test.

	Granger causality test	January 2008–December 2013	January 2014–December 2017
Slovenia; $\rho = 2$	$dUNR_t$ does Granger cause $SMEs^r_t$	1.63*	0.68
		[2.16]	[2.45]
	$SMEs^r_t$ does Granger cause $dUNR_t$	3.41***	1.96*
		[1.97]	[2.37]
	$dGDP_t$ does Granger cause $SMEs^r_t$	.02	0.13
		[1.96]	[2.43]
	$SMEs^r_t$ does Granger cause $dGDP_t$	$.24^{-5}$	39.91***
		[2.44]	[1.72]
Croatia; $\rho = 2$	$dUNR_t$ does Granger cause $SMEs^r_t$	.11	1.07
		[2.02]	[2.30]
	$SMEs^r_t$ does Granger cause $dUNR_t$	.33	0.09
		[2.28]	[1.79]
	$dGDP_t$ does Granger cause $SMEs^r_t$	$.74^{-2}$	$.94^{-2}$
		[2.01]	[2.16]
	$SMEs^r_t$ does Granger cause $dGDP_t$	.13	10.31***
		[2.14]	[1.85]
Croatia – Slovenia	$dSMEs_{t\ HR}$ does Granger cause $dSME_{t\ SI}$	$.29^{-3}$	$.86^{-3}$
		[2.25]	[2.18]
	$dSMEs_{t\ SI}$ does Granger cause $dSME_{t\ HR}$	.05	0.02
		[2.00]	[2.17]

Note: About variables, see note to Table 2. d – first differences; r – real; ρ – number of lags; *, *** significance level at 10% and 1%, respectively; [x.yy] – Durbin–Watson statistics of VAR.

5.5. Granger causality test for the recovering period between January 2014 and December 2017

5.5.1. The results for Slovenia

There is a statistically significant uni-directional cause from SMEs to UNR concerning Slovenia. Therefore, H5 maintains for Slovenia as the rate of growth in SMEs is important for employment in the analysed country.

The uni-directional causality from SMEs to UNR in Slovenia has also been reported by the European Commission (2018). Special focus should be given to improving skills of the labour force as one of the main drivers for increasing SMEs productivity. This previous point is linked to improving educational systems. Entrepreneurship needs to be integrated into the curricula at all levels of education. Moreover, in 2016, SMEs employment had not yet fully returned to its pre-crisis level.

5.5.2. The results for Croatia

There is no exclusive statistically significant causal relationship for Croatia.

5.5.3. Typical results for both countries

In both Slovenia and Croatia, a uni-directional causal relationship between SMEs and GDP has been identified. Therefore, the first causal hypothesis for Slovenia and Croatia indicates a one-way relationship from SMEs-led growth to GDP growth. When this cannot be rejected, a greater attention to SMEs development can increase income levels.

5.6. Discussions and implications

The initial model was tested by different model specifications. Some of the tested variables, e.g., CPI, were rejected due to their statistical insignificance and multi-collinearity. The latter were also performed as exogenous variables. The final model included the following endogenous variables: GDP growth, the number of SMEs and UNR.

SMEs development is influenced by the overall macroeconomic situation in the economy. In that context, SMEs growth and development depends on the level of a country's development, monetary and financial systems and its quality of life (Dwyer, 2018). The financial system allows the transfer of funds for the exchange of goods and services, or for promising future inflows. Yet, it involves a network of institutions that makes several crucial economic functions: mobilising savings, allocating capital, monitoring of managers and transforming the risk. From this perspective, there is an indisputable connection between the development of the financial system with growing SMEs.

A high potential is recognised for both countries in the recovering period between January 2014 and December 2017 if the grounds for SMEs realisation plans exist. It is recommended that specific attention is paid to SMEs development in order to reach higher-economic growth. SMEs programmes in the countries should be compiled in the field of economic development strategy and economic policy measures. In addition, it is recommended that authorities focus on growth entrepreneurial activities in order to increase domestic and foreign investments.

Regarding Slovenia, we found that SMEs generated lower unemployment rates during the crisis period between January 2008 and December 2013. The finding correlates with the self-employment strategy in Slovenia, implemented by a new organisational law in 2006. Subsequently, the number of micro enterprises has increased since 2006. Moreover, SMEs in the recovering period between January 2014 and December 2017 have created jobs and reduced unemployment rates.

We distinguished crucial problem concerning the low intensity of SMEs in Croatia, therefore macroeconomic aggregates do not hold any other causal relation. It is suggested that Croatian policy makers liberalise the SME administrative path where possible to increase the number of SMEs and their activities.

Our empirical results are consistent with some of the previous empirical studies. The European Commission (2018) recognises that Slovenia performs equally with the EU average for entrepreneurship. Although a downward trend has been observed in the overall performance of Slovenia in this area over the past decade, there has been a notable improvement in entrepreneurship over recent years (e.g., in 2016 and 2017).

The European Commission (2017) identifies that entrepreneurship remains one of Croatia's weakest areas. Whilst early-stage entrepreneurial activity marginally improved, the media attention given to successful entrepreneurship and their status in Croatia remain markedly low in the EU.

6. Conclusion

Our research results suggest that the impact of explanatory variables differ between Slovenia and Croatia. This can be explained by endogenous and exogenous factors of enabling a macroeconomic environment.

As part of our research, we have applied advanced econometric methods, starting from: multiple regression analysis, unit root test, VAR and the Granger (1969) causality test. Using these devices, we acquire the results for both countries, which are then compared. At the beginning of the empirical part of the article we have presented results of the applied VAR and Granger causality test.

The significant implication of these results for management and policy makers is that a more intensive development of SMEs in Slovenia can be explained by a bi-directional causal relationship between GDP growth and the number of SMEs. Alternatively, we have not found any causal relationship between analysed variables for Croatia during the crisis period. Moreover, we have discerned one cointegration between the number of SMEs and GDP growth for Croatia, but not Slovenia. The latter results suggest that Croatia needs additional administrative reform paths for conducting smoother SMEs with more open entry and operating environments for SMEs developments.

Whilst Slovenia may only have a population half the size of Croatia's, Slovenia still has double the number of SMEs. This finding is not unprecedented. Slovenia has made progress with regulations regarding the concern theme: to open an enterprise in one place takes no longer than 30 minutes, e.g., e-VEM (all in one place) in the past decade. There is a similar example in Croatia, a service of Croatian government 'HITRO.HR portal' that enables entrepreneurs to have quicker and simpler

information and service in one place. Therefore, positive results are to be expected in the forthcoming years.

During the recovery period, there is uni-directional causality for Slovenia from SMEs to UNR. Moreover, in the same period between January 2014 and December 2017, uni-directional causality relations have been found from SMEs to GDP in both countries.

Data availability and model specifications are amongst some of the limitations for our study. Therefore, in order to effectively conduct further research, it is vital to update the existing time series data in future. In conjunction with this latter observation, it is necessary to include additional explanatory variables in our econometric models, such as examining the impact of integration within the EU, subsidies for SME development and taxes in SME-led GDP growth development modelling frameworks. Finally, the proposal for future research is directed to include the Eurostat database for SMEs as Structural Business Statistics.

Note

1. The result is available upon request.

Disclosure statement

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