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INNOVATIONS AND COMPETITIVENESS IN REGIONAL DEVELOPMENT: A COMPARISON OF LATIN AMERICA, EUROPE, AND CHINA

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Abstract

Our paper focuses on the economic comparison of innovations and competitiveness in regional development using the specific case studies of three regions of special interest: Latin America, Europe (represented hereinafter by the European Union), and China.
We discuss the recent changes in economic development and global change and analyze the role of the three regions in question in that development. We argue that while Europe might be losing its economic momentum and China's economic growth is slowing down, Latin America might become the new hub of the economic growth and innovations. Moreover, it seems that exploring new markets and increasing the presence on the new territories might also foster the economic growth and innovations.

Keywords: innovations, competitiveness, regional development, economic growth, Latin America, Europe, China

JEL Classifications: F02**,** O30**,** R11

Introduction

After the Second World War, the world has experienced a period of relative universal peace with exceptions in some countries in Middle East, Africa, Europe, and Asia, which has been conducive for the growth of the world economy, characterized by rapid population growth, industrialization, and economic progress (Hirst et al., 2015). Driven by these changes, there has been increased globalization, hinged on improved international relations between different countries in the international or global political-economy system (Marquand, 2011). Globalization or internationalization was characterized by increased competition between nations, with countries from Europe, Asia, African, and Latin America emerging as some of the

rapidly industrializing or newly industrialized nations (Dahlman, 2010). Brazil, located in Latin America, Russia in Europe, and China in Asia, are some of the countries under the BRICS (Brazil, Russia, India, China, and South Africa) that are ranked as rapidly industrializing or newly industrialized nations (Dahlman, 2010). In addition to these countries, other emerging rapidly industrializing nations include South Korea, Mexico, and Turkey, located in Asia, Latin America, and Europe respectively (Hirst et al., 2015). This paper ssesses and compares the competitiveness and innovation of Latin America, China, and Europe. The novelty and the main value-added of the paper is the comprehensive comparison of all three regions in question via the means of economic analysis.

Competitiveness and Innovation

Combined, Latin America, China, and European regions account for approximately 3 billion people, or nearly half of the world's population, with China's population being approximately 1.3 billion people. The countries have a combined GDP of approximately US$16.6 trillion, the equivalent of approximately 25 percent of the global gross product. Projections for the average economic expansion for these countries were 4.6 percent for 2016, and 5.3 percent for 2017 (International Monetary Fund, 2017). However, in the late 20th Century to the early 21st Century, some of the countries in the regions that were categorized as rapidly industrializing nations or newly industrialized nations recorded higher expansions of the GDP. China's economy in some instance growing at approximately 10%, Brazil recorded an average GDP growth of 5 percent, with similarly high economic growth rates recorded by emerging economies in Europe (Jiaxing & Yangon, 2015).

The rapid economic growth experienced in these regions is attributable to various strategies implemented in the countries to foster the establishment and growth of industries. In the 1970s, China implemented economic reforms focused on a shift from government-controlled economy to a market-based economy, which has seen it achieve rapid industrialization and economic growth. According to Jiaxing and Yangon (2015), in the 1990s, Asia accounted for approximately 26.5 percent of the global manufacturing output, which rose to approximately 46.5 percent by the year 2013, with China accounting for more than half of that. In agreement, Esposito and Tse (2015) observed that China accounts for about 80 percent of the world's air conditioners, 70 percent of the world's mobile phones, and 60 percent of the shoes manufactured in the world as at 2014. Esposito and Tse (2015) further observed that out of the 162,000 robots sold globally; approximately 23,000 were outsourced from China.

Similarly, Russia and Turkey, in Europe, especially after the switch of ideology from a previous focus on communism to a mixed economy and Turkeys economic revival agenda of the 20th Century, these and other countries have re-emerged as economic powerhouses in the global economic scene (Cassiolato & Lastres, 2011). Brazil implemented the Plano Real economic and industrialization plan, while other countries such as Argentina and Mexico, also implemented near similar plans that saw the countries and region emerge as an economic and industrialization hub (Dahlman, 2010). The countries in Europe, Latin America, and Asian countries such as China, implemented various types of economic reforms that led to rapid economic growth, promoted by the growth of local and regional economies through the establishment of industries and increased trade between them and the rest of the world (Cassiolato & Lastres, 2011).

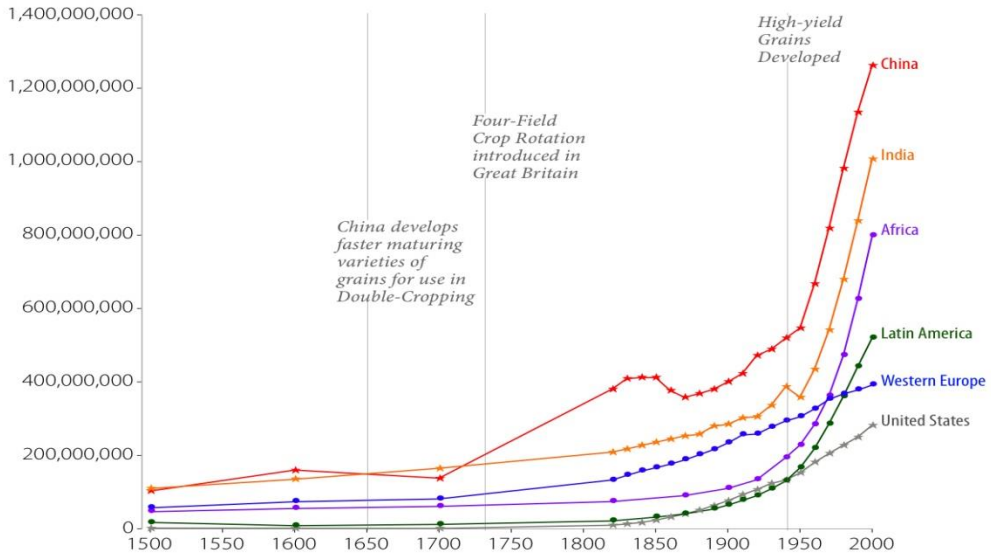
Further, within these regions, the countries have experienced rapid population growth, which has further been augmented by a formation of regional trading blocs such as the European Union, Latin American Free Trade Association (LAFTA), and Mercosur among others. According to the

Council on Foreign Relations (2017), economic integration regional bodies have greatly contributed to the continued growth of the economic and industrialization progress of the member countries. For example, the CFR (2017) observed that the formation and operationalization of the Mercosur trading bloc in the Latin American countries of Argentina, Brazil, Uruguay, Venezuela, and Paraguay caused a fivefold increase in trade in this region. Other trading blocs, such as the EU in Europe, which has fostered economic integration, have also realized similar benefits. In the 16th Century, these regions had a population of less than 200 million people respectively. However, from the late 19th Century, as per the graph below, China, India, Africa, Latin America, and Western Europe experienced a rapid growth to account for approximately half of the world's population.

Innovations, development and demography

The rapid growth in population in Latin America, China, Europe, and other parts of the world provided a ready market for the products being manufactured by the emerging industrial sector in these economies (Hirst et al., 2015). Further, because of the rapid growth in population, the countries had access to cheap labor, which caused manufacturing companies from the United States and other countries that were then considered as developed nations to outsource manufacturing to these countries. The outsourced operations from multinational corporations from the developed countries greatly contributed to the growth of the industrial sector in China, Latin America, and some parts of Europe, who were leveraging on technology and cheap labor to grow the emerging industrial sector to support the economic growth strategies and plans implemented by the governments (Marquand, 2011).

Figure 1: population growth in Latin America, China, and Europe



Source: Maddison Project (2010)

Further, countries in the Latin America, Europe, and Asia such as China, have undertaken large-scale infrastructural developments to support the economic growth and development, realized by the countries. For example, China completed and commissioned one of the largest hydroelectric

power generation plants in the world, the Three Gorges Dam on the Yangtze River, which will provide approximately 10 percent of the country's energy to support the industrialization strategy and the growing population (Cassiolato, & Lastres, 2011). Similarly, Brazil and Paraguay have invested in a large-scale hydroelectric power generation dam, the Itaipu dam, which is located on the border between Brazil and Paraguay, on the Parana, producing renewable sources of energy to support the industrialization and economic growth in the respective countries (Cassiolato, & Lastres, 2011). Moreover, these countries have invested heavily in road, rail, water, and other forms of transport infrastructures, which are aimed at supporting the government's industrialization and economic growth agenda, for sustainable growth and development.

Most of the countries falling in these regions have increased trade with other countries in the world, in addition, to actively participating in the development and economic activities in the world. China, Brazil, Russia, and Turkey, have improved relations with other parts of the world, which is evidenced by increased presence of these countries in the African continent, as they seek to leverage on a trade and international partnerships to bolster their competitiveness in the global economy (Hirst et al., 2015). On the other hand, these countries, such as Brazil and China, have chosen to take non-interference, economic-focus towards international relations. These approaches have bolstered the competitive position of the countries in Latin America, Europe, and Asia, more specifically, China. As evidenced in the table below, BRICS, exports to the other countries of the world have been growing, always giving the BRICS countries a positive balance of trade.

Figure 2: BRICS balance of trade

BRIC, Trade with World

Total Goods: Trade flows and balance

Source IMF

Period	Imports		Exports		Balance		Total trade	
	Value Mio €	% Growth*	Value Mio €	% Growth*	Value Mio €	% Growth*	Value Mio €	% Growth*
2005	732,776		929,434		196,658		1,662,210	
2006	887,060	21.1	1,146,806	23.4	259,747	32.1	2,033,866	22.4
2007	1,017,641	14.7	1,289,782	12.5	272,141	4.8	2,307,423	13.5
2008	1,149,778	13.0	1,439,507	11.6	289,729	6.5	2,589,285	12.2
2009	1,013,146	-11.9	1,205,889	-16.2	192,743	-33.5	2,219,035	-14.3
2010	1,470,011	45.1	1,655,030	37.3	185,019	-4.0	3,125,042	40.8
2011	1,776,897	20.9	1,954,910	18.1	178,013	-3.8	3,731,808	19.4
2012	2,014,546	13.4	2,233,799	14.3	219,253	23.2	4,248,346	13.8
2013	2,044,889	1.5	2,290,217	2.5	245,328	11.9	4,335,106	2.0
2014	2,012,621	-1.6	2,350,728	2.6	338,108	37.8	4,363,349	0.7
2015	1,913,254	-4.9	2,585,485	10.0	672,232	98.8	4,498,739	3.1

Source: BRICS (2017)

Methodology and the empirical model

Many econometric models measuring innovation and growth are usually based on the stochastic growth models. Stochastic growth models are the modification of basic growth models with incorporated random shocks (in order to understand business cycles), such as technological progress, shock on the supply or demand side. The well-known example of a stochastic model on the macro-level can be the stochastic version of the Cass-Koopmans model. Stochastic growth models (the best example on the micro-level is Gibrat's Law) are characterized by the following features: (i) macro/aggregated dynamics of the model, and (ii) no fluctuations (Storey, 1994).

Their basic aim is to reproduce observed power-law distributions, derive growth dynamics from the macro-level and allow for the fitting of real data.
The traditional outlook of any stochastic growth model is presented in a form of a model with two deterministic components (exogenous growth and endogenous) and one stochastic component (random growth term ε_t). Gibrat's Law (the Law of Proportionate Effect) that explains these model can be in turn expressed in terms of a stochastic model with two basic assumptions: (i) $\log \varepsilon_t$ is normally distributed and is independent of the size of the enterprise in time t (initial period); and (ii) the mean proportionate growth of a group of enterprises of the same initial size is independent of the initial size.
One can use a modified version of this model showing that deviating from Gibrat's Law decreases as the size of the company increases (Evans, 1987). Moreover, we can use a modified version of the log-linear form model where the enterprise size is expressed as the number of its employees and the growth rate of the enterprise is expressed as the following:

$$\log(S_{t'} / S_t)/(t' - t) \qquad (1)$$

where $S_{t'}$ is the employment size in 1980, S_t is the employment size in 1976 and (t' - t) is the number of years between these two dates (Evans, 1987). The growth equation was then expressed by the following regression equation:

$$\log(S_{t'} / S_t)/d = \log g(A_t, S_t, B_t) + u_t \qquad (2)$$

where d = t'-t, t'>t, g is a growth function, A, S and B denote age, size and the number of plants respectively. The regression model estimated by Evans (1987) has the following form:

$$\log(S_{t'} / S_t)/d = \beta_0 + \beta_1 \log S_t + \beta_2 \log A_t + \beta_3 (\log S_t)^2 + \beta_4 (\log A_t)^2 + \beta_5 (\log S_t)(\log A_t) + \mu_t \qquad (3)$$

Evans's model became an inspiration for the other few researchers. For instance, Variyam and Kraybill (1994) estimated the regression model without the squared and cross product terms, and tested for nonlinearities implied by these terms using Theil's BLUS residual tests. Then they estimated several model extensions that have additional sources of heterogeneity in growth rates. Their main findings were that independent firms, sole proprietorships and firms owned by women are found to have significantly lower-than-average growth rates; in addition, they find that firm growth is negatively related to firm size and age (Variyam and Kraybill, 1994).
Also, Reid (1993) discussed profitability as one of the determinants of growth, noting the endogeniety of growth and profitability and the implied simultaneity of growth and profitability relationships using the evidence from small firms (Reid, 1993). It appears that the growth/profitability tradeoff (known as the "Penrose Effect") can be proved. Moreover, it appears that the form of enterprise is an important determinant of profitability. The further the managerial organization moves from a pure owner-management form, the lower its profitability.
According to Dobson and Gerrard (1989), the growth and profitability relationship can be expressed by the two-way causation (Dobson and Gerrard, 1989). Growth generates profits and profits stimulate growth. Thus, it seems that profit is a good proxy for enterprise growth and thence its success.

Furthermore, econometric models were designed to deal with determining the influence of the various factors on enterprise success. One of the models that attempted to identify causality, which is a general aim of this type of quantitative analysis, was the study conducted by Honig (1998) of the performance of 215 micro-enterprises in Jamaica, This model, that worked with very "personal" measures of both success and "sensitive" financial information, tried to explain the determinants of success of Jamaican micro-enterprises expressed as average monthly profit (log average of monthly earnings). The general model used by Honig (1998) can be presented in the following form:

$$\log \ Y_t = \beta_0 + \beta_1 S_t + SK_t 1 + SK_t 2 + SES_t 2 + K_t 1 \ + K_t 2 \ + \beta_2 T_t + T_t^2 + E \qquad (4)$$

where Y_t is the log of average monthly earnings, S_i is the range of dummy variables for the level of schooling, $S_{Ki}1$ and $S_{Ki}2$ are two measures of social capital, $SES_i 1$ and $SES_i 2$ are measures of socioeconomic status, K1 and K2 represent variables for starting capital and loans, and T_t and T_i^2 are years of experience in the trade or business occupation (Honig, 1998).

Additionally, specific models related to small enterprises was developed to deal with the selection bias issue. For instance, in a study of the performance of Slovenian enterprises after the privatization of 1995-1999, it was stated that the initial break up of companies into groups of public, internal and external companies was not independent of the initial differences in companies' performances (i.e. the so-called selection bias). At the time of the selection of privatization modes, the operational characteristics and performance of companies influenced the ownership structure and not *vice versa.* There was a strong bias in the selection of privatization modes in Slovenia due to the principle of autonomy of companies in the selection of privatization methods (Simoneti et al, 2005). Because of the presence of selection bias, the Heckman two-step method was employed. In the first phase, a multinomial logit model was used to evaluate the optional multiple selection of enterprises among the three dominant privatization models (public, internal and external) on the basis of their operational characteristics in 1994. In the second phase of evaluation, the Amemiya procedure served to calculate the appropriate correction factors (the so-called 'inverse Mills ratios', i.e. lambda) on the basis of the probability (likelihood) of the selection of the individual privatization model (Simoneti et al, 2005).

Main results and discussions

We employ the data from 1100 companies in Latin, America, Europe and China to demonstrate the determinants of economic growth and innovations on the sample set of real-life data. The general econometric model for estimation used in our paper has the following form:

$$Y_i = \sum_{i=1}^{k} \beta_k X_{ki} + \sum_{i=1}^{m} \beta_m Z_{mi} + \sum_{i=1}^{l} \beta_l W_{li} + u_c + e_i \qquad (5)$$

where X are the exogenous variables of the small model, Z the extra objective variables of the intermediate model and W the extra subjective variables added to make the large model. u_c is a community identifier.

Several econometric techniques are employed in the econometric analysis presented in this chapter in order to estimate this model. The standard econometric technique employed is to use ordinary least squares (OLS) (to allow for heteroscedasticity problems robust standard errors are employed hereinafter in all OLS estimations).
We use 1100 observations, consisting of seventeen variables, three of which were categories, and the rest were defined as binary variables. Each model has the same list of "core" variables but differed in the additional binary variables that coded for instance the existence of barriers to business, the structure of ownership, or the impact of the external factors such as competition, or the rule of law (hence the names of the models such as "innovative", or "barriers" model).

Table 1: Results for model estimations

	Innovation model	Barriers model	Ownership model	Impact factors model
	RSE	**OLS**	**RSE**	**RSE**
Cluster	0.310* (0.211)	0.205* (0.111)	0.308* (0.212)	0.308* (0.211)
Equipment age	-0.158** (0.128)	-0.059** (0.028)	-0.258** (0.228)	-0.161** (0.128)
Competitors	0.141** (0.117)	0.038** (0.017)	0.243** (0.117)	0.141** (0.117)
New technologies	0.295*** (0.151)	0.200*** (0.051)	0.293*** (0.151)	0.298*** (0.152)
Diversification	0.270** (0.171)	0.170** (0.071)	0.274** (0.172)	0.274** (0.171)
Quality	0.124*** (0.148)	0.220*** (0.049)	0.321*** (0.148)	0.321*** (0.148)
Marketing	0.286*** (0.162)	0.186*** (0.062)	0.292*** (0.162)	0.285*** (0.162)
Optimization	0.286*** (0.156)	0.187*** (0.055)	0.291*** (0.156)	0.287*** (0.156)
Customers	0.268*** (0.249)	0.172*** (0.049)	0.263*** (0.149)	0.267*** (0.149)
Own R&D	0.520*** (0.159)	0.412*** (0.059)	0.521*** (0.159)	0.520*** (0.159)
Market barriers	-0.206** (0.147)	-0.100** (0.048)	-0.200** (0.147)	-0.203** (0.147)
Scientific cooperation	-0.240** (0.169)	-0.150* (0.0779)	-0.252** (0.171)	-0.246** (0.170)
Support of state		0.071 (0.053)		
Constant	2.872***	2.891***	2.835***	2.880***
	(1.259)	(1.257)	(0.262)	(0.263)
Observations	1100			
R-squared	0.57	0.66	0.56	0.55

Note: RSE stands for „robust standard errors", and OLS stands for "ordinary least squares"; *** 5% significance, ** 10% significance, * 15% significance.
Source: Own results

The results reported in Table 1 confirm that belonging to the industrial cluster, developing own R&D or having competitors positively influences innovations and economic growth in the economy. In the same time, market barriers or equipment age might become the hampering factors of growth.

Conclusions and implications

Overall, countries in the regions of Latin America, Europe, and Asia, more specifically, China, have recently emerged on the global scene as major industrial and economic powerhouses. The main drivers for the emergence of these economies are economic reform and industrialization strategies, which have fostered the establishment and growth of industries, which has been integral to the growth of the countries. Further, these countries have been able to leverage the technological developments to develop its industries, which was supported by the growth in population; a ready market for the products manufactured therein, and cheap labor, which further gave the countries an advantage in the global industrialization agenda, as developed countries outsourced manufacturing to these nations. On the other hand, the countries have invested heavily in infrastructural development, which are aimed at supporting the industrialization and economic growth agenda implemented by these governments. Finally, the countries have been increasingly involved in international relations with countries from other parts of the world, such as China's increased presence in Africa.

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