Economics Letters 146 (2016) 33–38

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

The Balassa–Samuelson hypothesis in the developed and developing countries revisited

Weiguo Wang, Jing Xue *, Chonghua Du

School of Economics, Dongbei University of Finance and Economics, Dalian City, 116023, China

HIGHLIGHTS

- A new cointegration test for panel data with multiple heterogeneous unknown breaks is proposed.
- This test also captures the cross sectional dependence by incorporating non-stationary factors.
- Applying new test to the Balassa–Samuelson (BS) hypothesis shows the BS hypothesis holds only for developed economies.

ARTICLE INFO

Article history:
Received 7 March 2016
Received in revised form
12 July 2016
Accepted 12 July 2016
Available online 18 July 2016

JEL classification:
C2
C5
E4

Keywords:
Balassa–Samuelson hypothesis
Real exchange rates
Productivity
Panel cointegration
Cross-sectional dependence
Structural breaks

ABSTRACT

This paper aims at examining the Balassa–Samuelson (BS) hypothesis in 20 developed and 20 developing countries, respectively. Given the cross-sectional dependence and structural breaks, we develop a new panel cointegration technique which allows for multiple heterogeneous unknown breaks and non-stationary factors. The empirical results show that the BS hypothesis holds in the developed countries, implying that higher productivity growth leads to a real appreciation, but they are cointegrated up to a number of cross-sectional unobserved stochastic trends as factors are non-stationary. However, we find little evidence to support the BS hypothesis in the developing countries and a further research is needed for the reason.

1. Introduction

The depreciation of RMB from August 11, 2015 shocked both the global financial market and the national financial market in China. In fact, the exchange rate plays an important role in the open economy and remains a key factor of international macroeconomics. The long-run real exchange rate movements have attracted much attention for a long time. The Balassa–Samuelson (BS) hypothesis provides a well-known explanation from the perspective of productivity differentials. According to Balassa (1964) and Samuelson (1964), the productivity in the domestic tradable goods sector will rise compared to that in the non-tradable goods sector, and so will the wage. Due to the labor mobility in the country, wages in both sectors will be identical leading to an increase in domestic prices of non-tradable goods relative to those of tradable goods — in other words, the exchange rate appreciates. The hypothesis implies a positive link between the real exchange rate and the productivity differential.

The reason for researchers to test the existence of the BS hypothesis is that a real appreciation in the exchange rate arising from the BS effect will not cause macroeconomic problems (García-Solanes et al., 2008). Thus, much attention has been paid to test the BS hypothesis in the existing literature. Hsieh (1982) estimates the BS effect in the U.S., Germany and Japan from 1954 to 1976, and he finds a strong evidence for the BS hypothesis. Many scholars support the BS hypothesis completely or partly using the empirical evidences (Ito et al., 1999; Thomas and King, 2008; Chong et al., 2012, and so on). However, Baumol and Bowen (1966) argue that the sign of the relationship between the productivity and

* Corresponding author.
E-mail addresses: wwguodufe@163.com (W. Wang), xuejingdufe@163.com (J. Xue), duchonghua@gmail.com (C. Du).

http://dx.doi.org/10.1016/j.econlet.2016.07.020
0165-1765/

the exchange rate is ambiguous since it is likely that the demand for non-tradable goods increases relative to tradable goods, giving rise to an appreciation of the exchange rate, while the demand for tradable goods may also rise relative to non-tradable goods in the developing countries when they open up to the rest of the world, which may lead to an opposite effect. Drine and Rault (2004) show that there is no long-run relationship between the real exchange rates and productivity differentials in six Asian countries. Therefore, there are still a number of scholars who do not agree with the BS hypothesis (Guimaraes-Filho, 1999; Camarero, 2008; Petrović, 2012, and so forth).

So far, the existing literature have not reached a consensus and it remains a puzzle. Actually, most of these researches on the BS hypothesis have some limitations. One problem is the ignorance of differences in countries. Given the discrepancies in the economy, policy and society among countries, the conclusion may be arbitrary when a comprehensive panel is used in the empirical analysis. Ito et al. (1999) notice this issue when they use data of the APEC economies to test the BS hypothesis, and suggest that the BS effect works for countries and regions following a similar industrialization pattern such as Japan, Korea, Taiwan, Hong Kong and Singapore, while it does not work for other fast-growing ASEAN (Association of Southeast Asian Nations) countries, like Thailand, Indonesia and Malaysia. Gente (2006) also summarizes that the BS theory can be proved in OECD countries while in developing countries the relation between the growth in tradable productivity and the real exchange rate appreciation cannot be proved. But Dumrongrittikul (2012) makes an opposite conclusion. Therefore, we will retest the BS hypothesis in the developed and developing countries, respectively.

As may be seen, with an upsurge in the availability and use of panel data sets, the most common approach in testing the BS hypothesis is to utilize the panel cointegration techniques. Due to the general panel cointegration tests, there are some other limitations. One is that the scope of the literature based on panel data sets allowing for cross-sectional dependence is fairly limited. In practice, only a few theoretical researches focusing on the panel cointegration consider the cross-sectional dependence, and even fewer empirical analyses can consider the cross-sectional dependence. As it is, there is a strong and complicated link among economies so that it does not seem appropriate to rule out the cross-sectional dependence when we study macroeconomic and financial data (Westerlund and Edgerton, 2008). Most tests assume independence among the cross-sectional units, which is difficult to hold in the reality, and the ignorance of cross-sectional dependence will bring about the severe distortion of results (Banerjee et al., 2004). Chong et al. (2012) use the four Westerlund et al. (2007) panel cointegration tests which account for cross-sectional correlation to examine the BS effect in OECD countries, and the test outcomes are different from those using traditional cointegration tests. So the cross-sectional dependence should be taken into account in the model.

Another important problem is that most analyses in the literature that address the panel data are unable to handle structural changes. In the reality, external shocks, disturbances and changes of economic system might all lead to the structural instability in data sets. The lack of accounting for a structural break can reduce the power of the panel cointegration test (Banerjee and Carrion-i-Silvestre, 2006). Attention has been paid to studying the nonlinearity in the exchange rate. For example, Cushman and Michael (2011) argue that the real exchange rates in 23 OCED from 1974 to 1998 are probably stationary around nonlinear trends. Tang and Zhou (2013) show that there does exist a nonlinear cointegrating relationship between the real exchange rates and fundamentals for China and Korea. Kutan and Zhou (2015) suggest the purchasing power parity (PPP) generally hold for 23 developed countries, accounting for both nonlinearity and multiple smooth temporary breaks in series.

In this paper, an innovative feature of our analysis comes from the panel cointegration technique. In our cointegration tests, we have dealt with two problems, which can also refer to Westerlund and Edgerton (2008) and Banerjee and Carrion-i-Silvestre (2015) who consider the cross-sectional dependence and structural breaks while testing the panel cointegration. We choose the framework from Bai and Carrion-i-Silvestre (2013) who only take the cross-sectional dependence into consideration because of the following reasons. First of all, in their model, they think about the cross-sectional dependence which is driven by common factors, and they do not restrain the factors to be stationary. Banerjee and Carrion-i-Silvestre (2015) also mention that the reason for allowing the factors to be $I(1)$ is that in this circumstance, effects from outside the model that are not included in might be captured by the factors from an empirical perspective. So the model relaxing the assumption for the factors is a generalization of the Westerlund and Edgerton (2008) framework. Second, in the model of Bai and Carrion-i-Silvestre (2013), the correlation between the stochastic regressors and the common factors is allowed. This is because common factors may affect both dependent and independent variables simultaneously, although might be in different degree. Then it is necessary to apply an iterated procedure to consistently estimate the slope parameters and common factors, which makes the Bai and Carrion-i-Silvestre (2013) framework better than the one of Banerjee and Carrion-i-Silvestre (2015). In the empirical analysis, we also need the consistent estimation to get the cointegration relationship. However, Bai and Carrion-i-Silvestre (2013) ignore the structural breaks, and when the assumption of structural stability is violated, their tests might lead to a biased result (Wang and Xue, 2015). So we extend their tests which only consider the cross-sectional dependence to the tests with both structural breaks and cross-sectional dependence. The structural breaks in our model are unknown and we specify six models depending on the location of breaks and whether time trends are included. Breaks can be located in the intercept and slope of the cointegrated regression, and we also allow for multiple heterogeneous breaks.

Another advantage of our model is that we consider the time trend in the model. As non-stationary process with a drift is virtually the best description of many economic variables, Westerlund and Edgerton (2007) indicate that unless both the stochastic and deterministic trends can be removed completely by the cointegration vector, a time trend should be regarded as an additional explanatory variable in the test regression. The SIC^* and the significance of the trend prove the rationality for the inclusion of time trend.

The last but not the least, we apply the new panel cointegration tests in 20 developed countries and 20 developing countries, respectively, in order to examine the BS hypothesis in different panels. The results show that the BS hypothesis holds in the 20 developed countries, while it does not hold in the 20 developing countries. Besides, a combination of the iterating joint least squared estimation proposed by Bai (2009) and the two-step iterative procedure proposed by Bai and Carrion-i-Silvestre (2009) is used to estimate the cointegration relationship and structural breaks.

The paper is organized as follows. Section 2 describes the new panel cointegration tests with structural breaks and cross-sectional dependence that are used to analyze the BS hypothesis. Section 3 presents the empirical analysis of the BS hypothesis in developed and developing countries, respectively. Section 4 concludes.