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An Econometric Analysis of Entrepreneurial Activity, Economic Growth and Employment: The Case of the BRICS countries

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ABSTRACT

Entrepreneurship has been identified as a key contributor to economic growth and job creation by policy makers and researchers alike. The role of entrepreneurship has become more noticeable in societies not only in developed countries but also in developing countries which are in many instances struggling with a variety socio-economic challenges. A possible link exist between entrepreneurship, economic growth and employment but few studies have determined the degree of the relationship between these variables. The purpose of this study was to determine the relationships between economic growth (GDP), employment, entrepreneurial intention (EI), total early-stage entrepreneurial activity (TEA), and established business ownership (EBO) rate using a quantitative econometric analysis method. The study design followed a quantitative empirical approach using annual secondary data from 2001 to 2015 for the BRICS countries. A pooled panel analysis was used to test the long and short run relationships between the mentioned variables. The first model tested the relationship between GDP, TEA, EI and EBO rate, while the second model tested the relationship between employment, TEA, EI and EBO rate. In both cases it was found that a long run relationship existed between the variables by using the Fisher-Johansen cointegration analysis. Further results of the analysis indicated that TEA and EI are significant predictors of economic growth (GDP), while established business ownership (EBO) is not a significant predictor. It was also found that only established business ownership is a significant predictor of employment. In conclusion, the study proved that links between the mentioned variables do exist and that entrepreneurial activity should be improved as it has an impact on GDP and employment on various degrees.

JEL Classification: E23; L26.

Keywords: Entrepreneurship; Employment; Economic Growth; BRICS.

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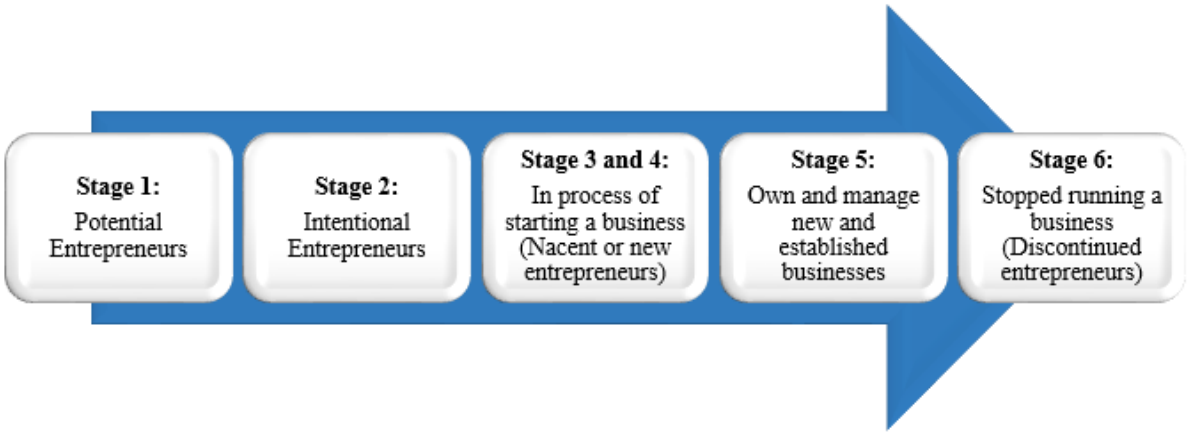
1. INTRODUCTION

Entrepreneurship has been identified by researchers and policy makers alike as one of the key components for economic growth and job creation (Botha *et al*., 2007; Athayde, 2012; Sivvam, 2012; Ambrish, 2014; Phillips *et al*., 2014; Haque et al.2017). Its contribution to GDP in many countries is significant and a contributing factor to economic growth. Countries such as Austria (61%), China (58.5%), Egypt (80%), France (58%), Greece (75%), Germany (53%), Indonesia (57%), Italy (68%), Netherlands (63%), Poland (52%), Portugal (69%), Slovakia (57%), Slovenia (63%), Spain (62%), Turkey (53.9%), United Kingdom (52%) and the United States of America (54%) all have small business activity contributions to GDP exceeding 50 percent (Herrington and Kew, 2017) indicating significant contributions. This means that for all of these countries more than half of their GDP is as a direct result of small business activity or entrepreneurship. These figures highlights the importance of a healthy entrepreneurship and small business sector as this will result in not only GDP growth but also lead to sustained job creation and market stability (Ambrish, 2014). When analysing the entrepreneurial process there are six distinct phases. Three of these phases leads to increased entrepreneurial activity and they are entrepreneurial intent (EI), early-stage entrepreneurial activity (TEA) and establish business ownership (EBO) (Herrington and Kew, 2017). In light of this, the purpose of this study was to determine the relationships between economic growth (GDP),

employment, entrepreneurial intention (EI), total early-stage entrepreneurial activity (TEA), and established business ownership (EBO) rate using a quantitative econometric analysis method.

2. REVIEW OF LITERATURE

As with some economic and business indicators, entrepreneurship is not an easy concept to measure (Wennekers and Thurik, 1999). Nonetheless, over the past 18 years, the Global Entrepreneurship Monitor (GEM) Consortium has developed a method to measure and compare cross-national entrepreneurial activity as well as intra-country time series analysis. One of the main goals of the GEM is to determine the interdependency between economic growth and entrepreneurship (Herrington *et al.,* 2015). The GEM divides entrepreneurship into six stages. These stages include the potential stage (Stage 1), intention stage (Stage 2), nascent stage (Stage 3), new entrepreneur stage (Stage 4), established business owner stage (Stage 5) and the last stage refers to business discontinuance (Stage 6). These stages are illustrated in Figure 1.



Source: Turton and Herrington (2012), Herrington and Kew (2013).

Figure 1.
Stages of the Entrepreneurial Pipeline

For the purpose of this study, Stages 2 to 5 will be considered. Stage 1 refers to individuals who have identified an entrepreneurial opportunity hold the ability to establish a new business and who in general have a lower fear of failure rate. Stage 2 consist of individuals who have the intention to, in the next three years, start a business. This rate will be referred to as entrepreneurial intention (EI) within the proposed econometric model. Stage 3 refers to the nascent stage (early stage) including individuals who have initiated the process of starting a new venture but have not paid salaries to employees for more than three months. Stage 4 entrepreneurs are individuals who have started a business that is older than three months but less than 42 months. Stage 3 and 4 entrepreneurs make up the early-stage entrepreneurial activity referred as TEA in the econometric model. Established business owners running a business for longer than 42 months are considered Stage 5 entrepreneurs and this indicator is referred to as the established business ownership rate (EBO) in the econometric model. The last stage consist of individuals who have ceased to do business due to several reasons (Turton and Herrington, 2012; Herrington and Kew, 2013). Many different definitions have been formulated over the decades describing and explaining the terms entrepreneur and entrepreneurship. One of the earlier more formal definitions by Schumpeter describes entrepreneurs as *"those who create new combinations, new markets, product, or distribution systems"* (De Bruin, Brush and Welter, 2006). Another definition by Kirzner (1973) describes an entrepreneur as a person who is alert to unrecognised opportunities and can create business ventures by timeously identifying such. In essence an entrepreneur can be defined as a self-employed individual who possesses the skill to exploit opportunities by introducing new or better ways to provide goods and services to the economy and by executing tasks for personal income (Shane, 2003; Ambrish, 2014). The following character words are almost always synonym with entrepreneurship; opportunism, innovation, risk taking, designing new combinations of processes and one of the principal definitions of entrepreneurship is ultimately starting new businesses (Bird and Brush, 2002). The following section explains the variables used in the econometric model in more detail.

2.1 Entrepreneurial Intention (EI)

Entrepreneurial intentions (EI), can be defined as a percentage of the population between the ages 18 and 64 years who intend to start a business in the next three years excluding anyone who has already commenced such activities. EI falls within Stage 2 (Figure 1) in the entrepreneurial process (GEM Consortium, 2016). Intention to start a business is the next step after a potential entrepreneur has identified a good opportunity and perceives that s/he might have the skills and capabilities needed to start a business. This is an important stage in the entrepreneurial process as a strong correlation exists between entrepreneurial intent and actually starting a business (Herrington and Kew, 2013; Herrington *et al.,* 2015). Various external factors may have an influence on entrepreneurial intention. Some of these factors include the perception about entrepreneurship by the general public and the media (Herrington and Kew, 2013).

2.2 Early-stage entrepreneurial activity (TEA)

Early-stage entrepreneurial activity or better known as TEA comprises two stages within the entrepreneurial pipeline namely Stage 3 (nascent entrepreneurs) and Stage 4 (new entrepreneurs). Nascent entrepreneurs are defined as individuals who have started a new business but who have not paid salaries to employees for more than three months (Herrington *et al*., 2015). The new business ownership rate refers to established businesses who have paid salaries to employees for more than three consecutive months but less than 42 months (Herrington *et al*., 2015). TEA is considered as the most important entrepreneurial measure. TEA can be defined as the percentage of the adult population between the age of 18 and 64 years who have just commenced with a business or who are in the process of starting a new business (Herrington and Kew, 2013). TEA levels could fluctuate with levels of unemployment and in some cases TEA rates can be higher when unemployment is high due to job demands not being met by the private and public sector (Herrington and Kew, 2013).

2.3 Established Business Ownership Rate (EBO)

Stage 5 of the entrepreneurial pipeline includes established business owners (EBO) as illustrated in Figure 1. This indicator is measured by the percentage of population between the ages of 18 and 64 years who own and manage an established business and who have paid salaries to employees for longer than 42 continues months (GEM Consortium, 2016). This indicator is in many cases much lower compared to the aforementioned two indicators and is a reflection of the sustainability of entrepreneurship in certain economies due to an enabling business environment (Kelley *et al*., 2013).

2.4 Relationship between entrepreneurship and Economic Growth (GDP)

Policy makers and researchers have identified entrepreneurial activity as a key contributing factor to a country's economic prosperity (Mitchell, 2003; Tamilmani, 2009; Toma, Grigore and Marinescu, 2014) and the role of entrepreneurship has become more prominent in societies. Toma *et al*. (2014) point out that in open and modern economies, entrepreneurship has become significantly vital for economic growth. From a Neo-classical theory approach, economic growth can be defined as a cumulative increase of output or the accumulation of production factors reflecting a quantitative measurement of a country's progress or growth (Masoud, 2014). Economic growth is mainly based on models by traditional economists such as Myrdal (1957), Rostow (1959) and Solow (1956) and can further be explained as a method to track progress of a country's GDP and per capita GDP. A definite link between economic growth (GDP) and entrepreneurship exists. Herrington and Kew (2013) and Naudé (2013) reports that there has been a consistent relationship between GDP and TEA rates.

Contributing to an understanding of this link, the following economic background holds importance. Attention to supply side economics and its underlying factors attracted new attention after the 1980s global stagflation and unemployment period. During this time, much attention was drawn to the role of entrepreneurship and small businesses development (Toma *et al*., 2014). As pointed out by researchers (North and Thomas, 1973; Olsen, 1982; Wennekers and Thurik, 1999), the institutional foundation of an economy is important. What has been neglected in these research efforts is economic agents, of whom entrepreneurs form a major part of, and their role in linking these institutions at micro level to economic outcome at macro level (Wennekers and Thurik, 1999). Many researchers have realised that the bulk of economic growth does not lie in contributions by large corporate companies anymore and that small and medium enterprises (SMEs) are making a considerable contribution to GDP (Brock and Evans, 1989; EIM, 1997; Toma *et al*., 2014). Evidence exist indicating that a shift from large firms to smaller, more robust firms has occurred. Since the 1970s a considerable amount of literature emerged

making specific reference to the role and contribution of SMEs in economies (Toma *et al.*, 2014). In 1997 a shift was identified showing that small business growth exceeded that of large businesses for the period of 1988 – 1997 in Europe (EIM, 1997) and similar trends were identified in the USA (Brock and Evans, 1989). These shifts were due to the following reasons: changes in the world economy, changes in the types of technology processes, labour supply (lower real wages), increasing education levels, consumer taste changes and ease of entry regulation of doing business (Wennekers and Thurik, 1999). The realisation of these global trends has placed much needed emphasis on the advancement of the small business sector and some of the causes of this shift has resulted in increased entrepreneurship development, improved innovation, industry dynamics and most importantly, job creation (Acs, 1992). SMEs contributed 45 percent to the South African GDP in 2015 (Kelley, Singer and Herrington, 2016) emphasising the importance of this sector. A clear reason for concern is that this rate decreased substantially during 2016 to 36 percent contribution towards GDP (Herrington and Kew, 2017).

2.5 Relationship between entrepreneurship and employment

The high levels of unemployment in especially developing countries linked to low levels of economic growth has triggered many studies to assess the impact of entrepreneurship development and small business growth on employment creation. Entrepreneurship activities, leading to self-employment could accelerate economic growth and reduce unemployment (Baptista and Thurik, 2007). Globally, industrial restructuring is affecting traditional manufacturing businesses, allowing entrepreneurs through innovation and knowledge to start businesses and by doing that, create jobs. The rapid pace of innovation with shorter technology life cycles benefit new entrants and small businesses, with their higher levels of flexibility if compared to large firms. According to Audretsch *et al.* (2001), higher rates of self-employment may lead to increased entrepreneurial initiatives, leading to employment and a reduction in unemployment. In a study by Sutton (1997) it was found that small businesses generally have higher growth rates than large corporate businesses and therefore small businesses have higher employment growth rates. In addition, increases in unemployment could lead to accelerated entrepreneurial start-up activity, but in the case of structural unemployment, high levels of unemployment may be related to low levels of entrepreneurial activity (Baptista and Thurik, 2007; Audretsch, 1995). Low levels of economic growth may also depress entrepreneurial activity leading to higher levels of unemployment. According to Loveman and Sengenberger (1991), the stimulation of entrepreneurship and small business development will most probably lead to labour intensity and employment creation. Lastly, the stimulation of entrepreneurial activity is needed for the optimal development of the knowledge-based economy (Baptista and Thurik, 2007).

3. PROFILE OF BRICS COUNTRIES

The BRICS block of countries consisting of Brazil, Russia, India, China and South Africa was established to strengthen the trade link between the major emerging economies. Due to an ever changing global environment many emerging countries, including the BRICS, have accepted greater political and economic responsibility. It is believed that by 2020 the five BRICS countries will contribute almost half of the total global GDP (Republic of South Africa, 2017). South Africa has the lowest population rate of all the BRICS countries and has a significant smaller economy than the other four members: China has a population of 1,34 billion while Russia boasts a population of 143 million, compared to South Africa's 50 million people (Global Sherpa, 2015). Whereas South Africa, China, Brazil and Russia are classified as efficiency-driven economies, India is classified as a factor-driven economy (Herrington and Kew, 2017).

The first of the five BRICS countries, Brazil, gained independence during the 1820s after a long Portuguese ruling. Brazil is the most populated South American country and until recently, they were known as one of the strongest emerging markets within the world. Since 2013, regrettably, their economy has lost some economic trajectory with political instability, rising unemployment and inflation obstructing former economic growth rates (CIA, 2016). Brazil forms part of the Latin America/Caribbean region (Herrington and Kew, 2017). The second country in the BRICS block, Russia, has a long history of war dating back centuries. It is the largest country in the world when considering physical area. Previously known as the USSR, as a result of expanded territory seized under communist leadership of Lenin and Stalin, this country developed as a super-power. The USSR lost its rule during 1991 after an attempt to modernise communism. This resulted in the country splitting into 14 smaller independent countries and a 15th which is known as the Russian Federation (CIA, 2016). Russia forms part of the European-developing region (Herrington and Kew, 2017). India, as the third BRICS country, has a vast history dating back centuries to the 3rd and 2nd millennium B.C. India regained independence in 1947 and shortly thereafter the subcontinent split into two separate states due to collective violence actions by the residents. This saw the start of India and Pakistan which was further separated into the area known as Bangladesh during 1971. Even though India

is widely known for socio-economic issues such as poverty, overpopulation, corruption and environmental decline, they have none the less emerged as one of the world's global economic leaders (CIA, 2016). India forms part of the Asia/Oceania factor- and efficiency-driven region (Herrington and Kew, 2017). The fourth country in this grouping is China. They have been classified as one of the leading empires for many centuries. Conversely, during the 19th and 20th century civil conflict and other events affected the performance of this country. In 1978 a market-orientated economic development strategy was adopted and this saw the country's output increased fourfold. Although living standards have improved and people are able to make more personal choices than in the past, political control remains high (CIA, 2016). China is also part of the Asia/Oceania factor- and efficiency-driven region (Herrington and Kew, 2017). South Africa was the last country to join the BRICS in 2010. South Africa is the smallest economy in this grouping. With its long history of Apartheid which only ended in 1994, it was left with long term scars and some lingering effects can still be seen. These include inequality, lack of access to proper education, high unemployment rates, poverty and high crime levels. Table 1 summarises the five BRICS countries key economic indicators.

Table 1:BRICS country economic indicators summary and comparison

Country	Year	GDP	GDP Growth (%)	GDP per Capita	Unemployment Rate (%)	Inflation (%)
South Africa	**2013**	$703.5 billion	2.2	$13 200	24.7	5.77
	2014	$714.4 billion	1.5	$13 200	25.1	6.1
	2015	$723.5 billion	1.3	$13 200	25.4	4.5
Brazil	**2013**	$3.317 trillion	3.0	$16 500	5.4	6.2
	2014	$3.32 trillion	0.1	$16 400	6.5	6.3
	2015	$3.192 trillion	-3.8	$15 600	9.0	9.0
Russia	**2013**	$3.834 trillion	1.3	$26 400	5.5	6.8
	2014	$3.862 trillion	0.7	$26 400	5.2	7.8
	2015	$3.718 trillion	-3.7	$25 400	5.6	15.5
India	**2013**	$6.92 trillion	6.6	$5 500	4.5	10.9
	2014	$7.421 trillion	7.2	$5 800	9.3	6.7
	2015	$7.965 trillion	7.3	$6 200	8.4	4.9
China	**2013**	$16.91 trillion	7.7	$12 400	4.1	2.6
	2014	$18.14 trillion	7.3	$13 300	4.1	2.1
	2015	$19.39 trillion	6.9	$14 100	4.0	1.5

Source: CIA (2016); IECONOMICS (2016); OECD (2016); Trading Economics (2016) World Bank (2016).

Table 2:BRICS countries entrepreneurial indicators summary and comparison 2016/17

Country	Country Classification	SME Contr. (%)	Doing Business (DBR) (/100)	Starting Business (SBR) (/100)	Competi-tiveness (/7)	Fear Failure (%)	Entrep Intent (EI) (%)	EBO (%)	TEA (%)
SA	Efficiency	36	65	81	4.5	31.2	10.1	2.5	6.9
Brazil	Factor	27	56	65	4.1	36.1	27.7	16.9	19.6
Russia	Efficiency	21	73	93	4.5	44.8	2.1	5.3	6.3
India	Factor	9	55	74	4.3	37.5	14.9	4.6	10.6
China	Efficiency	58.5	64	81	5.0	49.1	21.3	7.5	10.3

Source: Kelley *et al.* (2016); Herrington and Kew, (2017)

As can be seen from Table 1, only India showed an increase in GDP growth over the period of 2013 to 2015. Although China did not show an increase in GDP growth rates, they still maintained a high growth rate of 6.9 percent in 2015. Russia and Brazil reported negative growth rates in 2015 indicating that these countries are in an economic recession. South Africa had a low GDP growth rate of 1.3 percent during 2015 and although it is not in a recession, low economic growth is a reason for concern. South Africa's GDP per capita remained constant while Brazil and Russia reported a decreased rate following the recession they entered into during 2015. India showed improved GDP per capita rates and although China had a slight drop in GDP growth rates they showed an increase

in GDP per capita. All the BRICS countries reported an increase in unemployment rates with the exception of India which rate remained stable. South Africa has a significantly higher unemployment rate compared to the other countries in this comparison. China, South Africa and India reported a decrease in inflation rates over the given period indicating price stability within these countries.

Table 2 summarises the latest entrepreneurial indicators for the five BRICS countries. SME contribution towards GDP for South Africa (36%), Brazil (27%) and Russia (21%) is low and exceptionally low for India with a mere 9 percent. India's economic activity is focused around the industrial and service sector activities with the agricultural sector only contributing 17 percent of GDP (Statistics Times, 2017). The low SME/GDP contribution may be as a result of large corporations contributing more to GDP compared to smaller businesses and thus there is room for improvement for SMEs to contribute more. Contrary to India's low SME/GDP contribution China has a significantly high contribution rate of 58.5 percent. China's economic activities is also mainly focused on the service sector and industrial sector with a small agricultural contribution of 8.6 percent (Statista, 2017). Analysing the doing business (DBR) and starting a business (SBR) rates it is clear that Russia is outperforming the other countries with a DBR of 73 and a SBR of 93. India has the lowest DBR rate of 55 and this may also be a factor in their low SME/GDP contribution rate. China is considered most competitive and this also reflects in their high SME/GDP contribution rate.

Considering the entrepreneurial levels of these countries Russia reported the lowest perceived opportunities (17.9%) and capabilities (28.4%) possible contributing to their low entrepreneurial intent rate (2.1%) and TEA rate (6.3%). India and Russia reported the lowest rates considering entrepreneurship as a high status position in the community and also as being a good career choice. This may be a reason why their SME to GDP contribution is so low. Brazil is performing best overall on an entrepreneurial level with intent (27.7%), TEA (19.6%) and established business ownership (16.9%) rates outperforming all the other BRICS countries. South Africa and Russia are performing worst if considering these three categories.

4. METHODOLOGY

A quantitative research methodology was used to analyse secondary time series data. Data was obtained from the Global Insight (2016) data base, World Bank data and GEM reports. The methodology includes a descriptive analysis of the variables and econometric time series panel data models.

4.1 Data, variables and sample period

The study has its focus on the BRICS countries which includes Brazil, Russia, India, China and South Africa. The time series data ranges from 2001 to 2015 and the data was pooled in a panel, resulting in 75 observations. The research article investigates the relationship between economic growth (measured in GDP) and employment (employment as a percentage of the economic active population) and three entrepreneurship variables namely entrepreneurial intentions (EI), total early entrepreneurial activity (TEA) and established business ownership (EBO). Two different models were used as listed in equations (2) and (3).

4.2 Model specification

According to Brooks (2014) the basic equation for panel data can be defined as:

$$y_{it} = \alpha + \beta x_{it} + u_{it} \quad (1)$$

Where y_{it} is the dependent variable, α is the intercept term, β is a $k\times1$ vector of parameters to be estimated on the explanatory variables, and x_{it} is a $1 \times k$ vector of observations on the explanatory variables, $t = 1, \ldots, T$; $i = 1, \ldots$

All variables are stationary at the 1st difference and for this reason the long run model was used (see Table 6 and 7 for unit root tests). The model from the function described in equation (1) can be explained as follows:

$$GDP_t = \propto_1 + \sum_{j=1}^{k} \beta_{1j}\ GDP_{t-j} + \sum_{j=1}^{k} \lambda_{1j}\ EI_{t-j} + TEA_{t-j} + EBO_{t-j}\ u_{1t} \quad (2)$$

$$Employment_t = \propto_2 + \sum_{j=1}^{k} \beta_{2j}\ Employment_{t-j} + \sum_{j=1}^{k} \lambda_{2j}\ EI_{t-j} + TEA_{t-j} + EBO_{t-j}\ u_{2t} \quad (3)$$

Where α_n is the constant, β_n, λ_n are the coefficients, K is the number of lags and $\boldsymbol{u_{1t}}$ and $\boldsymbol{u_{2t}}$ are the stochastic error terms which are also known as shocks in the model. The unit root test is carried out to measure whether the variables are stationary or not, and was conducted using the Levin, Lin and Chu test as well as the PP-Fisher Chi-square test. If the variables are stationary at I(0) a normal panel VAR analysis is conducted whereas if variables are stationary at I(1), the Fisher Johansen panel co-integration test for long run relationship is conducted.

4.3 Estimation technique

The BRICS countries as emerging developing economies display homogeneous socio-economic characteristics; hence, as mentioned, the data for the countries were pooled together as balanced panel data. According to Baltagi (2008) panel data defines a process where observations over a specific time period on a cross-section are pooled. A panel data analysis allows for the use of data possessing both cross-sectional and time series dimensions (Brooks, 2014). The data was analysed using descriptive analysis, correlation, unit roots test for stationarity of variables, pairwise Granger causality test, Fisher Johansen panel co-integration test, FMOLS and DOLS tests for long run relationships and diagnostic tests for stability of the model.

4.4 Descriptive analysis

Table 3 presents a summary of the data used in the quantitative analysis. All five the BRICS countries are classified as developing economies. China has the highest employment levels as a percentage of EAP of 68.1 percent, followed by Brazil at 64.8 percent. China, India and South Africa have negative growth rates concerning employment creation. South Africa has the lowest employment participation of all the countries of only 39.5 percent. Overall, the economies of the BRICS countries have been under pressure over the last few years and that is reflected in the employment status quo. In terms of EI, China with a rate of 19.5 percent and Brazil 24.4 percent have the highest levels of intension towards entrepreneurship. South Africa has the highest growth rate in EI if compared to the other countries. In terms of TEA, Brazil has the highest level of activity by far at 20.9 percent, followed by China with 12.8 percent. All the countries have positive growth rates regarding TEA. EBO rates have increased for all countries except for China and India. Brazil has the highest rate of 18.9 percent with a growth rate of 26.5 percent. Brazil, Russia and South Africa also have EBO growth rates of above 20 percent per annum.

Table 3: Summary of key data for BRICS countries (annual growth rates from 2001 to 2015 are indicated in brackets)

Country	Year	Employment as % of EAP	EI	TEA	EBO
Brazil	2001	61.5	31.0	13.8	3.8
	2015	64.8 (0.36)	24.4 (-1.42)	20.9 (3.43)	18.9 (26.49)
China	2001	72.9	25.0	11.0	10.0
	2015	68.1 (-0.44)	19.5 (-1.47)	12.8 (1.09)	3.1 (-4.60)
India	2001	57.1	29.0	10.8	8.8
	2015	52.3 (-0.56)	9.2 (-4.55)	10.8 (0.0)	5.5 (-2.5)
Russia	2001	54.1	2.3	2.4	0.9
	2015	60.6 (0.80)	3.8 (4.35)	4.3 (5.28)	4.1 (23.70)
SA	2001	42.5	3.0	6.5	0.8
	2015	39.5 (-0.47)	10.9 (17.56)	9.2 (2.77)	3.4 (21.67)

Source: Own compilation from World Bank and GEM reports.

5. RESULTS AND DISCUSSION

All variables were converted to logarithms to simplify the analysis. Table 4 indicates the correlation between the variables. The results indicate a strong positive and significant relationship with a p-value of 0.0005, which signifies that a positive relationship exists between all variables, and needs to be further investigated by means of more advanced methods such as the Granger Causality test to determine the direction of the relationship. If the correlation between GDP and the other variables is further analysed, employment has the highest t-statistic of 10.23. This relationship has been tested by many researchers such as Okun's Law (Okun, 1962).

Table 4: Correlation analysis

Variables	GDP	Employment	Entrepreneurial intent (EI)	Total Early entrepreneurship activity (TEA	Established business ownership (EBO)
GDP	1.0000 ----- -----				
Employment	0.7674 10.229 0.0000*	1.0000 ----- -----			
Entrepreneurial intent (EI)	0.3086 2.7727 0.0070*	0.3372 3.0612 0.0031*	1.0000 ----- -----		
Total Early entrepreneurship activity (TEA)	0.4871 4.7655 0.0000*	0.4480 4.2818 0.0001*	0.8691 15.017 0.0000*	1.0000 ----- -----	
Established business ownership (EBO)	0.6309 6.9484 0.0000*	0.6648 7.6049 0.0000*	0.7941 11.164 0.0000*	0.8583 14.290 0.0000*	1.0000 ----- -----

Note: [ ] indicates t-statistic and ( ) indicates p-values. * indicates statistical significance at less than 5%.

Table 5: Pairwise Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
Employment does not Granger Cause GDP	70	6.67813	0.0119*
GDP does not Granger Cause Employment		0.22797	0.6346
EI does not Granger Cause GDP	70	0.36619	0.5471
GDP does not Granger Cause EI		1.41701	0.2381
TEA does not Granger Cause GDP	70	0.03908	0.8439
GDP does not Granger Cause TEA		0.87560	0.3528
EBO does not Granger Cause GDP	70	0.49378	0.4847
GDP does not Granger Cause EBO		0.08982	0.7653
EI does not Granger Cause Employment	75	3.13338	0.0813**
Employment does not Granger Cause EI		0.02028	0.8872
TEA does not Granger Cause Employment	75	3.58732	0.0625**
Employment does not Granger Cause TEA		1.02680	0.3146
EBO does not Granger Cause Employment	75	2.63268	0.1094
Employment does not Granger Cause EBO		1.58663	0.2122
TEA does not Granger Cause EI	75	2.35481	0.1296
EI does not Granger Cause TEA		4.40525	0.0396*
EBO does not Granger Cause EI	75	0.34834	0.5570
EI does not Granger Cause EBO		3.01117	0.0873**
EBO does not Granger Cause TEA	75	4.48623	0.0379*
TEA does not Granger Cause EBO		1.48190	0.2277

Note: * indicates 5% statistical significance and ** indicates 10% statistical significance.

If the strength of the correlation between GDP and EI, TEA and EBO is analysed, EBO has the strongest correlation with a coefficient of 0.63, followed by TEA with a coefficient of 0.48 and lastly EI with a coefficient of 0.31. This ranking of the strength of the variables makes sense in that established businesses should contribute more to GDP than early entrepreneurial activity and intention towards entrepreneurship (EI). The same situation is indicated in the correlation between employment and the three levels of entrepreneurial activity. EBO has the highest coefficient of 0.66, followed by TEA with 0.44 and EI with an index of 0.34.

Table 5 presents the pairwise Granger-Causality test results for all the variables. From the results it is evident that causality proceeds from employment to economic growth in the short run. In other words, between the two variables, there is a uni-directional causality at 5 percent significance level. In practice, this result indicates that employment causes economic growth. This result is in agreement with those reported by Todaro and Smith (2015) and Ezeala-Harrison (1996). In addition, EI, TEA causes employment growth at a 10 percent significant level, while EI causes TEA growth at a 5 percent significance level and EBO growth at a 10 percent significance level as EI is a pre-entrepreneurial activity for both TEA and EBO. Lastly EBO causes TEA growth at a 5 percent significance level.

In the next section, the relationship between the variables on the long run is tested. The first step in this process is to test for the existence of unit roots in panel data. Table 6 and Table 7 report the results from the Levin, Lin and Chu test as well as the PP-Fisher Chi-Square test. The results indicate that all variables are non-stationary at levels I(0). All variables become stationary at 1st difference; they are therefore stationary at I(1). This result implies that the process of long run cointegration testing could be estimated. In this case the Fisher Johansen panel cointegration test is utilised.

Table 6: Panel unit root test: Levin, Lin and Chu Test

Variables	Levels (I(0) – p-value	1st difference I(1) – p-value	Result
GDP	0.0580**	0.0002*	**I (1)**
Employment	0.0510**	0.0790**	**I (1)**
EI	0.0540**	0.0001*	**I (1)**
TEA	0.0913**	0.0002*	**I (1)**
EBO	0.1666	0.0975**	**I (1)**

Notes: Null hypothesis: Unit root. * indicates 5% statistically significant

Table 7: Panel unit root test: PP – Fisher Chi-Square Test

Variables	Levels I(0) – p-value	1st difference I(1) – p-value	Result
GDP	0.0650**	0.0010*	**I (1)**
Employment	0.0521**	0.0043*	**I (1)**
EI	0.0868**	0.0005*	**I (1)**
TEA	0.0551**	0.0001*	**I (1)**
EBO	0.1372	0.0000*	**I (1)**

Notes: Null hypothesis: Unit root. * indicates 5% statistically significant, ** indicates 10% statistically significant.

Table 8 and 9 records the Fisher Johansen panel cointegration test for the two models. For this test, the null hypothesis is rejected, meaning there is a long run relationship between variables. The test results indicate that for both the Trace test and the Max-Eigen test, there is evidence of a cointegrated relationship between the variables at a 1 percent significance level. It is concluded, therefore, that the results from the panel cointegration test point to a long run equilibrium relationship among the variables.

Table 8: Fisher Johansen panel cointegration test (with GDP, EI, TEA and EBO as variables)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	172.4	0.0000	144.3	0.0000
At most 1	57.02	0.0000	45.54	0.0000
At most 2	22.46	0.0129	22.25	0.0139
At most 3	12.01	0.2847	12.01	0.2847

Note: *indicates that the test statistics are significant at the 1% level.

Table 9: Fisher Johansen panel cointegration test (with Employment, EI, TEA and EBO as variables)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	184.4	0.0000	153.6	0.0000
At most 1	55.33	0.0000	40.66	0.0000
At most 2	25.90	0.0039	25.10	0.0052
At most 3	12.54	0.2507	12.54	0.2507

Note: *indicates that the test statistics are significant at the 1% level.

After the analysis confirming the long run equilibrium among the variables in the study, the short run impacts between the variables are estimated. The study uses two types of estimation methods: the Fully Modified Ordinary Least Squares (FMOLS) and the Dynamic Ordinary Least Squares (DOLS) models. A consideration of various forms of residual-based panel method results indicates that these models generally outperform single-equation estimation techniques (Pedroni, 2000). According to Tintin (2009), there is no consensus in the literature as to which method, FMOLS or DOLS, should be used; hence the results of both tests should be compared.

Table 10: FMOLS and DOLS results
Dependent variable: GDP; Independent variables: EI, TEA and EBO.

Method	Variables	Coefficient	t-statistic	P-value (prob)	Adjusted R-squared
FMOLS	EI	0.7116	2.9260	0.0048*	0.7391
	TEA	1.1509	2.4573	0.0017*	
	EBO	0.3367	1.2733	0.2076	
DOLS	EI	1.5111	3.6312	0.0084*	0.9624
	TEA	3.0755	4.7760	0.0020*	
	EBO	0.5129	1.2340	0.2570	

Note: *indicates that the test statistics are significant at the 5% level.

Table 11: FMOLS and DOLS results
Dependent variable: Employment; Independent variables: EI, TEA and EBO.

Method	Variables	Coefficient	t-statistic	P-value (prob)	Adjusted R-squared
FMOLS	EI	0.0082	0.5161	0.6076	0.9745
	TEA	0.0253	0.8109	0.4205	
	EBO	0.0405	2.3024	0.0247*	
DOLS	EI	0.0002	0.0028	0.9978	0.9620
	TEA	0.1544	1.2836	0.2401	
	EBO	0.0924	1.1904	0.0427*	

Note: *indicates that the test statistics are significant at the 5% level.
In terms of residual diagnostics, both equations past the tests of normality distribution and serial correlation.

Model 1: GDP as the dependent variable (Table 10). For both the FMOLS and DOLS methods the results indicate that EI and TEA exerts a positive and significant impact on GDP (economic growth). It can be postulated that a 1 percent increase in EI leads to an increase of 0.71 percent (FMOLS result) and 1.15 percent (DOLS result) increase in economic growth. The impact of TEA is similar with coefficients of between 1.15 percent and 3.07 percent increases in GDP. EBO has a positive but non-significant impact on GDP. From the results it can be concluded that entrepreneurial activities have a significant impact on economic growth in the BRICS countries. This result confirms findings by Toma *et al.* (2014) and Naudé (2013).

Model 2: Employment as the dependent variable (Table 11). Both the results for the FMOLS and DOLS methods, indicate that EBO has a positive and significant impact on employment. It could be postulated that a 1 percent increase in EBO leads to an increase of 0.04 percent (FMOLS result) and 0.09 percent (DOLS result) in employment. Both EI and TEA have positive impacts on employment but the impacts are non-significant and this result is similar to findings by Audretsch *et al.* (2001) and Baptista and Thurik (2007). From the results it can be

concluded that entrepreneurial activities have an impact on employment, but less so than on economic growth. This result could be due to the phenomenon of jobless growth.

6. CONCLUSIONS AND RECOMMENDATIONS

Entrepreneurial activity and small business development are important factors in any economy on both the micro and macro level. The primary objective of the research was to determine the relationship between economic growth, employment and entrepreneurial activity by means of a time series econometric analysis. Important results are that entrepreneurial activities have a significant impact on economic growth in the BRICS countries and entrepreneurial activities have an impact on employment, but less so than on economic growth. This result is interesting and policy development should attempt to ensure that entrepreneurial activity translate to job creation on a larger scale. The measurement of entrepreneurship activities as used in this research also proved to be appropriate as an analysis strategy towards the contribution to research within this important study field. The research objectives were achieved by using an econometric analysis in the determination of the impact of entrepreneurship on economic growth and employment. Limitations of the research is that longer time series data was not available for all countries and only a 15 year time span was used. The use of a panel analysis however addressed this issue. Future research will focus on Southern African countries to determine the role of entrepreneurial activities and also a focus on Eastern European countries. It is recommended that development of entrepreneurship and small businesses again be prioritized as a key factor for economic growth. Current and future policy should attempt to remove stumbling blocks preventing accelerated business activities. Finally, the relationship between entrepreneurship and economic growth with employment is positive, but the impact must be increased. Entrepreneurship development should be the focus of most development programmes through training initiatives and sustainable employment creation.

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