An Analysis on the Validity of Okun's Law: Case of Turkey and BRICS[1]

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Abstract

The relationship between economic growth and employment has always preoccupied economists and politicians. To study the relationship between, on the one hand, the evolution of economic growth and, secondly, the unemployment, economists are accustomed to refer to the "Okun's law". The main objective of this paper is to estimate the Okun's coefficient, and to check the validity of Okun's law in some emerging countries (Brazil, Russia, India, China, South Africa and Turkey) to see whether it is valid or not, using the time series annual data during the period 1990-2014. Engle granger co-integration test and Fully Modified OLS are employed. Empirical evidences show that Okun's law interpretation may not be applicable in some emerging countries. Tests of cointegration revealed long-run association between unemployment and economic growth except the case of Brazil. Our findings suggest that Okun's law is not valid for Turkey, South Africa and Brazil.

Keywords: Economic Growth, Unemployment, Okun's Law

INTRODUCTION

Since the evolution of the production depends on the number of workers and productivity per worker, it was quite natural to verify the existence of statistical link between GDP growth rates and changes in the unemployment rate. Indeed, the unemployment rate for a given active population depends on the number of jobs. Verified in the case of the United States by Arthur Malvin Okun this relationship is strong enough for it to be presented today as a law: the Okun law. Okun's approach was Keynesian; he sought to link variations in aggregate demand and employment (or unemployment).

In 1962, Okun announced for the first time his law, which will have significant political and economic consequences. In politics, it's used to provide a minimum growth to stabilize unemployment and avoid popular overflows. In economics, it determines ideal values to achieve growth in order to guarantee a fixed or ideal level of unemployment. It allows then to estimate the goals of economic recovery. Okun's statistic shows a very strong correlation between changes in the unemployment rate and economic growth.

Unlike developed countries, the emerging and developing countries showed a robust growth in the past decade and experienced a rapid recovery after the Great Recession. It would be interesting to observe the evolution of the unemployment rate in these countries with high economic growth, in other words, to check validity of Okun's law and determine the impact of production on unemployment in emerging countries. We will limit our study in the case of Turkey and BRICS[2] for the period of 1990-2014.

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[2] BRICS: Brazil, Russia, India, China, South Africa.

The purpose of this article is to check whether Okun's law is valid in these countries by measuring the relationship between production and the unemployment rate. This paper is organized into three sections. The first section presents Okun's law and a literature review. The second section is devoted to a brief presentation of the economic situation in Turkey and BRICS using macroeconomic indicators. Finally, in the third section, we will attempt to implement an empirical analysis of Okun's law.

2. Okun's Law

Okun's law simply postulates the existence of a negative link between changes in the unemployment rate and real output. This law measures the elasticity of unemployment to changes in growth. In his pioneering article in 1962, Okun formulated two versions of the relationship between unemployment and macroeconomic activity in the United States. The first version of Okun's law is written as a simple relationship that connects changes in unemployment rate and growth of gross national product (Okun, 1962) It can be written mathematically as follows:

$$\Delta U = -0,4(\Delta Y - 3\%)$$

This equation is interpreted as follows: For a 1% increase in economic activity above 3%, the rate of unemployment falls by 0.4%. 0.4 represents the Okun coefficient, and the negative sign of this coefficient shows the inverse relationship between changes in the unemployment rate and output growth.

The second version is a simple linear relationship between the deviation of unemployment from its natural level estimated at 4% and the deviation of output from its potential level (output gap), (Okun, 1962). The mathematical formulation of the second version is as follows:

$$U - 4\% = -0,3(out\ put\ gap)$$

This equation implies that unemployment is stationary around the natural unemployment rate (non accelerating inflation rate of unemployment). We can write Okun's law as follows:

$$\frac{Yp - Y}{Y} = -\alpha(U - U^*)$$

With Y_p represents the potential GDP, Y represents real GDP, U unemployment rate, U^* the natural rate of unemployment and α measure the decrease in the unemployment rate when production exceeds a certain threshold.

Potential output for Okun (Potential GNP) is a supply concept, a measure of productive capacity. However, it is not a measure of how much output could be generated by unlimited amounts of aggregate demand. The nation would probably be most productive in the short-run with inflationary pressure pushing the economy. The social target of maximum production and employment is constrained by a social desire for price stability and free markets. The full employment goal must be understood as striving for maximum production without inflationary pressure (Okun 1962). We note that Okun takes account the price stability as a necessary condition for calculation of potential output.

3. Literature Review

After Okun (1962), others have followed justifying the existence of the Okun coefficient. These other studies have shown a remarkable stability of the coefficient in the United States, coefficient proves less stable when the estimates are carried out on other countries. Below we summarize many referred studies.

Baker and Schmidt (1997) determined the Okun coefficient for a panel of OECD countries. They showed that the sensitivity of the job to growth was stronger in the 1980-1990 than in the 1960's. Hubert (2005) showed that the Okun coefficient depends partly on degree of flexibility of the labour market. His study suggests that the link between the labour market (measured by the change in unemployment) and the goods market (measured by the output gap) is higher in countries with few restrictions on the labour market (flexibility) compared to countries with a lot of restrictions (less flexibility).

Buescher and Muller (1999) showed that the unemployment sensitivity to output gap is affected by the volatility of the exchange rate. The argument was that the volatility of the exchange rate creates uncertainty and generates additional transaction costs. This cost has negative impact on exports and consequently on production and employment. They concluded that high volatility of the exchange rate tended to decrease the value of coefficient.

Bankole and Fatai (2013) checked the validity of Okun's law in Nigeria, using the time series annual data for the period 1980-2008. They have employed the Engle granger co-integration test and FMOLS. The empirical evidences show that there is positive coefficient in the Regression, implying that Okun's law interpretation is not applicable to Nigeria.

Choi and Chang (2007) showed the effect of employment on economic growth. They call this as employment elasticity and particularly study the determinants of elasticity. Suryadarma and Suryahadi (2007) developed a model that describes the impact of different sectors on economic growth. They use a provincial panel data and find that the growth of urban employment is based on the strategies used and the increase in services has a positive impact on urban employment, while agriculture remains the best strategy to increase the employment in rural areas.

Tombolo and Hasegawa (2014) estimate the Brazilian "Okun's coefficient" with quarterly data of 1980Q1 until 2013Q3. Considering the typical Okun's relationship, $\Delta U = \alpha - \beta g_y$, where β is the Okun coefficient, they have obtained estimates of β between -0.1878 and -0.2055, such values are in general lower than the values obtained by similar studies for others countries.

Lal, Muhammad, Jalil and Hussain (2010) estimate the Okun's coefficient, and check the validity of Okun's law in some Asian countries (Pakistan, India, Bangladesh, Srilanka and China) whether it is valid or not, for this purpose they have used the time series annual data during the period 1980-2006. Engle Granger (1987) co integration technique is employed to find out long run association between variables and error correction mechanism (ECM) is used for short run dynamic. After getting empirical evidences, they concluded that Okun's law interpretation may not be applicable and also the principle of NAIRU does not hold its validity in some Asian developing countries. Their results have also supported to Noble Prize awarded Austrian economist Paul Krugman.

Leshoro (2013), adopt the Toda-Yamamoto technique of causality in order to examine the direction of causality between employment and economic growth. They investigate whether the increase in the Gross Domestic Product (GDP) translates into increased employment or not and vice versa, in South Africa, using quarterly data from 2000Q1 to 2012Q3. The results they obtained shows that causality does not run from employment to economic growth in South Africa, as the null hypothesis was not rejected at all significant levels

Demirgil (2010) tested the validity of the Okun's law during periods of between 1989 and 2007 (with quarterly data) for Turkey. Its results concludes that there are stronger evidence on inefficacy of Okun's law, especially during the periods of abnormal productivity growth, and, moreover, Turkey is encountering a structural changes in its economy rather than cyclical recovery with the beginnings of 2000's.

Barışık, Çevik and Çevik (2010) have used Markov Regime Switching Model and their findings have shown that for explaining the relationship between variables techniques of classic and linear time series are inadequate. They have concluded that Markov Regime Switching Model has more predominant results than linear models, the relationship between variables has asymmetric structure according to economy's growth and depression periods and Turkey's existing growth does not cause employment.

4. The Concepte of Emerging Countries

The concept of "emerging country" comes from the world of finance. After the debt crisis in the early 1990s, the term "emerging markets" appeared to refer to the countries growing rapidly and presenting investment opportunities for rich countries. Mexico, Argentina, Indonesia, Turkey, for example, were included in this new category. Then it emerged that growth in these countries was sustainable, unlike

that seen in previous decades, and it gradually changed the world economic geography. Finally, in early 2000s, Goldman Sachs has introduced the concept of BRIC to name the group of Brazil, Russia, India and China. In 2010, South Africa converged to the BRIC group, and the process for its formal admission began in August of that year. South Africa officially became a member nation on 24 December 2010, after being formally invited by the BRIC countries to join the group which was renamed BRICS with the "S" standing for South Africa to reflect the group's expanded membership (Graceffo and Antonio, 2011). These five states differ from other emerging countries firstly by their economic and demographic weight, and also by their ability to influence international politics. These countries are both emerging economies and considerable political actors. Outside the BRICS, there is also the MINT, which is an acronym, referring to the economies of Mexico, Indonesia, Nigeria and Turkey but we will limit our study in the case of Turkey and BRICS countries.

5. An Economic Overview of the Sample

In 2013, most of the BRICS countries were already the biggest economic powers in the world and should gain even more weight on the international scene in the decades to come. All BRICS countries represent 45% of the population of the planet, nearly a quarter of global wealth, and two thirds of growth. Four of the five countries are among the top ten world economic powers (Brazil 7th, Russia 8th, India 10th, and China 2nd). South Africa, first power of the African continent, is ranked as the 29th largest economy in the world (CEBR).[3]

China is currently considered as the second world power (behind the US), China became the second largest economy in the world since 2011, dethroning Japan and becoming the first power of the Asian continent. In 2013 for the first time China has overtook the USA to become the world's largest trading country in goods. China's foreign trade rose 7.6%, China's exports rose to 2210 billion and imports increased 7.3% to 1.95 trillion, according to figures released in 2013 by customs. With a spectacular growth (the most important of the last decade) in the order of about 10% per year, China is the country that registered the highest economic growth of recent years. In 2010, China reached a record 9.5% growth (for comparison, economic growth in France was 2,1% in 2011). (WB, 2016)

Brazil is the fourth largest economy of the BRICS and the main economic power in South America. The liberalization of the Brazilian economy took place at the pace of liberalization of the global economy as evidenced by Brazil's accession to the World Trade Organization (WTO) and the rapid development of Brazilian multinationals in primary productions (agriculture, energy) but also in industrial production (aeronautics). However, despite the increase of the middle class and significant poverty reduction, (several million poor Brazilians have joined the middle class between 2000 and 2010), Brazil is still marked by increased inequality between social groups and between regions. In terms of the economy growth, Brazil has registered an increase of 7.5% in 2010, representing a growth significantly higher than that of developed countries such as Germany, France, the United Kingdom and the United States. With India and China, Brazil is one of the countries that experienced the highest rates of growth between 2007 and 2010. In 2011, after a growth rate of 7,6%, Brazil overtook the UK to become the 6th world economy (theguardian, 2012). Brazil is now the seventh world power and has the world's seventh largest GDP, just ahead of Russia.

India is among the countries that have experienced high rates of economic growth in recent years, with a growth rate of about 9.3% in 2006, 9.8% in 2007 and up 10.3% in 2010, India ranks as the 3rd among the countries that experienced the highest rate of growth in recent years. Over this period, no other country except China has outperformed India. However, since 2012, the Indian economy is experiencing a slowdown, due to the global economic crisis and the weakness of domestic demand. Growth reached its lowest level of last decade in Q2 2013 (4.4%). After several consecutive years of depreciation of the Indian currency (-11% of its value against the dollar over the year 2013), it has been relatively stable during the year 2014, thanks to the interventions of the central bank and greater confidence of investors against the currencies of other emerging countries. Beyond the current slowdown in its economy, India remains an important market for large companies, and also benefits

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[3] Centre for Economics and Business Research

from investments of its diaspora: India's growth has thus recovered to 7.3% in 2014. (WB, 2016) If this trend continues, India should become one of the top four global economies in twenty years. India's economic growth, which was driven by intensive service activities of skilled labour, is now more diverse, with the expansion of manufacturing and construction, but also a growing share of investment and private consumption.

The question of Russia as an emerging country has long been a source of controversy. Russia is indeed one of the most influential countries in the world and is one of five countries in the world to occupy a permanent seat on the United Nations Security Council. It is probably the most developed of the BRICS countries, with a literacy rate over 99% in 2010, higher than China (95%), Brazil (90%), South Africa (88%) and India (77%)[4]. On this point, it is one of the most developed countries in the world, ahead of Germany, France, the United Kingdom or the United States. Economically, Russia has a moderate economic growth (3.4% in 2012), has the world's third largest currency reserves (after China and Japan) and is one of the least indebted countries (the Russian debt has a low rate of 10% of GDP, one of the best in the world). Economic growth in Russia remains nevertheless modest compared to 6% experienced by Brazil (almost double) and 10% in China and India. According to some analysts, the Russian presence in BRICS would be more geopolitical than economic aspects, given that the economy of Russia, despite a sizeable economic growth, has not had much in common with the dynamism that characterizes the rest of the group.

South Africa has 75% of the biggest African companies, has lower growth than 2% and a GDP of sixteen times lower than that of China. For the majority of specialists, experts or economists, South Africa appears to be the least influential BRICS countries. South Africa is indeed far behind the four economic giants Russia, India, China and Brazil in terms of GDP, development or economic growth. With a GDP of $ 384 billion, South Africa's GDP is not even half that of India ($ 1,842 billion), Russia ($ 2,000 billion), Brazil (2253 $ billion) and appears to be very small compared with that of China ($ 8 227 billion) (jeuneafrique, 2013). Considering the size of its economy (2.5% of total GDP of the BRICS), or population (52 million), South Africa appears tiny compared to other countries in the group. However, regionally, South Africa remains a leader in its entire continent. Today ranked second economic power (after Nigeria), South Africa had been the largest economy in Africa until 2013.

Turkey was the first economic power in the Middle East ahead Iran and Saudi Arabia, the 7th economic power in Europe and the 15th largest economy in 2015. G20 member and the Customs Union, Turkey officially started its accession talks with the EU in October 2005. After significant growth until 2011 (9.2% in 2010 and 8.8% in 2011), Turkey has been experienced a sharp slowdown in its growth rate (2.9% in 2014). Turkey is an industrial country where agriculture plays an important role in the national wealth production. The added value of the industry represents 26.6% of GDP against 63.7% for services and 9.6% for agriculture (WB, 2015). The vitality of the Turkish economy is explained by:

➢ The presence of a large internal market (75 million of consumers): Private consumption is supported and its purchase power is growing. Turkey shows a GDP per capital growth of of 7.8% compared to 1,4% in the United Kingdom.

➢ Significant investments: they represented a significant share of GDP in 2010 (20% against 17.3% in Germany).

➢ Turkey's business sector dynamism has underpinned strong and inclusive growth in the 2000s, even though well-being indicators suggested there remained ample room for improvement. Robust public finance and a resilient banking sector supported economic performance. However, with low domestic saving and volatile external competitiveness, growth was highly dependent on domestic demand and foreign finance (OECD, 2014).

[4] OECD 2012 Data set, literacy rate

Turkey's rising prosperity has been shared. Between 2002 and 2012, the consumption of the bottom 40 percent increased at around the same rate as the national average. Over the same period, extreme poverty fell from 13 to 4.5 percent and moderate poverty fell from 44 to 21 percent, while access to health, education, and municipal services vastly improved for the less well off. Since the global financial crisis, Turkey has created some 6.3 million jobs, although increases in the labour force, including through a rise in the participation of women, has kept unemployment at around 10% (WB, 2016). The Turkish economy is a relatively open economy. Foreign trade accounted for 48% of GDP against 22% in Brazil and 88% in Germany.

6. A few Socio-Economic Indicators

It is important to observe the economic indicators that will be used in the econometric analysis. Our observations will be limited in the period of 1990-2014 for the BRICS countries and Turkey.

6.1. Economic Growth

Economic growth means an increase in real GDP. Firstly, and most commonly, growth is defined as an increase in the output that an economy produces over a period. The second meaning of economic growth is an increase in what an economy can produce if it is using all its scarce resources. An increase in an economy's productive potential can be shown by an outward shift in the economy's production possibility frontier. Economic growth is an important macro-economic objective because it enables increased living standards and helps create new jobs.
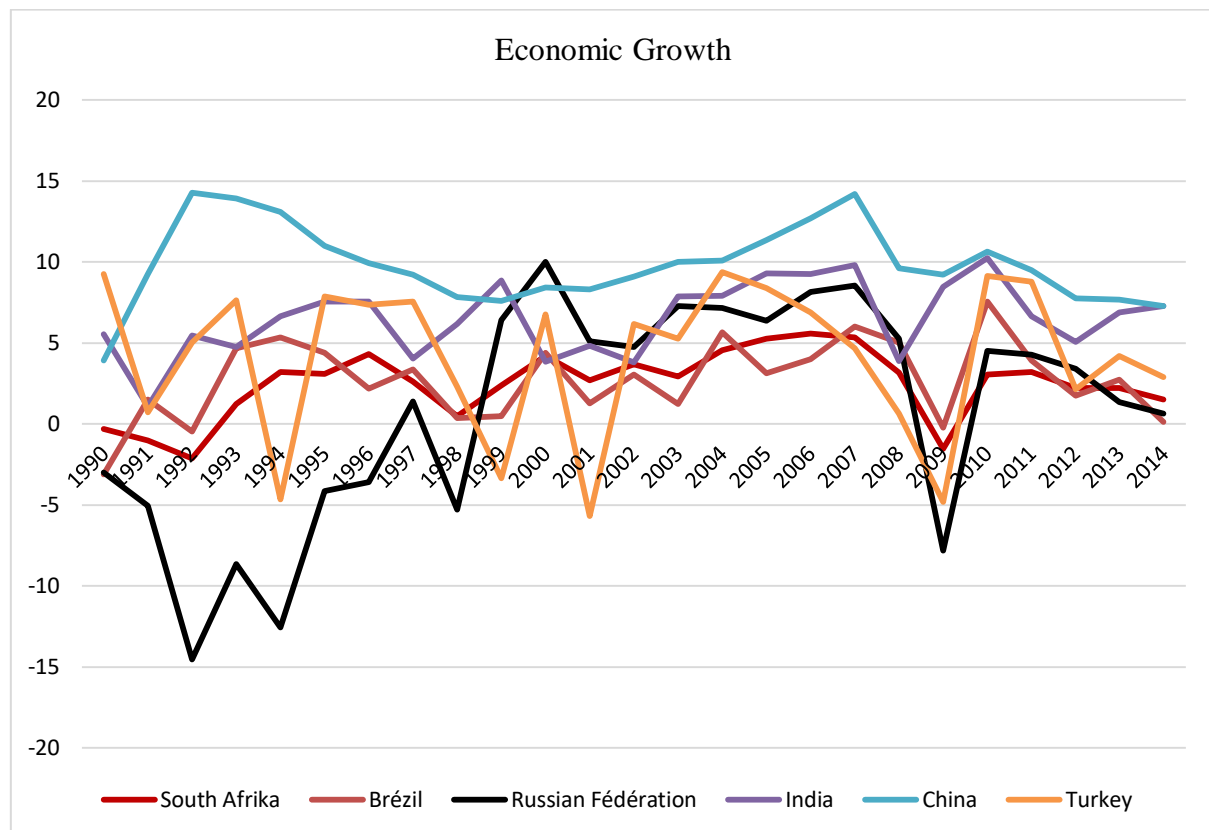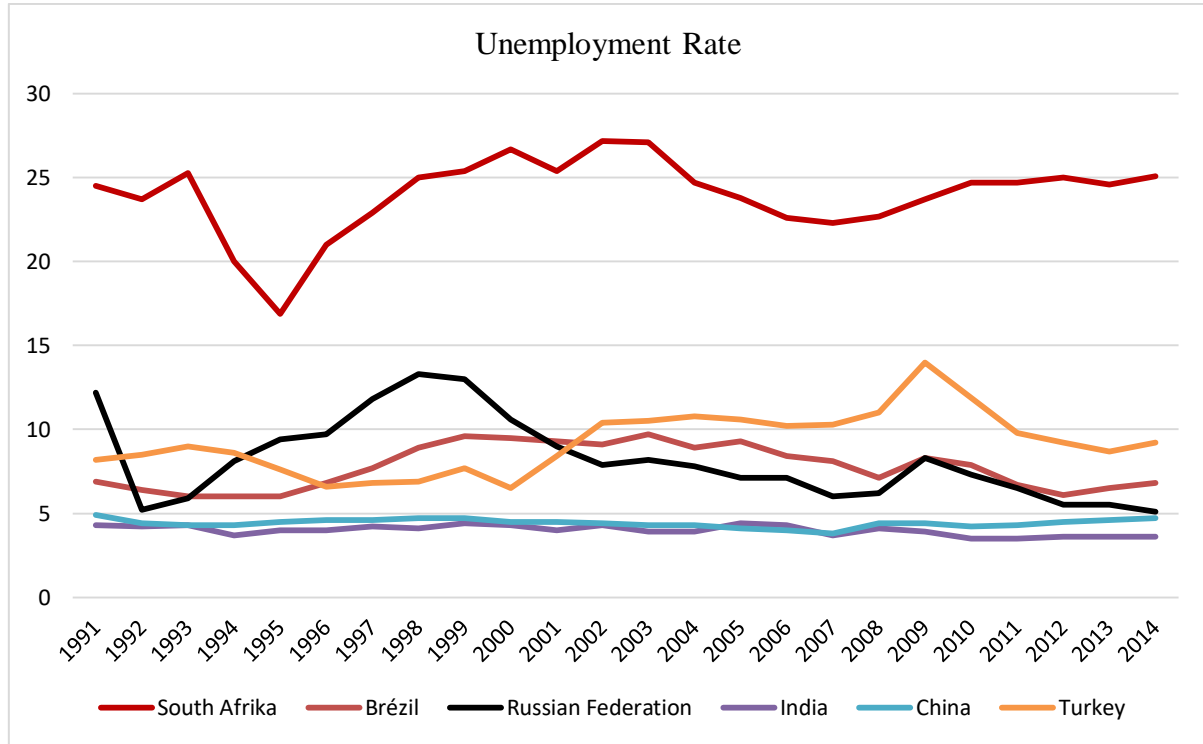

Source: World Bank, 2016

Figure 1: Economic Growth

Graph 1 shows that Chinese growth curve clearly dominates the other countries until 2008 period of the financial crisis. Russia is the country that has been the most affected by this crisis, which has for that matter spared none of the other countries. From 2010, we have observed a general decline of growth in these countries except India, which shows a slight recovery of its economy. We can also observe the crises of 1994, 1998 and 2001 experienced by Turkey.

6.2. Unemployment Rate

Unemployment occurs when people are without work and actively seeking work.[5] The unemployment rate is a measure of the prevalence of unemployment and it is calculated as a percentage by dividing the number of unemployed individuals by all individuals currently in the labour force. During periods of recession, an economy usually experiences a relatively high unemployment rate.

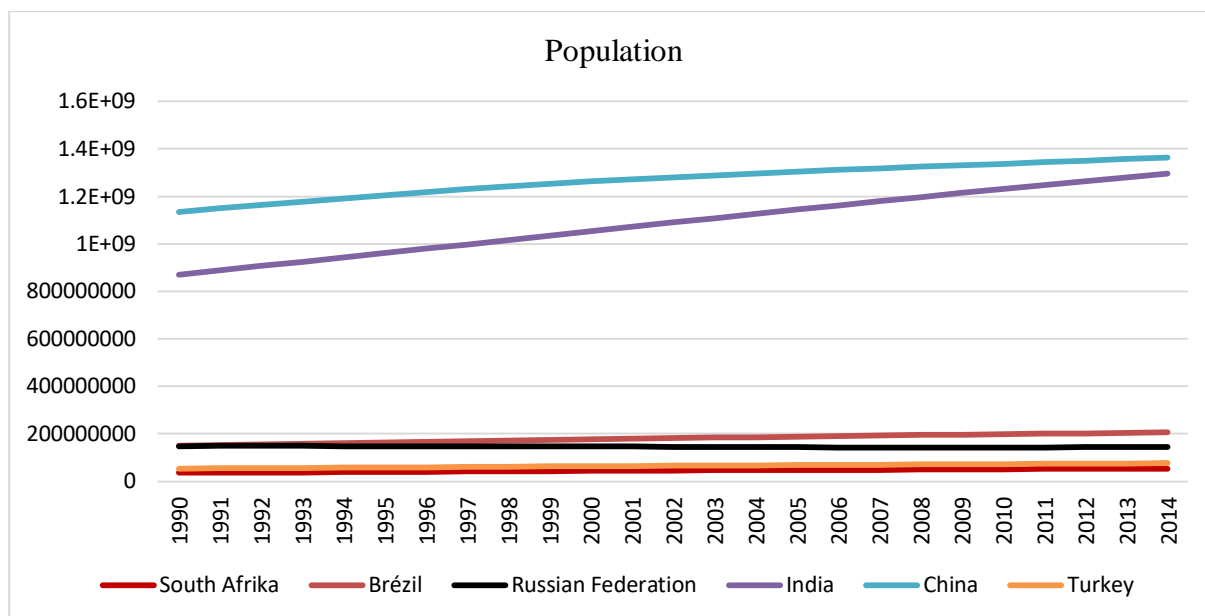**Source:** World Bank, 2016

Figure 2: Unemployment Rate

The record for the highest unemployment rate is incontestably detained by South Africa, and India is the country which has been experiencing a relatively low unemployment rate since 1990. The financial crisis of 2008 has led to an increase in unemployment rates in most emerging countries.

6.3. Population

Economists have often neglected the impact of fundamental demographic processes on economic growth. In general, growing economies need growing populations, increasing the supply of both workers and consumers, although the precise nature of this relationship is of course complex and variable (Berry,2014). Bloom and Canning (2001) are among the few who explore the effect of the demographic transition on economic growth. They argue that it is possible that the interaction of economic growth with population dynamics can result in a poverty trap.

[5] International Labor Organization (October 1982)

Source: World Bank 2016

Figure 3: Population

India and China are unquestionably the most populous countries of the world. This graph also shows that India has a high population growth rate more than China. BRIC countries account for a population of 3 billion people, or 41% of the world population. In geopolitical terms, this figure can be compared to the total population of the NATO member countries: 992 million people, or 14% of the world population.

6.4. Spending on Research and Development (% of GDP)

Expenditures on research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development (World Bank, 2016).
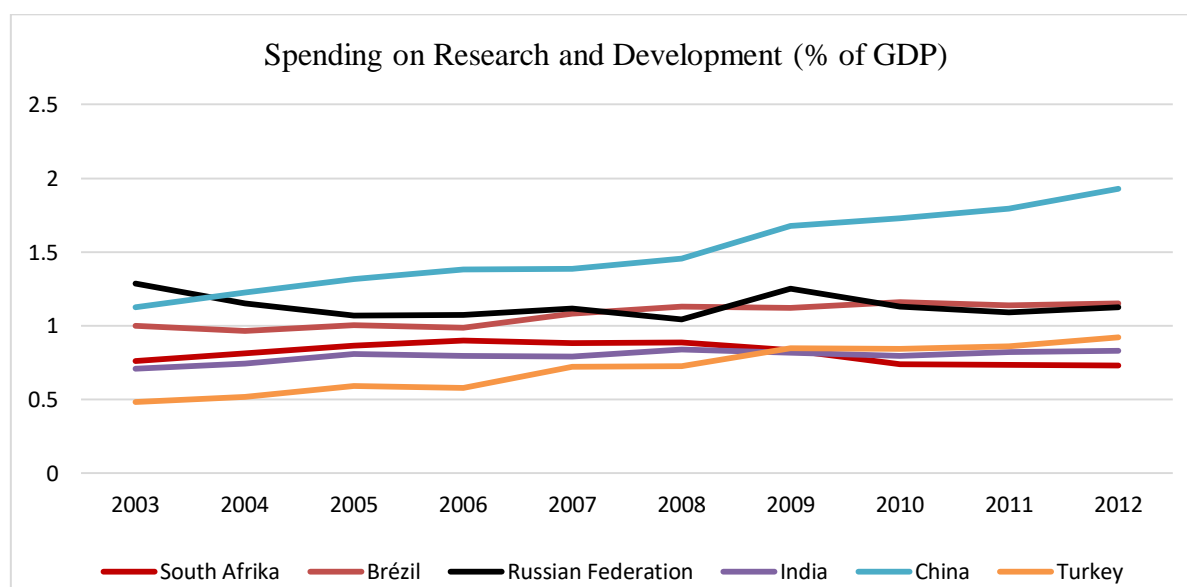
Source: World Bank 2016

Figure 4: Spending on Research and Development (% of GDP)

China is by far the country that spends the most on research and development followed by Russia and Brazil. We can notice that after the financial crisis, the states of emerging countries have decided to spend more on research and development.

7. Econometric Analysis

In this section, we present the Okun's model, the analysis techniques, statistical tests applied to the data and their results.

7.1. Model Specification

Generally, as suggested by Okun (1970), there are two standard model specifications of Okun's law, first is the "First difference model" and the second is the "Gap model". According to the first-difference model, the link between the natural log of real output (Y_t) and the natural log of unemployment rate (U_t) is as follows:

$$Y_t - Y_{t-1} = \alpha + \beta(U_t - U_{t-1}) + \varepsilon_t \tag{1}$$

The second is "Gap model" as given as:

$$Y_t - Y_t^* = \alpha + \beta(U_t - U_t^*) + \varepsilon_t \tag{2}$$

Where Y_t^* refers the log of potential output, U_t^* is the natural rate of unemployment. Where α is the intercept, β (β < 0) is Okun's coefficient computing that how much variation in the unemployment rate to changes in output, and ε_t is the disturbance term. The Gap model has been chosen for further analysis of the Okun's law, where the left-hand side represents the output gap and right-hand side represents the unemployment gap$(U_t - U_t^*)$. Thus, the difference between the observed and potential real GDP postulates the fluctuations in output. Similarly, the difference between the observed and natural rate of unemployment refers the cyclical rate of unemployment. It is obvious that the stationary or cointegration conditions of these gaps also have to be fulfilled.

A major problem with this model is that there are no observable data on Y_t^* and U_t^* so they have to be estimated, which means it is necessary to generate *y* and *u* trend series. To relatively overcome it, and in order to test for the robustness of the Okun's coefficients, we apply the Hodrick–Prescott (HP) filter detrending technique (Hodrick and Prescott, 1990).

7.2. Data sources and Estimation Procedure

Our estimate has been performed in the case of BRICS countries and Turkey. The annual data in the unemployment rate and real GDP has been used for the period 1990 to 2014; these data are obtained from the World Bank data set (WB).

Our analysis is carried out in four steps. In the first step, we have generated the unemployment and the output gaps by using the Hodrick–Prescott (HP) filter detrending technique. The second step has consisted in performing unit root tests by using Augmented Dickey-Fuller test, to avoid spurious regression. Third, we have performed Engle-Granger Cointagration Test. Four, we estimate the cointegrating equations from equation (2) using the fully modified OLS to obtain the long-run elasticities.

7.3. Empirical Analyses

After having generate the unemployment and the output gaps by using the Hodrick–Prescott (HP) filter detrending technique, we have performed the unit roots test.

7.3.1. Unit Root Test

Unit root testing is a necessary procedure before estimating. It allows us to know whether the processes generated are stationary and, therefore, the obtained results are not spurious and have economic sense. Augmented Dickey-Fuller (ADF) and the Philips-Perron (PP) are some of the most applied tests. In both, the null hypothesis assumes that series are generated by integrated processes whereas the alternative establishes the series are stationary. The difference between them is in the way the serial correlation problem is dealt. Whereas ADF introduces additional lags as regressors of the

variable that is susceptible to present a certain autocorrelation degree, PP makes a non-parametric correction of the t-test statistic, i.e., PP test uses Newey–West (1987) standard errors to account for serial correlation (Celia Melguizo Cháfer 2015). We have chosen to use the Augmented Dickey-Fuller (ADF) to check the stationarity of variables.

Table 1: Unit Root Test Result

		Brazil	Russia	India	Chine	South Africa	Turkey
GDP		-0.148124 *	-0.020833 *	-0.008248	-0.000592 *	-0.022616	-0.297175 **
		(0.0000)	**(0.0007)**	**(0.0465)**	**(0.0176)**	**(0.0003)**	**(0.0028)**
UNEM		-0.096586 *	-0.027735 *	-0.000250	-0.117869 *	-0.044668	-0.053975 **
		(0.0000)	**(0.0000)**	**(0.0206)**	**(0.000)**	**(0.0005)**	**(0.0351)**

Source: Author's Computation.
Note: P values are in italics and brackets under, *show the first difference stationary and ** show second difference stationary

According to the ADF test, the series are stationary at first difference in the case of Brazil, China and Russia and at level for South Africa and India. Turkey's GDP and unemployment rate values are stationary at second difference.

Table-1 exhibits the stationarity of variables at different form. However, the stationary is found on the same differencing level of the variables (output gap and unemployment gap) of same country that fulfil the Engle granger requirement.

7.3.2. Cointegration Test

The results of the Unit Root Test point out that the variables are integrated at same order, the next step is to check if a long run relationship exists between the variables of interest. If the sequence of residuals from this regression is stationary, the variables are said to be co-integrated. On the other hand, if these residuals are non-stationary, it is concluded that there is no long run equilibrium relationship or no cointegration lies between the output gap the and unemployment gap.

Table 2: Engle Granger Result (Cointegration)

	Coefficient	P-Value	Decision
Brazil	-0.107533	0.0000	No cointegrated
Russia	-0.351025	0.0027	Cointegrated
India	-0.066404	0.0006	Cointegrated
China	-0.013070	0.0111	Cointegrated
South Africa	-0.029520	0.000	Cointegrated
Turkey	-3.26145	0.0508	Cointegrated

Source: Authors' Computation

Table 2 summarizes the results of Co-integration analysis between output gap and Unemployment gap. Engle and Granger result identifies the existence of long run association, error term of both equations are stationary at level, which reflects the evidence of cointegration. The presence of co integration vector shows the existence of a long run equilibrium association between the variables in all countries except the case of Brazil.

7.3.3. Fully Modified Ordinary Least Square (FMOLS)

Having found the long-run relationship between the output gap and unemployment gap, in this context the aim is to estimate the long-run elasticities. They can be calculated through using Phillips and

Hansen (1990) fully modified ordinary least squares (FMOLS). FMOLS technique was originally introduced by Philips and Hansen, which provides the most favourable estimation of Co-integration regressions. In order to get asymptotic efficiency (normal distribution) this technique advances the least squares method to explain the serial correlation stationary at same order, the condition to employ the FMOLS for estimating long-run parameters must cointegrated at a set of I(1) variables or at a same level.

Table 3: Fully Modified OLS Result

	Coefficient	T-Value	P-Value
Russia	-0.601787 **	-16.68369	0.0000
India	-5.882557 **	-5.565951	0.000
China	-0.241874 *	-1.879841	0.0741
South Africa	3.269557 **	3.420095	0.0045
Turkey	0.027131 **	2.373349	0.0272

Source: Authors' Computation, ***, **, and * indicate statistical significance at the 1, 5, and 10 percent level.

Table 3 exhibits the results of fully modified ordinary least squares, which are not satisfied the condition of Okun's law coefficients. The results of South Africa and Turkey show us that there is a positive relationship between unemployment and output growth. In this case, the results do not support the implications of Okun's Law in South Africa and Turkey, therefore, economic growth does not explain the unemployment problem in these countries.

7.3.4. Estimation results

Except the case of Brazil, the estimation results show that there exists a long run relationship between output gap and unemployment gap. The estimation results also show that there is a positive relationship between unemployment and output growth in the case of South Africa and Turkey.

Despite an increase in real GDP there is no decrease in the unemployment rate (jobless growth), because in 2000s, Turkey began a structural change of its economy. Entry of new goods and services (mainly due to increased imports) in market at lower cost; the difficulty of old firms in the market to create jobs after the 2001 crisis. Furthermore, increased demand for skilled labour from new companies making much profit contributed to increase the unemployment rate (Demirgil,2010).

South Africa's mass unemployment dates back to the 1970s, and continued to rise through the 1980s and 1990s. Unemployment has increased substantially since the African National Congress came to power in 1994, going from 15.6% in 1995 to 30.3% in 2001 (Seria,2010). In the second quarter of 2010, the jobless rate increased to 25.3%, and the number of people with work fell by 61,000 to 12.7 million. The biggest decline in employment was recorded in the manufacturing industry, which shed 53,000 workers. Agriculture lost 32,000 jobs; employment in the construction industry fell by 15,000. In the third quarter of 2010, 29.80% of blacks were officially unemployed, compared with 22.30% of coloureds, 8.60 of Asians and 5.10% of whites. The higher wages negotiated by politically powerful trade unions have suppressed job growth (Dugger,2010).

South Africa experiences a situation where there is a surplus of especially unskilled and low-skilled job seekers caused largely by historically low levels of investment in African education. There are various arguments about the causes of unemployment in South Africa, among them we can highlight the deliberate exclusion of black people from the educational system and from skilled occupations under apartheid which contributed to rise the rate of unemployment today. Labour supply is affected by the increase in the number of job seekers over the years. The rate of entry of women especially African women into the labour market has risen sharply. Furthermore, the South African population is a young population, more people enter the working age as compared to the number of jobs that become available in the labour market. The test results of Fully Modified OLS also showed that the Indian economy produced more jobs than Russia and China, the Okun coefficient is -5,9 in the case of India, -0,6 for Russia and -0,24 for China.

CONCLUSION

The question of the relationship between economic growth and jobs is very relevant in the recent economic context, marked by the Great Recession. To study the relationship between, on the one hand, the evolution of economic growth and, on the other hand, that of unemployment, economists are accustomed to refer to the "Okun's law". This study attempts to provide a robust empirical analysis of the relationship between GDP growth and Unemployment for Turkey and BRICS countries during the period (1990-2014). Further, the study provided an estimation of Okun's coefficient. Our empirical analysis consisted of Hodrick–Prescott (HP) filter detrending technique, Augmented Dickey-Fuller (ADF), Engle granger cointegration test and fully modified OLS to estimate relationship between unemployment rate and economic growth.

The results presented in this study, showed that the data series are stationary in their differences. Tests of cointegration revealed long-run associationed between unemployment and economic growth except the case of Brazil. Our findings suggest that Okun's law was not valid for Turkey, South Africa and Brazil. It can be suggested that the lack of growth does not explain the unemployment problem in these countries.

The implications of Okun's law for economic policy that economists need to anticipate the further development of unemployment for a given projected growth level which is additionally important to forecast unemployment costs. However, our results do not support the implications of Okun's Law in some developing countries. It can be said that Okun's law interpretation may not be applicable in developing countries. Any increase in GDP does not necessarily imply a decline in unemployment. In this case the government and policy makers should employ economic policies that are more oriented to structural changes and reform in labor market.

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