An Analysis of Unemployment Determinants in BRIC Countries

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Abstract

Unemployment is one of the main problems in the world economy today. Many countries at different levels of development are trying to cope with this problem. Economic growth, population, inflation rate, interest rates, changes in exchange rates and various other factors cause unemployment. Unemployment arises for different reasons in each country. The aim of this study is to examine the factors that affect unemployment in the recently attention-grabbing BRIC countries (Brazil, Russia, India and China). The study covers the 2001-2012 period. Panel data analysis is employed as the research method. Data is taken from the World Bank, the OECD and Bloomberg databases. According to the analysis results, the most important cause of increasing unemployment in the BRIC countries is inflation followed by population growth. Respectively, gross domestic product growth, trade volume, total investment and industrial product growth are the main economic factors that lead to the reduction of unemployment.

Keywords: BRIC, Unemployment, Panel Data Analysis

1. Introduction

One of the problems discussed in macro-economic analysis is unemployment. In the International Labor Office's (ILO, 2014) definition of unemployment, there are three basic elements. They are "without work", "currently the available for work" and "seeking work". In the broadest definition, people with the desire and ability to generate income are called unemployed when they are looking for but cannot find work, and this situation is called unemployment.

Unemployment has become a global problem. It has reached serious proportions due to the slowing of growth in the United States, European Union, other developed countries, and the global crisis experienced in the second half of the 2000s. The integration between financial markets has rapidly spread the crisis to other countries and regions around the world. The shock in the financial markets has brought about credibility and reliability problems. Investment, production and consumption have declined. Due to this economic contraction many people were left unemployed.

The BRIC countries consisting of Brazil, Russia, India and China are expected to become the biggest economies in the world in the near future. High economic performance and high economic potential of the BRIC countries makes them different from other developing countries. Therefore, BRIC countries are also called "emerging markets". As stated by Wilson & Purushothama (2003), by 2050 China and India are expected to be global actors in the manufacturing and service sectors with Brazil and Russia becoming global actors in the raw materials sector. By the year 2050, China is expected to become the world's largest economy while India is expected to become the third largest, Brazil the fourth and Russia the sixth largest. Following the Global Crisis, China passed Japan in 2010 and became the second largest economy in the world after the United States. This situation points to the likelihood of more short-term expectations for the future.

South Africa, in 2010, was included among the BRIC countries. Thus, these countries began to be referred to as BRICS (Smith, 2011). Since South Africa joined the ranks of the BRIC countries only recently, it was not included in this study. Referred to as BRIC by O'Neill (2001) for the first time, these countries despite having a population have rapidly growing economies. Therefore, it is worth studying the problem of unemployment in the BRIC countries from various angles.

The aim of this study is to examine the factors affecting unemployment in the BRIC countries during the period 2001-2012. Panel data analysis was used as the research method. The first section of the study is literature review. The theoretical framework and the various empirical studies on the causes of unemployment are discussed. The next section is on empirical analysis. Light is shed on the methods and data analysis, and the empirical results are evaluated. And a final evaluation of the article is drawn from these results.

2. Theoretical and Empirical Background

In the literature, there are many studies examining the effects of factors such as inflation, free trade, population, exchange rate, economic growth, education, foreign direct investment and technology on unemployment.

In Ricardo's Comparative Advantages theory, unemployment is reduced as foreign trade is liberalized. Dutt, Mitra and Ranjan's (2009) study confirms the Ricardian position that there's a negative relationship between unemployment and openness. According to the Heckscher-Ohlin-Samuelson theorem, free foreign trade reduces unemployment only in labor abundant countries. Thus, in capital abundant countries, increasing liberalization of the foreign trade could also increase unemployment (Dutt, Mitra & Ranjan, 2009). According to this theorem, increased production in a labor abundant country would also increase the demand for labor. With employment real wages go up. When trade barriers are removed and exports liven up, unemployment initially increases but then decreases (Gül & Kamacı, 2012). Kim (2010) investigated the effects of trade on unemployment in 20 OECD countries for the period of 1961-2008. Increasing trade volume in labor markets that lack flexibility raises total unemployment. According to Janiak (2006), exporting firms are larger and more productive than non-exporting firms. The liberalization of foreign trade makes large companies require more labor to increase their production. However, the potential for job creation is bigger in small non-exporting firms with low productivity than in large exporting firms.

In economic theory, the trade-off between gross national product and employment is described by Okun (1962) for the first time. Okun's law reads "...each extra percentage point in the unemployment rate above four percent has been associated with about a three percent decrement in real GNP." Okun's law describes how much the economy will grow at a specific unemployment rate. Farsio & Quade (2003) and Chowdhury & Hossain (2014) suggest that there exists a negative relationship between unemployment and GDP growth. In the Valadkhani (2003)study for the 1968-2000 period in Iran, a negative relationship between unemployment and high growth rate together with real investment, was revealed. In the Yılmaz (2005) study of Turkey there is a true causal relationship to growth from unemployment. This is consistent with the Solow growth model. In the Solow growth model, labor is an exogenous factor and increases depending on the population growth. The increase in unemployment in recent years in Turkey's economy despite the high growth rate can be explained in this way.

The relationship between unemployment and money wages is explained for the first time by Phillips (1958). In his study of England covering the 1861-1957 period, Phillips revealed that increasing money wages reduces unemployment. Studies by Monternsen (1970) and Valadkhani (2003) support that there exists a trade-off between unemployment and inflation. In the short term, in inflationary conditions, while increasing the demand for labor, employers minimize their expectations from skilled labor. Employers increase wage levels in order to meet the demand for labor. In this case, the time for job search is shortened due to wage increases. Hence, there is a negative relationship between inflation caused by wage increase and unemployment. This negative relationship expressed by the Phillips curve does not persist in the long term. There is no constant trade-off between inflation and unemployment. This was first introduced by Friedman (1968) and Phelps (1967). In the Chowdhury & Hossain (2014) study of the 2000-2011 period in Bangladesh, inflation positively affects unemployment.

According to Yılmaz (2005), policies that enhance investments in human capital should be developed as stated in endogenous growth theories. Thus, while economic growth increases, unemployment is reduced. InTaşçı and Özdemir (2006), Turkish middle school and high school graduates are more adversely affected by unemployment in the long term than untrained labor.

There is a negative relationship between higher education graduates and long-term unemployment. Monternsen (1970) argues that the wage job seekers would be willing to settle for depends on the work force's level of education, skills, duration for the job seeking and their self-sustaining income.

According to Chowdhury & Hossain (2014), there is a negative relationship between unemployment and the exchange rate.

According to the results of Afşin & Cengiz (2011)'s research on the 2003-2009 period in Turkey, real exchange rate influences commercial and non-commercial sectors at different levels. Balaylar (2011),shows that with the adoption of the flexible exchange rate system in the early 2000s in Turkey, the real exchange rate increased. Thus, the relationship between production and employment weakened.

Data, Methodology & Empirical Results

3.1 Data

In this study, the literature was reviewed in order to identify the variables influential in unemployment in the BRIC countries in the 2001-2012 period. The variables were obtained from OECD(http://www.oecd.org), the World Bank (http://www.worldbank.org) and Bloomberg (http://www.bloomberg.com) databases. The data used in the study are given in Table1.

The literature review revealed that in explaining the unemployment rate, variables such as interest, import, export and exchange rates are included in the model. These variables were excluded in this study because they lead to multiple linear correlations.

As in all time series analyses, in panel data analyses which combine time and horizontal cross-section data, variables need to be static in order not to create any false relationships. State Eviews 8.0 and Stata 11.0 were used for analysis.

3.2 Panel Unit Root Test and Cross-Section Dependence Test Results

While the Levin, Lin and Chu (2002) test was applied in the study to investigate the common unit root process, the Im, Pesaran& Shin (2003) test was applied to test the unit root process for each unit (country). The stationarity of independent variables is tested with the Augmented Dickey Fuller (ADF) (1979) test. Stationarity results are given in table 2.

All the variables in this study are found stationary I(1) on first difference. After taking the first difference, all variables were put through the Tramo/Seats filter in order to eliminate seasonal effects.

When using panel data to test the presence of a unit root, it is necessary to also test cross-section dependence. If cross-section dependence in panel data is rejected, the first generation unit root tests can be used. However, if there is cross-section dependence in panel data, using the second generation unit root tests is more consistent and effective and provides a more powerful forecasting.

The presence of cross-section dependence is checked with the Berusch Pagan (1980) CD LM1 test when T>N, with the Pesaran (2004) CD LM2 test when T=N, and with the Pesaran (2004) CD LM test when T<N. Since there are 5 countries (N=5) and 12 years (T=12) in this study, the Berusch Pagan (1980) CD LM1 test was used.

Test hypotheses are as follows:

H0: There is no cross-section dependence
H1: There is cross-section dependence

When the probability value obtained as the test result is less than 0.05, H0 hypothesis is rejected with a significance level of 5% and it is determined that there is cross-section dependence among units that form the panel (Pesaran, 2004).The following values are the values of t statistics.

According to results of Table 3; as probability values are smaller than 0.05, it is seen that the horizontal cross-section dependence in series and the equation. In this case there exists a cross-sectional dependence among the countries in the panel. Any shock to one country also affects others.

In this study, a cross-sectional dependence was identified among the countries that make up the panel. The stationarity of the series is tested with the CIPS test linked to the second generation unit root test of the CADF test.

Test hypotheses are as follows:

H_0: There is unit root
H_1: No unit root

In order to decide whether there is a unit root in the panel in general, CIPS statistics are calculated by taking the arithmetic average of the CADF statistics available for each country.

The CIPS statistics are compared with the values in the Pesaran (2006) table. When the CIPS value is smaller than the table critical value, H_0 is rejected. In this case, it is determined for all the countries that make up the panel that there is no unit root in the data and shocks are temporary.

The calculated CIPS statistic is greater than the critical table value, so H_0 is adopted and it is determinedthat there is a unit root in the series that forms the panel. In this case, the series are not stationary in their level values. This shows that a shock oriented towards the countries' independent variables does not immediately lose its effect. When the series are not stationary in their level values, regression analysis will be made with first differences.

3.3 Panel Regression Results

Baltagi (2004), states that panel data methods involve pooled, stable and random effects. To be able to choose between two possible prediction models, some statistical tests should be conducted. All the variables in the models vary between countries and time, the basic question is whether the data can be pooled in countries and times. The Chow test is used here in order to determine the joint significance of country-specific effects and time-specific effects. The efficient estimator is "pool OLS" estimator in the null hypothesis whereas it is the "fixed effect" model in the alternative hypothesis.

The Chow and Breush Pagan (BP) test results, which help determine the appropriate panel regression model, are given in Table 4. While the H_0 hypothesis is pooled regression and the H_1 hypothesis is the SEM model in the Chow test, the H0 hypothesis is pooled regression and H1 is the TEM model in the BP test.

The next step is to decide between the TEM and SEM models with the aid of the Hausman Test. Our hypotheses are as follows:

H_0: There are random effects (TEM)
H_1: There are no random effects (SEM)

As seen in the Hausman Test results in Table 5, H_1 hypothesis was accepted and the SEM model was chosen. Model estimation results obtained by period SUR the algorithm are given in Table 6.

Nuisance variables included in the model explain 89% of the unemployment rate. In the model, while IR and POP increase unemployment, GDP, TV, IPI and TI have an impact on reducing unemployment. Among the variables that have a reducing impact, GDP is the strongest. Among the variables that have a booster impact, IR is the strongest.

With all time series, autocorrelation is an important problem in panel data analyses. One of the main assumptions in regression analyses is that there is correlation between the same errors for different observations. If the error terms are associated with each other, this is called autocorrelation or serial correlation. Whether the data set had any autocorrelations was tested with the Wooldridge (2002) autocorrelation test.

The results for the autocorrelation test statistic proposed by Wooldridge (2002) are given in Table 7. Inthese test results, the null hypothesis "there is no autocorrelation" is rejected. In other words, there aren't any autocorrelation problems with the error terms in the equations.

Whether or not the model had a heteroscedasticity problem was tested with the heteroscedasticity test developed by Greene (2003). The H0 hypothesis, which stated that analyses indicated no heteroscedasticity, was accepted. Results are given in Table 8.

Thus, it was revealed that the estimated regression results would be reliable. It was determined that the model supported for the assumptions.

4. Conclusion

These results show that in BRIC countries, the main factor that leads to increased unemployment is inflation. Inflation increases the impact of unemployment (Friedman, 1968; Phelps, 1967).
In Solow growth model, population growth is the variable that increases unemployment, and this view is confirmed for the BRIC countries according to the survey results. As a result of the liberalization of foreign trade, volume of trade increases and unemployment decreases.
This is consistant with Ricardo's Comparative Advantages theorem. According to the results of the study, the negative relationship between economic growth and unemployment also applies to the BRIC countries. Furthermore, increases in industrial production and total investment are effective in reducing unemployment.

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Table 1. Description of theKeyVariables	
Definition	**Variables**
Unemployment(% of total laborforce)	UR
Grossdomestic product growth (annual %)	GDP
Tradevolume (1000 US$)	TV
Population	POP
Inflation (consumerprices) (annual %)	IR
Industrialproductindex	IPI
Total investment	TI

Table 2. Panel UnitRootTest Results

	DUR(1)		DGDP(1)		DTV(1)		DPOP(1)		DIR(1)		DIPI(1)		DTI(1)		DTV(1)	
Method	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Levin, Lin & Chu t	-7.224	0.0000	-13.215	0.0000	-6.834	0.0033	-5.405	0.0037	-5.665	0.000	-9.871	0.002	-6.782	0.004	-8.034	0.000
Im, PesaranandShin W-stat	-3.987	0.0022	-3.909	0.0179	-7.372	0.0001	-6.812	0.0006	-5.807	0.0027	-8.906	0.000	-4.983	0.003	-5.632	0.001
ADF - FisherChi-square	23.653	0.0178	25.226	0.0002	28.902	0.0036	27.003	0.0081	27.830	0.0103	39.437	0.000	29.003	0.000	35.003	0.000

Tablo 3. CD_{LM1}ve CIPS Test Sonuçları								
Test	**UR**	**GDP**	**TV**	**POP**	**IR**	**IPI**	**TI**	**UR**
CD_{LM1}	4.911*	4.765*	5.315*	5.763*	5.172*	7.620*	6.438*	7.552*
CIPS	4.335*	5.887*	7.303*	8.320*	6.409*	10.821*	7.463*	9.003*
*Significant at the 0.05 level								

Tablo 4. Panel RegresyonTahminYöntemiSeçim Test Sonuçları		
Test	**p değeri**	**Karar**
Chow(F testi)	0.006	H_1kabul
BP(χ^2testi)	0.017	H_1kabul

Tablo 5. HausmanTestiSonuçları			
Test Summary	**Chi-Sq. Statistic**	**Chi-Sq. d.f.**	**Prob.**
Cross-sectionrandom	15.663	6	0.001
Periodrandom	14.962	6	0.002
Cross-sectionandperiodrandom	16.539	6	0.000

Tablo 6. Panel Regression Results

Dependent Variable: DUR
Method: Panel Least Squares
Sample: 2001 2012
Periods included: 12
Cross-sections included: 5
Total panel (balanced) observations: 60
Period SUR (PCSE) standard errors & covariance (d.f. corrected)

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
DIR	0.155408	0.035243	4.409614	0.0000
DGDP	-0.269727	0.031215	-8.641038	0.0000
DTV	-0.142678	0.021764	-6.555607	0.0000
DPOP	0.090901	0.028998	3.134738	0.0021
DIPI	-0.104880	0.030716	-3.414548	0.0008
DTI	-0.136285	0.050999	-2.672315	0.0085
C	10.56610	4.120481	2.564287	0.0115

Effects Specification

Cross-section fixed (dummy variables)
Periodfixed (dummy variables)

R-squared	0.892999	Meandependent var	2.811506
Adjusted R-squared	0.865873	S.D. dependent var	3.352307
S.E. of regression	2.911161	Akaikeinfocriterion	3.645942
Sumsquaredresid	13.55633	Schwarzcriterion	2.645338
Loglikelihood	-34.34302	Hannan-Quinncriterion.	3.944562
F-statistic	40.06379	Durbin-Watson stat	1.986643
Prob(F-statistic)	0.000000	Second-Stage SSR	12.85562

Tablo 7. WooldridgeOtokorelasyonTestiSonuçları

F değeri	**Olasılık**
234.651	0.138

Tablo 8. GreeneHeteroskedasticityTestiSonuçları

chi2 (5) = 387.223
Prob>chi2 = 0.197