TESTING THE PRODUCTIVITY BIAS HYPOTHESIS FOR BRAZIL

DOI: 10.17261/Pressacademia.2019.1145
PAP-IFC- V.10-2019(13)-p.68-71

Gulfer Vural
Istanbul Medeniyet University, South Campus, Faculty of Political Science, Department of Economics, Istanbul, Turkey.
gulfer.vural@medeniyet.edu.tr, ORCID: 0000-0002-7297-7545

To cite this document
Permanent link to this document: http://doi.org/10.17261/Pressacademia.2019.1145
Copyright: Published by PressAcademia and limited licenced re-use rights only.

ABSTRACT

Purpose- Productivity Bias Hypothesis (Balassa-Samuelson hypothesis) implies that currency appreciates in a relatively more productive country. The focus of this study is to test productivity bias hypothesis for Brazil by employing time series data over the period 1980-2018.
Methodology- Time series data is analyzed by Autoregressive Distributed Lag (ARDL) method of cointegration.
Findings- Stationarity of the variables are supported by Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests. F bounds test and error correction model suggest that variables are cointegrated.
Conclusion- Empirical analysis does not support the evidence in favor of productivity bias hypothesis for Brazil over the selected period.

Keywords: Productivity bias hypothesis, Brazil.
JEL Codes: C22, F30

1. INTRODUCTION

Purchasing Power Parity (PPP) theory suggests that the exchange rate between currencies of two country is obtained as the ratio of the general price level. In the literature, there are many studies testing the validity of the theory but the results are not conclusive. Productivity differences across countries arise as one of the important reasons about the deviations of exchange rates from the equilibrium level.

The independent studies of Balassa (1964) and Samuelson (1964) revealed Balassa-Samuelson hypothesis that is also known as Productivity Bias Hypothesis (PBH). According to the hypothesis, if a country is more productive than the other country then real exchange rate appreciates in the more productive country.

In this study Productivity Bias Hypothesis is tested for Brazil from 1980 to 2018 period. Although there are many studies testing PBH, there is no time series study that tests the validity of the hypothesis in Brazil. This study contributes to the literature in this sense.

The rest of the paper is organized as follows: Section 2 provides a brief literature review. Section 3 presents methodology and empirical analysis. Section 4 concludes.

2. A BRIEF LITERATURE REVIEW


3. METHODOLOGY AND EMPIRICAL ANALYSIS

Following Officer (1976), the relationship between real exchange rate and productivity differentials is expressed in Equation 1.

\[ RER_t = a_0 + a_1 PROD_t + \epsilon_t \]  \hspace{1cm} (1)
RER is real exchange rate that is obtained by (P/Po)EX. P is price level in country i and Pp is price level in US and EX the exchange rate. PROD denotes productivity differential. PROD = (PROD/PRODus). PROD is productivity in country i and PRODus is productivity in US. εt is the error term. Expected sign of slope parameter αi is positive. Consumer price index is used for P. Productivity is measured by real GDP per capita. All data are taken World Bank, World Development Indicators Database.

In this study Pesaran et al. (2001) Autoregressive distributed lag model (ARDL) is used. Equation 2 below shows the ARDL representation of the model in Equation 1. ARDL method is invalid when the variables are I(2). When the variables are I(0) or I(1) or mixed the test is valid. In order to check that the variables are not I(2)Dickey and Fuller (1979), Augmented Dickey Fuller (ADF) and Phillips Perron (1988) (PP) tests are used. Table 1 shows the test results and existence of unit root is rejected by both tests for both variables.

\[ \Delta RER_i = \alpha_0 + \sum_{m=1}^{m_i} \alpha_{m1} \Delta RER_{i-1} + \sum_{k=1}^{m_2} \alpha_{k1} \Delta PROD_{i-1} + \alpha_t RER_t + \alpha_4 PROD_t + \epsilon_t \]  

(2)

Table 1: Unit Root Test

<table>
<thead>
<tr>
<th></th>
<th>ADF</th>
<th>PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>rer</td>
<td>-2.58**</td>
<td>-3.74*</td>
</tr>
<tr>
<td>prod</td>
<td>-2.64***</td>
<td>-2.68***</td>
</tr>
</tbody>
</table>

Null hypothesis is the presence of the unit root. *, **, *** denote rejection of the null hypothesis at the 1%, 5% and 10% significance levels respectively.

The cointegration relationship between the variables are investigated by the bounds testing that is a Wald statistics (F statistics). The null hypothesis is no cointegration among the variables:

H0: \( \alpha_4 = \alpha_t = 0 \)

H1: at least one of \( \alpha_4, \alpha_t \neq 0 \)

When F statistics is above the upper bound critical values then the null hypothesis is rejected. When the F statistics is below the lower bound critical value then the null hypothesis cannot be rejected. When the F statistics is between critical values then no conclusion can be drawn. Table 2 shows F bounds test results. The computed F statistics is above the upper bound critical value at 10% significance level.

Table 2: Cointegration F Test

<table>
<thead>
<tr>
<th>F-Statistics</th>
<th>90%LB</th>
<th>90%UB</th>
<th>95%LB</th>
<th>95%UB</th>
<th>99%LB</th>
<th>99%UB</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.15</td>
<td>3.02</td>
<td>3.51</td>
<td>3.62</td>
<td>4.16</td>
<td>4.94</td>
<td>5.58</td>
</tr>
</tbody>
</table>

Error correction model (ECM) provides estimates of short run parameters after determining the long run cointegration relationship between the variables. Equation 3 is the ECM representation of the model.

\[ \Delta RER_i = \beta_0 + \sum_{k=0}^{m} \beta_{1k} \Delta RER_{i-1} + \sum_{k=0}^{m} \beta_{2k} \Delta PROD_{i-1} + \lambda t EC_{i-1} + w_i \]  

(3)

ECt is the error correction term and \( \lambda \) is the speed of adjustment parameter. Negative and significant ECt indicates cointegration among the variables as well. Table 3 shows ECM estimation results and some regression diagnostics. ECt is estimated as negative and statistically significant and therefore provides further evidence on the cointegration.

Table 3: Error Correction Model

<table>
<thead>
<tr>
<th>ECt-1</th>
<th>t-stat</th>
<th>R²</th>
<th>DW Stat.</th>
<th>RSS</th>
<th>Normality</th>
<th>Serial Correlation</th>
<th>Heteroscedasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.06</td>
<td>-3.66</td>
<td>0.85</td>
<td>1.86</td>
<td>21.95</td>
<td>5.58</td>
<td>0.31</td>
<td>4.51</td>
</tr>
</tbody>
</table>

Table 4 presents ARDL long run results. The slope parameter is estimated as negative and significant. Therefore for the selected period of time in Brazil, no evidence is found to support Productivity Bias Hypothesis. Finally, cumulative sum of recursive residuals and (CUSUM) and cumulative sum of squares of recursive residuals CUSUM² tests of Brown et al. (1975) are used. Due to space constraints plots are not included. CUSUM and CUSUM² plots suggest stability of the model (S stands for stability).

Table 4: ARDL Long Run Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficient Estimate of Slope Parameter</th>
<th>t-stat</th>
<th>CUSUM</th>
<th>CUSUM²</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARDL (4,4)</td>
<td>-88.36</td>
<td>-2.06**</td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>

4. CONCLUSION

The purpose of this study is to determine whether Productivity Bias Hypothesis is supported in Brazil over the 1980-2018 period. Autoregressive distributed lag model (ARDL) is used. Firstly, Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests are used to check that none of the variables is I(2). Since ARDL is invalid when one of the variables is I(2). F bounds test suggests cointegration among the
variables. Then Error Correction Model is estimated. Lastly ARDL long run results imply that the slope coefficient is negative and significant. Therefore for the considered period of time no support for PBH is obtained in Brazil.

REFERENCES


Officer, L. H. (1976), The productivity bias in purchasing power parity: An econometric investigation. International Monetary Fund Staff Papers vol.23, p. 545–579.


