Economics Bulletin

Volume 36, Issue 2

Real exchange rate and bilateral trade balance of Cambodia: A panel investigation

Yannick Bineau
University of Lille1

Abstract

This article investigates the relationship between Cambodia's bilateral trade balance and its fundamental determinants: the real exchange rate and real income differentials between Cambodia and its foreign trading partners. The Panel Fully Modified Ordinary Least Squares method is applied to a sample of 10 trading partners for the 1998–2014 period on a quarterly basis. The main findings suggest that a devaluation of the real exchange rate significantly improves bilateral trade balance. However, it is not possible to prove that any modification of the real exchange rate will cause a trade balance adjustment that follows the standard J-curve shape, although two of the 10 sampled countries are exceptions. The model also shows that higher foreign partner real incomes relative to domestic real income levels cause a significant inverse change in bilateral trade balance for five of the sampled countries, suggesting that Cambodia is highly dependent on imports.

Citation: Yannick Bineau, (2016) "Real exchange rate and bilateral trade balance of Cambodia: A panel investigation", *Economics Bulletin*, Volume 36, Issue 2, pages 895-900
Contact: Yannick Bineau - yannick.bineau@univ-lille1.fr.
Submitted: January 22, 2016. **Published:** May 18, 2016.

1. Introduction

Cambodia has received little scholarly attention in terms of its trade balance due to its high level of dollarization. However, a dollarization rate of nearly 90% does not necessarily indicate that an economy is immune to the effects of changes in other bilateral exchange rates, even if these pass through the dollar peg. Additionally, weaknesses in Cambodia's financial system reduce balance of payment adjustments through capital flows, while foreign trade elasticities derived from import and export equations play a larger role in the existing account dynamics. The standard theory of foreign trade, wherein capital markets are set as exogenous while supply remains constant, indicates that any depreciation of the exchange rate improves a country's trade surplus if the sum of the absolute values of the price elasticity estimated from exports and imports through standard equations is strictly larger than unity. However, this outcome does not come about instantaneously. It requires long-term adjustments that lead to trade deficits over the short term. Later on, it is slowly eliminated to improve trade balance. This pattern follows a J-curve.

The main contribution to the existing literature is to show that, in the case of Cambodia, the effects of changes in real exchange rates on trade balance should not be underestimated. There are three motivations for this article. First, as far as we are aware, this research is a pioneering investigation of the link between trade balance and real exchange rates in Cambodia. Few studies investigate this issue for Continental South East Asian countries such as Laos (Kyophilavong *et al.* 2013), Thailand (Onafowora 2003) or Vietnam (Hoang 2013)[1]. Second, we use panel rather than time series data. Bilateral approaches often suffer from an insufficient number of observations. Time series can induce omitted variable bias or functional form misspecification, leading to contradictory signs or non-significant estimated parameters. Then, panel data will allow the implementation of panel unit root tests to examine the order of integration of the series. Cointegration techniques developed by Pedroni (1999) are used to compare trade balances with those of the following 10 trading partners for Cambodia over the 1998Q1–2014Q3 period: the European Union (EU), Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, Thailand, the United Kingdom (UK) and the United States (US). The countries included in the sample are limited only by data availability. Finally, the J-curve phenomenon is investigated on a bilateral basis using impulse response functions.

The article is organized as follows. The next section describes the model. Section III presents the data and discusses the empirical results. Section IV concludes.

2. Trade balance model

The model employed is widely cited in the existing literature. Bahmani-Oskooee (1985), Arora *et al.* (2003), Narayan (2006), Rose (1990) and Rose and Yellen (1989), show that the trade balance is related to real exchange rates, to domestic real income and to foreign real income. Following Çelik and Kaya (2010), the model is specified as follows:

[1] A number of empirical studies have been published on developed and developing countries. For comprehensive literature surveys, see Bahmani-Oskooee and Ratha. (2004) and Bahmani-Oskooee *et al.* (2013).

$$TB_{jt} = \alpha + \beta_1 RER_{jt} + \beta_2 \left(Y_{jt}^f / Y_t^d\right) + \varepsilon_t \quad (1)$$

TB_{jt} denotes the trade balance between Cambodia and country *j*. It is defined as the ratio of domestic exports to country *j* to domestic imports from country *j*. Y_{jt}^f is the foreign real income of country *j*, Y_t^d is the domestic real income, RER_{jt} is the real bilateral exchange rate between the domestic country and trading partner *j* and ε_t is an error term.

If coefficient β_1 is positive, then over the long run, any real exchange rate depreciation should improve the bilateral trade balance. This suggests that Marshall-Lerner foreign trade elasticity condition, wherein volume effects on trade are larger over the long run than price effects on trade, is verified. Growth real income rates between Cambodia and each partner country should not be similar. If Cambodia's bilateral trade flows are oriented towards high-speed real income growth rate partners, the β_2 coefficient, which reflects the impact of export and import trade equation income elasticity effects on bilateral trade balance, should be positive. Bilateral Cambodian exports are much more sensitive to real foreign income changes than Cambodian imports are to real domestic income changes. The trade balance surplus should improve.

3. Data and empirical results

All of the model variables are presented in log form. Data were drawn from the IMF's *Direction of Trade Statistics* and *International Financial Statistics* and from several national statistical institution databases. Quarterly data, which are seasonally adjusted where necessary, cover the 1998Q1–2014Q3 period. The sample includes 10 countries. This size of the sample is limited by the degree of data availability. The sample includes the EU, Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, Thailand, the UK and the US. This sample accounts for nearly 50% of total trade between 2010Q1 and 2014Q3. The real exchange rate is the ratio of foreign prices converted into the Cambodian currency price of foreign exchange to Cambodia's price levels. Real income is defined as the index of industrial production for each country (i.e., real GDP).

First, the nature of the series employed in this study is investigated using Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), Breitung (2000) and Hadri (2000) panel unit roots tests. These tests are more powerful than individual series-based unit root tests. Information in the time series is enhanced by that contained in cross-sectional data. These results are presented in Table 1.

Table 1: Panel unit root tests

		LLC	Breitung	IPS	Hadri
TB	C+T	3.041	0.647	-0.477	5.652***
Y^f/Y^d	C+T	-0.515	0.644	-1.590**	6.75***
RER	C+T	-1.404	-0.442	-1.028	6.992***

*** and ** denote rejection of the null hypothesis of non-stationarity (LLC, Breitung, IPS) or stationarity (Hadri) at the 0.01 and 0.05 levels, respectively.

According to the LLC, Breitung and IPS tests, the null hypothesis of unit roots for TB_{jt} and RER_{jt} is rejected. The unit root hypothesis is supported for $\left(Y_{jt}^f / Y_{jt}^d\right)$ according to the IPS and

Breitung test results, but it is rejected according to the LLC test results. However, Hadri-Z test statistic clearly supports the hypothesis that all series cannot be stationary. Thus, it is possible to suggest that all variables are I(1).

Second, panel cointegration tests were conducted to identify a potential long-run relation between the trade balance and its fundamental determinants. The seven conventional Pedroni panel cointegration tests (1999) on heterogeneous and homogeneous data were conducted to determine whether this long-run cointegration relation could be estimated. The number of observations available increases if a panel framework is adopted. Then, when testing the stationarity of the residual series in a level regression, the power of these cointegration tests is significantly enhanced. These tests take into account heterogeneity in the cointegration relationship. For each individual, there is one or more cointegration relation that is not necessarily identical for each panel. The results are presented in Table 2. The statistical results show that six of the seven panel cointegration tests reject the null hypothesis of no cointegration. The panel results provide clear evidence that there are strong long-run relationships among the bilateral trade balance, real exchange rate and growth rate differential.

Table 2: Panel cointegration tests

Alternative Hypothesis: common AR coefficients (within dimension)	
Panel v Stat	1.271**
Panel rho Stat	-0.006**
Panel PP Stat	-0.521**
Panel ADF Stat	-4.277***
Alternative hypothesis: individual AR coefficients (between dimension)	
Group rho Stat	1.229***
Group PP Stat	0.480***
Group ADF Stat	-4.037

***and ** indicate rejection of the unit root null and no cointegration at the 0.01 and 0.05 levels, respectively.

An estimation of the long-term relation between bilateral trade balance and its fundamental determinants, such as the real exchange rate and the real income ratio, was conducted. The Fully Modified Ordinary Least Square method described by Pedroni (1999, 2001) was used. Table 3 presents the corresponding results.

Table 3: Long run determinants of trade balance

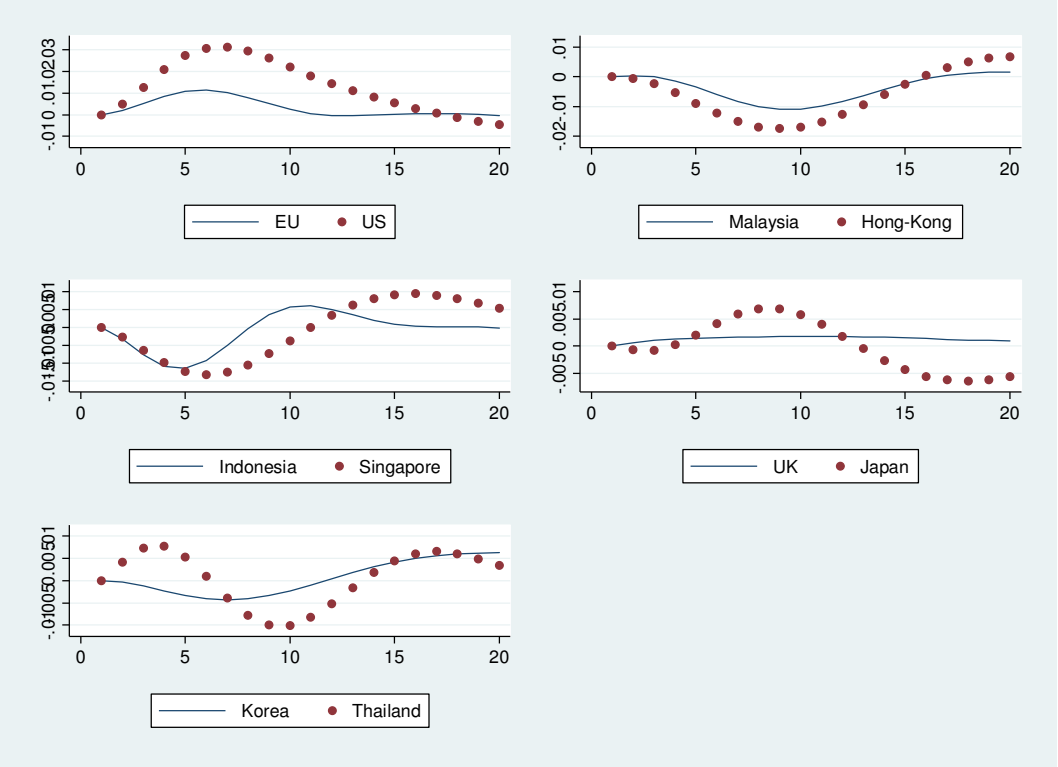
	RER	$\mathbf{Y^f/Y^d}$		**RER**	$\mathbf{Y^f/Y^d}$
European Union	0.145***	-0.104***	Malaysia	0.076**	0.267
Hong Kong	0.133***	-0.529***	Singapore	0.107***	0.158
Indonesia	0.026***	-0.079	Thailand	0.054***	-0.094
Japan	0.094***	-0.138**	United Kingdom	0.170***	-0.277***
Korea	0.043***	-0.725***	United States	0.159***	0.066
			Panel	0.027*	-0.131***

***, ** and * indicate significance at the 1, 5 and 10% levels, respectively.

The β_1 coefficients for all individual equations are predicted in terms of their signs and significance levels. Then, any positive change in the variable RER should lead to long-term, positive changes in the bilateral trade balance of Cambodia. The largest effects are found for the two largest trade blocs examined in the sample: the US and the EU. Total exports from Cambodia to the US and EU represent 61% of Cambodia's total exports. The estimate for the US is 0.159. The high level of Cambodian dollarization appears to ease international trade with the US – and more generally with the US dollar zone – and may have a stronger effect on price competitiveness. The second major impact of RER is with the EU, with a significant positive parameter of 0.145. Thus, the largest price effects are found amongst Cambodia's largest trading partners. Any real exchange rate change may significantly affect Cambodia's trade balance. The smallest effects are found for Indonesia, Thailand, and Malaysia, which are members of ASEAN, and for Japan and Korea.

The signs of the real income ratio β_2 are strongly negative for the EU, Hong Kong, Japan, Korea and the UK. Thus, a change in Cambodia's real income that is smaller than a change in trading partner real income will reduce Cambodia's trade balance. Cambodian trade flows are not geographically oriented to ease a positive increase in bilateral trade balance after a larger change in foreign real income relative to that of domestic real income. The real income ratio does not have significant long-term effects for Indonesia, Malaysia, Singapore, Thailand or the US. Thus, the impact on trade balance occurs through the real exchange rate channel.

Figure 1: J-curve effect



Several recent studies, such as Dach (2013), Lal and Lowinger (2002) and Narayan (2004), examine the J-curve effect using impulse response functions. Bilateral trade balance responses after a shock can manifest as one standard deviation shock on the real exchange rate that is estimated using a vector error correction model. If a J-curve effect is present, the trade balance first deteriorates after an exchange rate shock. Then, the trade balance should gradually improve and converge towards the long-run equilibrium trade balance, as the volume effects are larger than the price effects.

Figure 1 traces the impact of real exchange rate shocks on trade balance dynamics during 20 different periods for each partner country. Heterogeneity in trade balance responses to exchange rate shocks is observed. It is not possible to conclude that all bilateral trade balances follow a J-curve. Thailand follows an S-shaped curve, whereas dynamics for Indonesia and Singapore exhibit an initial deterioration of trade balance following a period of improvement, reflecting J-curve dynamics. Trade balance improvements develop more quickly for Indonesia than for Singapore. Other countries face trade balance deterioration, or even short-term improvements, as seen in the EU and the US, and it is not possible to conclude that a J-curve effect is present.

4. Conclusion

This article estimated the effects of a change in the Cambodian trade balance on the real exchange rate or real income differential between Cambodia and its top 10 trading partners using data for the 1998Q1–2014Q3 period. We employed the Fully Modified Ordinary Least Square technique. The data show that changes in the real exchange rate have a positive and significant effect on the bilateral trade balance. A change in the real exchange rate has a long-term systematic impact in the same direction on trade balance, even for the country's bilateral relationship with the US. By contrast, real income differentials have a negative effect on trade balance, especially vis-à-vis the US and the EU. This inverse effect between the trade balance and the real income ratio may explain the absence of a J-curve effect between most of the sampled countries, with the exception of Indonesia and Singapore.

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