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Economic growth and balance-of-payments constraint in Vietnam

Abstract: Our paper examines the long-run relation between economic growth and current account equilibrium in Vietnam, using a multicountry balance-of-payments-constrained growth model. We find that for the whole sample (1985–2010) Vietnam grew less than the rate predicted by the model. We also find that the balance-of-payments-constrained growth rate shifted after the 1997 Asian crisis. Since the relative price effect is neutral, the volume effects dominate in setting the balance-of-payments constraint. On the one hand, owing to the high income elasticities of exports, growth in advanced countries has a strong multiplier effect on the Vietnamese economy. On the other hand, this effect is hindered by a strong “appetite” for imports coming from Asia. Finally, we assess the impact of the current crisis on Vietnam’s growth for the period 2011 to 2017.

Key words: Asia, BoP-constrained growth model, Economic growth, multicountry model, Vietnam

JEL classifications E12, F43, O11, O53

The transition process from central planning to a market economy, launched in 1986 with Doi Moi (“renovation” in Vietnamese), enabled Vietnam to shift in less than twenty years from one of the
poorest countries in the world (with a per capita income of US$98 in 1990) to a lower-middle-income (LMI) country (with a per capita income of US$1,130 in 2010). Vietnam’s economy has grown at an annual average rate of 7.3 percent from 1990 through 2010, outpacing other countries in the Asian region. The ratio of population in absolute poverty has fallen from 58 percent in 1993 to 14.5 percent in 2008, while most indicators of welfare have improved (World Bank, 2011).

Behind the story, integration in the world economy has been the key driver of Vietnam’s economic and social development. The country has gone through a far-reaching transformation from an inward looking planned economy to one that is globalized and market-based. The country formally completed World Trade Organization (WTO) accession in late 2006, culminating a long process of efforts to integrate the national economy into global markets (Abbott et al., 2009). These changes have had dramatic implications for trade and investment flows: exports and imports as a share of gross domestic product (GDP) increased tenfold from 1988 to 2008, reaching 77.5 percent and 87.8 percent, respectively, of GDP in 2010. Over the two decades, the average growth rates of exports and imports were 16.4 percent and 18 percent, respectively, compared with 7.3 percent for GDP.

However, owing to rapid growth and massive capital inflows, the country has experienced growing macroeconomic turbulence in recent years. Between 2005 and 2007, the current account deficit increased from 0.9 percent to 9.8 percent of GDP (Figure 1), while the capital account surplus increased even faster, from 4.8 percent

![Figure 1](image-url)  
**Figure 1** Vietnam’s external balance

*Sources*: Trade balance, UN Comtrade, and General Statistics Office of Vietnam (GSO); Current account balance, International Monetary Fund World Economic Outlook.
to 24.6 percent of GDP (World Bank, 2008). Net positive capital inflows have led to demand pressures and subsequent changes in relative prices. Inflation rates averaged 16 percent a year between 2008 and 2011, and asset price bubbles emerged, while the country was coping with persistent pressures on its currency, loss of international reserves, and capital flight.

According to the World Bank (2011), the government addressed these macroeconomic imbalances by relying almost exclusively on tight monetary policy, but it has yet to tackle their root causes. From our point of view, the analysis of macroeconomic instability in Vietnam cannot be dissociated from the country’s balance-of-payments (BoP) position. Substantial current account deficits and the rising capital inflows to finance them played a significant role in upsetting macroeconomic stability. Based on these stylized facts, the question naturally arises as to whether the country is growing faster than the rate allowed by its BoP equilibrium.

To this purpose, our paper examines the long-run relation between economic growth and the current account balance equilibrium, using the BoP-constrained-growth model originally developed by Thirlwall (1979). While neoclassical theories explain growth through supply-side elements such as factor accumulation, technological progress, or the contribution of productivity growth, this alternative approach emphasizes demand-driven mechanisms by postulating that in the long run, BoP equilibrium is the primary constraint on a country’s economic growth.

Our study aims at filling a number of gaps in the literature. From a theoretical point of view, the analytical framework proposed here improves over previous attempts to extend Thirlwall’s law to a multicountry setting (e.g., Nell, 2003), by allowing for a more rigorous disaggregation of the BoP constraint among different partner areas (Bagnai et al., 2012). More precisely, our extended model allows us to assess the relative importance of the different channels of transmission (real growth, changes in relative prices and import/export market shares) in the different partner areas. From an empirical point of view, the paper provides fresh evidence on growth performance in Vietnam since Doi Moi, using annual data from 1985 to 2010. Several studies have applied the BoP-constrained-growth model to individual countries and groups of countries (Thirlwall, 2012), but to our knowledge, no empirical study has yet tested the model for Vietnam, nor has there been an analysis of long-run growth since the country’s accession to the WTO.
The theoretical background

Thirlwall’s law and the developing countries

According to Thirlwall (1979), the need to satisfy the external constraint in the long run sets an upper limit to growth. Thirlwall’s law is expressed in these terms: “In the long run, no country can grow faster than the rate consistent with its balance of payments equilibrium on the current account, unless it can finance an ever growing external deficit, which, in general, it cannot” (Thirlwall, 2011, p. 310). In other words, there is a growth rate that a country cannot exceed for prolonged periods, because if it does, it will quickly incur BoP difficulties. This is the “BoP-constrained-growth rate.” Exports play a major role in the definition of the BoP-constrained-growth rate because, in contrast to the other components of aggregate demand, they are the only component whose expansion provides the foreign exchange needed to pay for the import requirements associated with the following expansion of output (Hussain, 1999).

Assuming the constancy of relative prices, Thirlwall’s law postulates that the rate of growth of an open economy that is consistent with BoP equilibrium (denoted here $\dot{Y}_{BP}$) is determined by the growth rate of its volume of exports ($\dot{X}$) divided by the income elasticity of imports ($\pi$). To put it differently, the BoP equilibrium growth rate depends on the growth of world income ($\dot{Z}$) and on the relative size of the income elasticities of demand for exports ($\epsilon$) and imports. This relation can be formulated as follows: \[\dot{Y}_{BP} = \frac{\epsilon \dot{Z}}{\pi} = \frac{\dot{X}}{\pi}.\]  

If a country’s growth rate is lower than $\dot{Y}_{BP}$, the country will accumulate trade surpluses and become a net capital exporter. Conversely, if its actual growth exceeds $\dot{Y}_{BP}$, the current account worsens and the country will become a net capital importer, but this cannot continue indefinitely. An economy is “BoP constrained” whenever its growth rate must adjust downward to maintain the BoP equilibrium.

Two remarks are worth emphasizing at this stage. First, the model assumes that developing countries operate at less than full

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1 Alternatively, Equation (1) can be obtained by assuming that the Marshall–Lerner condition is satisfied with equality (Thirlwall, 1979). Since this appears to be an extremely unlikely event, we will not discuss it any further.
capacity, as a result of the lack of foreign exchange and other structural bottlenecks. However, although it stresses the role of growth in aggregate demand to raise capacity utilization, the model does not imply that supply factors are unimportant. Rather, any production bottleneck that restricts export growth will be detrimental to growth (Felipe et al., 2009).

Second, this approach provides a rationale for an export-led growth model, because exports are the only component of demand whose growth simultaneously relaxes the BoP constraint. Therefore, policies designed to increase the income elasticity of export (ε), such as the changing composition of exports, or other measures that improve the performance of exports, may have positive effects on long-run growth. But these efforts could be hindered by the country’s “appetite” for imports (π), that is, by its degree of dependence on foreign goods and services. This implies that the same rates of export growth in different countries do not produce the same rates of economic growth because of the existence of different income elasticities of imports.

Our study extends the original BoP-constrained-growth model in two ways. First, we relax the hypothesis of relative price constancy in Equation (1), which is contradicted by the evidence in developing countries that the terms of trade are trending, as implied by the Prebisch–Singer hypothesis (Sapsford and Chen, 1998). Such relative price changes appear to be relevant in a transition economy like Vietnam, where the abolition of price and exchange rate controls in 1987, followed by international integration, caused substantial adjustments in relative prices. Therefore, we decided to include the role of relative price changes in the analytical framework.

Our second extension deals with the geographical structure of trade flows. In the original model, the long-run economic growth of an open economy is determined by the rate of growth of aggregate exports, which, in turn, is determined by the exogenously given growth of “world income.” In practice, however, an individual country trades goods and services with a number of partner countries, and each bilateral trade relation may have different outcomes. Since the economic growth of a country depends on the growth rate of other countries through the BoP constraint, this mutual interdependence should be captured in a model with multi-lateral trade relations between the individual country and blocks of countries. By the same token, the import behavior should be
differentiated among the selling countries to assess how geography can be a determinant of trade relations. In view of this, we extend the original law of Thirlwall by applying it in a multicountry setting. This allows us to identify the role of structural parameters such as import and export market shares and bilateral trade elasticities in determining the BoP-constrained rate.

A multicountry version of Thirlwall’s law

Our analytical extension assumes that a given country $i$ has $n$ trading partners. In our empirical analysis, we set $n = 5$ by considering five main partner areas: $j = A, B, C, D, E$ (see Appendix A for country grouping). The current account equilibrium becomes:

$$ P_i \sum_{j=A,B,C,D,E} X_{ij} = \sum_{j=A,B,C,D,E} E_{ij} P_j M_{ij}, $$

where $P_i$ are country $i$ export prices, $X_{ij}$ is the real demand of partner $j$ for country $i$ exports, $E_{ij}$ is the bilateral nominal exchange rate, $P_j$ are export prices in $j$, and $M_{ij}$ are country $i$ imports from partner $j$. As a matter of fact, $X_{ij} = M_{ji}$ (namely, the exports from country $i$ to partner $j$ must equal the imports of the latter from the former). This “mirror flows” identity, routinely exploited as a convenient simplification in a number of multicountry models, offers some practical advantages in terms of data collection and the specification of demand functions. Notably, it enables us to work only with import functions.

As a consequence, we formulate the model as follows:

$$ M_{ij} = \left( \frac{P_i}{E_{ij} P_j} \right)^{\psi_{ij}} Y_i^{\pi_{ij}} $$

$$ M_{ji} = \left( \frac{E_{ij} P_j}{P_i} \right)^{\psi_{ji}} Y_j^{\pi_{ji}} $$

$$ P_i \sum_j M_{ji} = \sum_j E_{ij} P_j M_{ij}, $$

where, in addition to the previous variables, $\psi_{ij}$ and $\pi_{ij}$ are the price and income elasticities, respectively, of country $i$ imports from partner $j$, $M_{ji}$ is the real demand of partner $j$ for imports from country $i$.

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2 To keep things simple, we ignore net incomes from abroad.
country \(i\) (namely, exports from country \(i\) to partner \(j\)), \(\psi_{ji}\) and \(\pi_{ji}\) are the corresponding price and income elasticities, and \(Y_j\) is partner \(j\) real GDP.

Taking the growth rates in Equation (4) we obtain:

\[
\dot{P}_i + \sum_j \nu_{ji} \dot{M}_{ji} = \sum_j \mu_{ij} (\dot{E}_{ij} + \dot{P}_j + \dot{M}_{ij}),
\]

where

\[
\nu_{ji} = \frac{M_{ji}}{\sum_j M_{ji}} = \frac{X_{ij}}{X_i},
\]

\[
\mu_{ij} = \frac{E_{ij} P_j M_{ij}}{\sum_j E_{ij} P_j M_{ij}}
\]

\((j = A, B, C, D, E)\),

\(\nu_{ji}\) and \(\mu_{ij}\) are, respectively, the market shares of partner \(j\) in country \(i\) total exports (in volume) and in country \(i\) total imports (in value).\(^3\)

Solving for the growth rate of country \(i\) as before, and denoting \(R_{ij} = P_i E_{ij} / P_j\) the bilateral relative prices (namely, the ratio of domestic to foreign prices expressed in domestic currency), we obtain a multicountry version of Thirlwall’s law:

\[
\dot{Y}_{i, BP} = \frac{\sum_{j=A,B,C,D,E} \dot{R}_{ij} [\mu_{ij}(1 - \psi_{ij}) - \nu_{ji}\psi_{ji}] + \sum_{j=A,B,C,D,E} \nu_{ji}\pi_{ji} \dot{Y}_j}{\sum_{j=A,B,C,D,E} \mu_{ij}\pi_{ij}}.
\]

The multicountry specification allows us to separately assess the contribution of each group of countries to country \(i\) growth rate predicted by the model. We can observe that the numerator of the multicountry law features both a relative price effect (whose sign depends on the market shares weighted bilateral price elasticities), and a volume effect (a weighted sum of real export growth). The denominator instead features a sum of bilateral income elasticities of imports, weighted by the corresponding

\(^3\)This asymmetric treatment of the market shares is a mathematical consequence of the fact that the summation in the left-hand side of the constraint (4) involves terms in volume, while the summation in the right-hand side involves terms in value.
market shares, that expresses country’s i aggregate “appetite for imports” \( \pi = \sum \mu_{ij} \pi_{ij} \). In other words, the aggregate income elasticity, which plays a crucial role in the single-country version of Thirlwall’s law, is nothing but a “black box” summarizing behavioral parameters that are likely be subject to changes.

Another important feature of the multicountry law is that it cannot be decomposed in bilateral terms. In fact, any bilateral deficit is not constrained per se because, in principle, it could be financed by another bilateral surplus; as a consequence, the aggregate BoP constraint cannot be expressed as an additive function of bilateral balances. However, the extended law allows one to measure the contribution of partner j’s variables (either in country i export market or import demand) to changes in the aggregate BoP constraint of country i (see Bagnai et al., 2012).

**Data and estimation issues**

In a first step, the long-run elasticities featuring the BoP constraint are estimated through the following ten loglinear bilateral trade equations:

\[
m_{j,t} = \alpha_{j} + \psi_{ij} r_{j,t} + \pi_{ij} y_{i,t} + u_{j,t} \quad (j = A, B, C, D, E) \\
x_{j,t} = \beta_{j} - \psi_{ij} r_{j,t} + \pi_{ij} y_{j,t} + e_{j,t} \quad (j = A, B, C, D, E),
\]

where lowercase letters indicate natural logs of the corresponding variables (therefore, \( r_{j,t} = p_{i,t} - e_{i,j,t} - p_{j,t} \)), and \( u_{j,t} \) and \( e_{j,t} \) are error terms.

Appendix B provides the sources and definitions of the data used in the estimation. In order to estimate the long-run elasticities by cointegration, we first need to ascertain whether the data generating process (DGP) of each series features a stochastic trend. The relevant tests were performed following the procedure suggested by Elder and Kennedy (2001). The rationale of this procedure is reported in Appendix C, along with its results. Summing up, all the time series involved in the estimation of the trade equations for Vietnam turn out to possess a unit root.

Having established the presence of stochastic trends in the DGP of our time series, we tested for the existence of a long-run relation between the relevant variables by the usual Engle and Granger (1987) cointegrating residual augmented Dickey–Fuller (CRADF)
test. When this test rejected the null of noncointegration, we took
the estimated elasticities as the relevant long-run parameters. If,
instead, the ordinary cointegration test failed to reject the null of
noncointegration, we hypothesized that the nonrejection could
depend on the presence of a structural break in the long-run para-
parameters. In order to cope with this, we applied the cointegration
estimator proposed by Gregory and Hansen (1996), which tests
the null of noncointegration against the alternative of cointegra-
tion in the presence of a structural break of unknown date. The
breaks are modeled using the dummy variable \( \varphi_{\tau t} = I (t > [T \tau]) \),
where \( I \) is the indicator function, \( T \) is the sample size (\( T = 24, \)
except for exports to the United States), \( \tau \) is the relative timing
of the change point, and \([.]\) is the integer part function. The
Gregory and Hansen procedure takes into account several possible
alternative models, featuring a break in the intercept only (the
“level” shift), or in the intercept and in the slopes (the “regime”
shift). Moreover, some alternative modes include a time trend,
which in turn can be modeled with or without a break. Owing to
the relatively limited dimension of our sample, we decided to test
the null of noncointegration against the simplest alternative, that
of level shift, where only the intercept is affected by the structural
break.5

Taking the import equation as an example, the level shift is
modeled as follows:

\[
m_{j,t} = \alpha_{j0} + \mu_{j0} \varphi_{\tau t} + \psi_{i,j} r_{j,t} + \pi_{i,j} y_{i,t} + u_{j,t} \quad (j = A, B, C, D, E)
\]

where \( \alpha_{j0} \) is the intercept in the first regime, \( \varphi_{\tau t} \) is the shift dummy
variable defined before, \( \mu_{j0} \) is the intercept shift, so that the value
taken by the intercept in the second subsample is \( \alpha_{j1} = \alpha_{j0} + \mu_{j0} \). It
is worth noting that in the level shift case the income and price
elasticities are unaffected, which implies that a structural break
of this kind has no impact on the BoP constraint (because the
relevant elasticities remain constant throughout the sample).

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4 Since bilateral trade data with the United States were subject to embargo
until 1994 and only started thereafter, we were not able to apply the Gregory
and Hansen procedure to these equations.

5 Testing the null of non cointegration against other alternatives led to non
rejection, or rejection with larger \( p \)-values, or models with imprecisely estimated
elasticities. It is worth noting that in our case, the so called regime shift alternative
entails the loss of three (instead of one) degrees of freedom (corresponding to the
three shift parameters).
The test statistic is evaluated as \( ADF^* = \inf_\tau ADF_\tau(\tau) \), where \( ADF(\tau) \) is the cointegrating \( ADF \) statistic corresponding to the shift occurring in \([T_\tau]\). In other words, \( ADF^* \) is the smallest among all the \( ADF \) statistics that can be evaluated across all possible dates of structural breaks. The reported break date \( T_1 = [\tau T] \) refers to the last year of the first regime (i.e., the change in the parameter occurs between \( T_1 \) and \( T_1 + 1 \)).

Finally, in order to take into account the possible endogeneity bias in the income elasticity of imports (whose importance has been pointed out by Soukiazis and Antunes, 2011–12), the import functions were reestimated using Phillips and Hansen (1990) fully modified ordinary least squares (FMOLS) estimator.

Results

The estimates of the long-run elasticities

Tables 1 to 4 report the estimation results, starting from the import equations. The Engle–Granger CRADF (reported in

| Sample | \( \alpha_{ij} \) | \( \psi_{ij} \) | \( \pi_{ij} \) | \( R^2 \) | DW | CRADF |
|--------|----------------|-------------|-------------|--------|-----|-------|
| DA     | –29.54         | –0.42       | 3.63        | 0.96   | 0.69| –1.81 |
|         | –15.48         | –1.94       | 19.49       |        |     |       |
| RoA    | –18.53         | –0.39       | 2.63        | 0.94   | 0.622| –2.28 |
|         | –11.60         | –2.62       | 16.98       |        |     |       |
| EU15   | –12.28         | –0.12       | 1.87        | 0.93   | 1.119| –3.05 |
|         | –9.80          | –1.01       | 15.22       |        |     |       |
| EU15   | –12.97         | 1.94        | 0.93        | 1.049  | –2.94|       |
|         | –12.28         |             | 18.69       |        |     |       |
| USA    | –18.14         | 0.52        | 2.35        | 0.87   | 1.763| –3.44 |
|         | –7.66          | 1.12        | 10.41       |        |     |       |
| USA    | –18.22         | 2.36        | 0.87        | 1.653  | –3.24*|       |
|         | –7.64          |             | 10.39       |        |     |       |
| RoW    | –4.16          | 0.61        | 0.73        | 0.42   | 1.268| –3.48 |
|         | –8.25          | –1.76       | 12.09       |        |     |       |

Notes: The \( t \)-statistics are reported in italics under the coefficient estimates. DW is the statistic of the Durbin–Watson test, CRADF is the cointegrating residual augmented Dickey–Fuller test. An asterisk indicates rejection at the 10 percent level.
Table 1, was unable to reject the null of noncointegration, with the limited exception of the imports from the United States, where the null is rejected at the 10 percent significance level. In most cases, the relative price term is small and statistically insignificant. The Gregory–Hansen procedure confirms that bilateral import flows are rather inelastic to changes in relative prices (Table 2). The structural breaks in the bilateral import equations are all upward level shifts, the only exception being the rest of the world (RoW) case, which features a downward level shift after 1990. This structural break with level shifts makes sense from an economic point of view. The year 1991 corresponds to the collapse of the Soviet bloc countries, forcing Vietnam to reform its trade relations. The country adjusted by shifting its bilateral trade flows from former socialist countries toward Western countries and the Asian neighbors.

Table 2
Bilateral imports equations, Gregory and Hansen estimation

|        | $\alpha_0$ | $\mu_0$ | $\psi_{i,j}$ | $\pi_{i,j}$ | $R^2$ | DW   | ADF* | Break |
|--------|------------|---------|--------------|-------------|-------|------|------|-------|
| DA     | -23.99     | 1.15    | -0.17        | 3.00        | 0.985 | 1.99 | -7.49*** | 1991   |
|        | -16.20     | 6.19    | -1.24        | 19.51       |       |      |      |       |
| DA     | -24.44     | 1.22    | 3.03         | 0.984       | 1.84  | -6.63*** | 1991   |
|        | -16.84     | 6.75    |              | 19.93       |       |      |      |       |
| RoA    | -12.77     | 1.27    | -0.02        | 1.97        | 0.984 | 1.76 | -5.55*** | 1991   |
|        | -11.82     | 8.13    | -0.26        | 17.25       |       |      |      |       |
| RoA    | -12.76     | 1.29    | 1.96         | 0.985       | 1.78  | -5.54*** | 1991   |
|        | -12.08     | 9.81    |              | 17.71       |       |      |      |       |
| EU15   | -7.89      | 0.64    | -0.10        | 1.40        | 0.959 | 2.29 | -5.72*** | 1993   |
|        | -5.28      | 3.91    | -1.12        | 9.03        |       |      |      |       |
| EU15   | -8.20      | 0.73    | 1.42         | 0.97        | 2.25  | -5.60*** | 1992   |
|        | -7.28      | 5.46    |              | 12.04       |       |      |      |       |
| RoW    | 16.44      | -16.99  | 0.25         | -1.38       | 0.68  | 3.00 | -4.53   | 1991   |
|        | 3.58       | -2.88   | 1.60         | -2.95       |       |      |      |       |
| RoW    | -5.27      | -0.99   | 0.92         | 0.44        | 1.82  | -4.57* | 1990   |
|        | -2.77      | -3.96   |              | 4.63        |       |      |      |       |

Notes: $\alpha_0$ is the intercept, $\mu_0$ the shift in the intercept, $\psi_{i,j}$ the relative prices elasticity, $\pi_{i,j}$ the income elasticity. The $t$-statistics are reported in italics under the coefficient estimates. DW is the statistic of the Durbin–Watson test, ADF* is the statistic of the Gregory and Hansen test for the null of noncointegration. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
As far as the bilateral export equations are concerned, the results are similar, with two differences: the equations appear to be more stable (noncointegration is strongly rejected against a stable alternative in two cases, the rest of Asia and the United States), and the relative price elasticity is statistically significant in a number of cases (while it was never found to be significant in the bilateral import equations). As shown in Table 3, the Engle–Granger procedure rejects the null of noncointegration in the cases of the rest of Asia (RoA), the United States (USA), and RoW (in the last case only at the 10 percent level). In the latter two cases the price elasticity, although correctly signed, is found to be statistically insignificant (although marginally in the RoW case). In the remaining cases, the Gregory–Hansen procedure rejects the null of noncointegration against the alternative of cointegration with an upward level shift (Table 4).

Despite using a relatively short sample in terms of number of observations, all the relevant elasticities are estimated very precisely, with Student’s $t$ typically ranging from about 5 to about

| Sample       | β$_j$  | ψ$_{j,i}$ | π$_{j,i}$ | $R^2$ | DW   | CRADF  |
|--------------|--------|-----------|-----------|-------|------|--------|
| DA 1985–2010 | –28.0  | –2.2      | 2.4       | 0.98  | 0.645| –3.15  |
|             | –13.6  | –12.6     | 17.2      |       |      |        |
| RoA 1985–2010| –112.2 | –0.8      | 7.7       | 0.98  | 0.998| –5.58***|
|             | –20.8  | –7.2      | 22.3      |       |      |        |
| EU15 1985–2010| –138.5 | –1.0      | 9.2       | 0.95  | 0.335| –2.34  |
|             | –13.1  | –5.0      | 13.8      |       |      |        |
| USA 1994–2010| –178.7 | –0.6      | 11.5      | 0.95  | 1.124| –3.75* |
|             | –15.7  | –1.0      | 16.4      |       |      |        |
| USA 1994–2010| –180.2 | 11.6      | 0.95      | 1.153 |      | –3.85**|
|             | –16.0  |          | 16.7      |       |      |        |
| RoW 1985–2010| –50.6  | –0.3      | 3.7       | 0.80  | 1.322| –3.81* |
|             | –6.3   | –1.7      | 7.2       |       |      |        |
| RoW 1985–2010| –58.2  | 4.2       | 0.78      | 1.314 |      | –3.63* |
|             | –8.4   |           | 9.5       |       |      |        |

Notes: The $t$-statistics are reported in italics under the coefficient estimates. DW is the statistic of the Durbin–Watson test, CRADF is the cointegrating residual augmented Dickey–Fuller test. An asterisk indicates rejection at the 10 percent level.
20. This result is consistent with the fact that as far as the statistical properties of cointegration estimates are concerned, the sample length (in calendar terms) is more important than the number of observations (Otero and Smith, 2000).

Table 5 presents the FMOLS estimates of the import equations’ income and relative price elasticities, performed conditionally on the structure of the deterministic component selected in the

Table 4

| Sample  | $\beta_{j0}$ | $\mu_{j0}$ | $\psi_{j,i}$ | $\pi_{j,i}$ | $R^2$ | DW | ADF* | Break |
|---------|--------------|------------|--------------|------------|-------|-----|------|-------|
| DA      | 85–10        | –21.35     | 0.61         | –2.23      | 1.93  | 0.981| 1.01 | –5.0**| 1995  |
|         |              | –7.13      | 2.78         | –14.54     | 9.06  |     |      |       |       |
| EU15    | 86–09        | –93.74     | 1.31         | –0.91      | 6.32  | 0.987| 1.78 | –4.6* | 1992  |
|         |              | –12.53     | 8.78         | –9.55      | 13.23 |     |      |       |       |
| RoW     | 85–10        | –42.07     | 0.64         | 3.15       | 0.813 | 1.44 | –5.8***| 1993  |
|         |              | –4.37      | 2.25         | 5.02       |       |     |      |       |       |

Notes: $\beta_{j0}$ is the intercept, $\mu_{j0}$ the shift in the intercept, $\psi_{j,i}$ the relative prices elasticity, $\pi_{j,i}$ the income elasticity. The $t$-statistics are reported in italics under the coefficient estimates. DW is the statistic of the Durbin–Watson test. ADF* is the statistic of the Gregory and Hansen test for the null of noncointegration against the alternative of a level shift. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 5

| Sample  | $\pi_{j,i}$ | DW |
|---------|-------------|----|
| DA      | 1985–2010   | 2.92 | 2.11 |
|         |             | 25.12 |      |
| RoA     | 1985–2010   | 1.96 | 1.95 |
|         |             | 21.46 |      |
| EU15    | 1985–2010   | 1.34 | 2.28 |
|         |             | 13.07 |      |
| USA     | 1994–2010   | 2.41 | 1.63 |
|         |             | 9.68 |      |
| RoW     | 1985–2010   | 1.07 | 1.91 |
|         |             | 5.76 |      |

Notes: The $t$-statistics are reported in italics under the coefficient estimates. DW is the statistic of the Durbin–Watson test.
previous stages of the estimation procedure. In three out of five cases the conventional estimates of the income elasticities appear to be downward biased, as suggested by Soukiazis and Antunes (2011–12).

Finally, Table 6 summarizes the long-run elasticities that will be used to calculate the predicted growth rate for Vietnam. In brief, all the income elasticities are statistically significant and correctly signed. The largest export income elasticities are those of the developed partners (the US, the RoA and the EU), which, in addition, feature smaller import income elasticities. This implies that any favorable change in the Northern partners’ income (especially in the United States, where the export elasticity reaches 11.7) has a major role in relaxing Vietnam’s BoP constraint, through the export demand. The asymmetry in the income elasticities implies that with unchanged relative prices and market shares, if Vietnam grows at the same rate as its trading partners, the corresponding bilateral balance will improve. The opposite applies to developing Asia (DA), whose imports income elasticity is both the largest, and larger than the corresponding bilateral exports elasticity (2.9 and 1.9, respectively). This stylized fact is consistent with a triangular trade relation, where Vietnam imports raw materials and semifinished goods from the neighboring developing countries, and exports finished goods to the developed countries.

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6 In other words, the deterministic component of the estimated equation ($k_t$ in Phillips and Hansen’s notation) consists of a segmented intercept (the only exception being the equation of imports from the United States), where the appropriate intercept shift results from Gregory and Hansen’s procedure. The conventional goodness-of-fit measures are omitted from Table 5 because they make no sense in the context of instrumental variable estimation.
Another picture that emerges is one where variations in the relative prices do not matter in Vietnam’s imports, or in the country’s exports to the United States and the RoW. This means that in the long run, a large part of foreign goods and services are imported regardless of changes in their prices. This is explained by the structure of Vietnam’s imports, where a large part is dominated by production goods (semifinal products, intermediate and capital goods) that are not produced domestically. On the other hand, any competitive devaluation that decreases domestic prices relative to foreign ones will only boost exports to developing Asia, and to a much lesser extent to the RoA and the EU.

The BoP equilibrium growth rate

A second step consists in comparing the average growth rates predicted by the BoP-constrained-growth model ($\dot{Y}_{BP}$) with the actual rates ($\dot{Y}$): the purpose is to test whether or not the country’s growth was BoP constrained over the period from 1985 to 2010. Moreover, since most Asian countries were affected by the economic recession that hit the region after 1997, we separately examined the two subperiods before (1985–97) and after (1998–2010) the East Asian crisis.

Table 7 reports the elements needed for the evaluation of the BoP-constrained-growth rate following Equation (6). Broadly speaking, Vietnam’s actual growth rate was below the constrained rate during the entire period considered: 6.9 percent compared to 8.5 percent on average. This indicates that Vietnam was respecting its BoP constraint. Equation (6) gives us further insights into the meaning of this result. The estimation results showed that the coefficients of the relative price term are statistically insignificant in all import equations as well as in the equations of exports to the United States and the RoW. As a consequence, the relative price effect in the numerator of Equation (6) is very small, and income changes dominate the BoP constraint. The export volume effect (namely, the second term in the numerator) contributes to the BoP-constrained rate by $(0.153/1.805)\times 8.5$ percentage points in aggregate, a result unaffected by the adverse but negligible relative price effect. A closer look at Equation (6) shows that the volume effect in the numerator depends on partner countries’ growth as well as on the interaction between the bilateral income elasticities and the market shares of exports. In particular, since the RoA
has the largest export market, equal to 33.2 percent in the whole sample, its contribution dominates the sum. As far as the denominator is concerned, the sum is dominated again by the RoA, owing to its large import market shares (equal to 0.357), followed by developing Asia, whose market share is smaller (0.194), but whose import elasticity is larger (2.9 instead of 2.0 for the rest of Asia; see Table 6). With a contribution of 0.567 and 0.701 respectively, DA and RoA explain 70 percent of the aggregate import elasticity of Vietnam.

Substantial differences emerge however when we analyze the two subperiods before and after the Asian crisis separately. While the actual growth rate displays surprising stability, the constraint shifts between the first and the second subsample. Before the East Asian crisis, Vietnam grew at a rate below the BoP-constrained

| Table 7                                                                 |
|------------------------------------------------------------------------|
| Comparison between the BoP equilibrium and the actual growth rates      |
|                                                                      |
| **Numerator: Relative price effect**                                   |
| DA                       | –0.003 | –0.010 | 0.001  |
| RoA                      | 0.000  | 0.000  | 0.002  |
| EU15                     | 0.000  | 0.000  | 0.000  |
| USA                      | 0.001  | 0.001  | 0.000  |
| RoW                      | 0.001  | 0.013  | –0.003 |
| Subtotal                 | –0.001 | 0.004  | 0.000  |

| Numerator: Volume effect                                              |
| DA                       | 0.021  | 0.016  | 0.026  |
| RoA                      | 0.060  | 0.096  | 0.032  |
| EU15                     | 0.023  | 0.021  | 0.024  |
| USA                      | 0.024  | 0.003  | 0.038  |
| RoW                      | 0.025  | 0.029  | 0.017  |
| Subtotal                 | 0.153  | 0.165  | 0.137  |

| Denominator               |
| DA                       | 0.567  | 0.297  | 0.865  |
| RoA                      | 0.701  | 0.632  | 0.761  |
| EU15                     | 0.123  | 0.126  | 0.119  |
| USA                      | 0.053  | 0.031  | 0.077  |
| RoW                      | 0.361  | 0.505  | 0.211  |
| Subtotal                 | 1.805  | 1.591  | 2.033  |

| Economic growth rate constraints |
| YBP                          |
| DA                           |
| RoA                          |
| EU15                         |
| USA                          |
| RoW                          |
| Subtotal                     |

| Table 6                                                                 |
|------------------------------------------------------------------------|
| Comparison between the BoP equilibrium and the actual growth rates      |
|                                                                      |
| **Numerator: Relative price effect**                                   |
| DA                       | –0.003 | –0.010 | 0.001  |
| RoA                      | 0.000  | 0.000  | 0.002  |
| EU15                     | 0.000  | 0.000  | 0.000  |
| USA                      | 0.001  | 0.001  | 0.000  |
| RoW                      | 0.001  | 0.013  | –0.003 |
| Subtotal                 | –0.001 | 0.004  | 0.000  |

| Numerator: Volume effect                                              |
| DA                       | 0.021  | 0.016  | 0.026  |
| RoA                      | 0.060  | 0.096  | 0.032  |
| EU15                     | 0.023  | 0.021  | 0.024  |
| USA                      | 0.024  | 0.003  | 0.038  |
| RoW                      | 0.025  | 0.029  | 0.017  |
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| Economic growth rate constraints |
| YBP                          |
| DA                           |
| RoA                          |
| EU15                         |
| USA                          |
| RoW                          |
| Subtotal                     |

Substantial differences emerge however when we analyze the two subperiods before and after the Asian crisis separately. While the actual growth rate displays surprising stability, the constraint shifts between the first and the second subsample. Before the East Asian crisis, Vietnam grew at a rate below the BoP-constrained
one, with a spread of 4.1 percentage points. The large proportion of trade that occurred with the former Soviet bloc countries may partially explain the much higher growth rate predicted by the model for this subperiod. Still, the sustained rapid growth achieved by the country after Doi Moi illustrates a situation where productive capacity was underutilized within the planned economy and the transition reforms brought resources into production. Thus, Vietnam between 1985 and 1997 may be described as capacity constrained, with the country growing at its capacity growth rate without encountering BoP difficulties.

The reverse occurs in the second subperiod, where Vietnam's actual growth rate marginally exceeded the BoP-constrained one (6.9 percent compared to 6.7 percent), resulting in capital inflows to bridge the financing gap. The spread between the BoP equilibrium and the actual averages, which decreased from 4.1 to about −0.2 percentage points, can be taken as evidence of an increased demand constraint on Vietnam's growth. As a matter of fact, the constrained growth rate fell from 10.6 percent to 6.7 percent after the Asian crisis, while the country actually kept growing at 6.9 percent. As a consequence, the question arises as to why Vietnam's BoP-equilibrium growth rate was falling. Which partners were responsible for this and through which channel of transmission?

Table 7 allows us to answer these questions by separately reporting the terms of the summations at the numerator and the denominator of Equation (6). We should remark at the outset that since the estimated elasticities are constant and the relative price effects are negligible over the whole sample, any change between the first and second subsamples must come either from the evolution of the market shares or from a change in a partner’s growth rate, or both. At an aggregate level, we observe that the evolution of the constraint was determined by both a decrease in the numerator (from 0.165 to 0.137) and an increase in the denominator (from 1.591 to 2.033), where the former was smaller (in percentage terms) than the latter (the numerator decreased by 18.6 percent and the denominator increased by 27.7 percent). As for the numerator, the strongest effect that contributed to tightening Vietnam’s BoP came from the volume of exports destined for the RoA. With the heaviest weight in the bilateral income elasticity of exports, the RoA (namely, developed Asia) sustained Vietnam’s export growth over the whole period considered (Figure 2). However, its GDP growth rate declined by two percentage points in the
second subperiod, eroding Vietnam’s export performance. A bilateral trade agreement (BTA) signed in 2000 between Vietnam and the United States evidently boosted Vietnamese exports. But this compensated only partially for the former negative effect. In fact, the U.S. contribution in the first subsample was negligible. Therefore, although it increased tenfold (from 0.3 percentage points to 3.8 percentage points), its contribution was unable to offset the fall of the RoA export volume effect to one-third (from 9.6 to 3.2).

As for the denominator of Equation (6), its increase from 1.59 to 2.03 between the two subperiods is explained mainly by the evolution of trade relations with the other Asian countries. While Vietnam was mainly dependent on imports from the rest of Asia over the whole period considered, the most relevant change came from the share of developing Asia in Vietnam’s total imports. Since this market share climbed from 10.1 percent before the Asian crisis to 29.6 percent in the last subperiod, the corresponding weighted bilateral elasticity rose sharply from 0.31 to 0.9. This indicates a strong asymmetry in bilateral trade relations between Vietnam and its developing neighbors: the country exports mainly to the advanced countries (with the highest export sensitivity to income

Figure 2 Export and import market shares (in volume and value, respectively)
changes for the United States), but any rise in domestic activity will imply a sustained growth of imports from developing Asia.

Figure 2 depicts the evolution of Vietnam’s trade market shares over the period considered: as bilateral flows grew at different rates, the market shares evolved accordingly. Even if the bilateral income elasticities remained constant, the denominator changed over time and negatively affected the country’s BoP position. Our study finds evidence in support of Sepehri and Akram-Lodhi (2005), whose estimates for import behavior demonstrated that Vietnam’s growth is highly dependent on imported capital and intermediate goods. After the regional crisis in 1997, its appetite for imports coming from Asia reached 1.62 out of 2.03 in the denominator. Thus, the greater the rate of capacity utilization through exports, the greater the extent of necessary imports to keep production moving.

**Impact of the current global crisis**

**Filtering**

A last step of our study assesses the impact of the current global crisis on Vietnam’s economic growth. More precisely, the overreliance on the high income markets for exports has been questioned since 2008. In order to address this issue, we look at the evolution over time of the BoP-constrained rate. Since the BoP constraint is by nature a long-run constraint, we evaluate it using the long-run components of the relevant variables, and compare it with an estimate of the long-run growth rate.

The long-run component of each series was extracted using the Hodrick and Prescott (1997) filter. The filter computes the smoothed (long-run) component $s_t$ of a series $y_t$ by minimizing the variance of the deviation of $y_t$ from $s_t$, subject to a penalty that constrains the second differences of the smoothed series. The long-run component $s_t$ thus minimizes the following expression:

$$
\sum_{t=1}^{T} (y_t - s_t)^2 + \lambda \sum_{t=2}^{T-1} [(s_{t+1} - s_t) - (s_t - s_{t-1})]^2.
$$

The $\lambda$ parameter equals 100, namely, the value suggested by Hodrick and Prescott (1997) when dealing with annual data.

The filtered series were then input into Equation (6), providing us with a time-varying estimate of the BoP constraint. The estimate
allows us to confirm the previous results (Figure 3). After successful transition reforms through Doi Moi, Vietnam grew at an impressive rate. From a capacity-constrained growth before 1993, the country grew almost at the same rate as the one predicted by the model until 2005, and then started to violate its BoP constraint. This outcome was not caused by an acceleration in growth, as the historical rates remained almost stable, but by a tightening of the BoP constraint since 2005 that was determined by the evolution of the bilateral market shares and partners’ growth rates. Export growth made a significant contribution to GDP growth, but the shift to a more import intensive pattern of growth contributed to deteriorating the BoP position of Vietnam, whose export growth was affected by an economic slowdown in the rest of Asia, while import growth was simultaneously accelerated by the process of regional integration (notably toward developing Asia).

Growth targets and global economic turmoil

Vietnam’s Socio-Economic Development Strategy (SEDS) for the period 2011 to 2020 identifies the country’s key priorities over the current decade. The overall goal is for Vietnam to lay the foundations for a modern, industrialized society by 2020. Accordingly, the government aspires to achieve by that year a per capita income level of current US$3,000. This translates into a nearly 10 percent annual growth in per capita nominal GDP over the decade (World Bank, 2011). To meet this ambitious target, the Vietnamese
National Assembly set a target for real GDP growth of around 6.5–7.0 percent annually under the five-year Socio-Economic Development Plan 2011–2015 (SEDP). The total export receipts are expected to increase by 13 percent. Gross capital accumulation would occupy 33.5–35.0 percent of GDP in this period, while the trade deficit rate would be gradually reduced from 2012 onward and is expected to be 10 percent of total export turnover by 2015.

The question addressed here is whether the government’s medium-run growth target is achievable in the context of a weaker global economic environment, and how the foreign exchange requirements will be filled to meet this target. To this purpose, we depart from the last assessment of GDP growth edited by the International Monetary Fund (IMF, 2012). We constructed our baseline scenario by using the IMF’s medium-term projections for the period 2011 to 2017, along with the filtered series for import and export market shares. The corresponding BoP equilibrium growth rate is calculated by substituting our estimates of the long-run income and price elasticities.

According to IMF projections, growth prospects differ across the partner areas: while developing Asia is expected to maintain a high growth rate (7.8 percent per year on average; see Table 8), activity in the Northern partners (the RoW, EU, and United States) will remain rather low. The relatively high growth rate in the rest of the world is attributable to the recent dynamic expansion of South–

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Table 8
Some projections on Vietnam’s economic growth (2011–2017)

| Partner’s growth | Baseline: IMF projections | Scenario 1 | Scenario 2 | Scenario 3 |
|------------------|---------------------------|------------|------------|------------|
| DA               | 0.078                     | 0.068      | 0.078      | 0.078      |
| RoA              | 0.021                     | 0.011      | 0.011      | 0.021      |
| EU15             | 0.016                     | 0.006      | 0.006      | 0.006      |
| USA              | 0.028                     | 0.018      | 0.018      | 0.018      |
| RoW              | 0.040                     | 0.030      | 0.040      | 0.030      |
| $y_{AR}$         | 0.082                     | 0.052      | 0.055      | 0.062      |
| $y_{RoW}$        | 0.065                     | 0.065      | 0.065      | 0.065      |

Note: Bold is used to highlight the value of the variables that change with respect to the baseline scenario.

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7 Due to the low relative price effect, we neglect it in our simulations.
South trade, providing developing countries with a favorable external economic climate for export expansion (Bagnai et al., 2012). The IMF expects Vietnam to keep growing at a rate of 6.7 percent per year, which is consistent with the government’s target (Table 8).

Our baseline scenario shows that, if all the partner areas confirm the growth rates projected by the IMF for the period from 2011 to 2017, Vietnam’s BoP constraint would be relaxed in comparison to the 1998–2010 subperiod, because of high demand growth in the RoA, the United States, and the RoW. The growth rate predicted by the model rises (8.2 percent), enabling the country to achieve its growth target without encountering BoP problems.

However, in case the current crisis in the euro area does not lead to visible improvement in the external environment, this relevant change could be reversed. In this perspective, here we compare three scenarios. Scenario 1 assumes a sharp recession in the world economy, with a decrease in all partners’ GDP growth by one percentage point with respect to the baseline. Under Scenario 2, the same slowdown in GDP growth affects only the Northern partners (the RoA, the United States, and the EU). Finally, Scenario 3 hypothesizes that the Asian area is able to avoid the economic turmoil.

Under Scenario 1, recession in all partner areas, with the associated slowdown in the demand for Vietnam’s exports, will tighten the BoP constraint to 5.2 percent. As a result, the government growth target could be achieved only through a heavier reliance on capital inflows. Under Scenario 2, when only the Northern partners are affected by the economic turmoil, Vietnam’s BoP constraint is less binding; but the corresponding growth rate (5.5 percent) remains lower than the government’s target and far lower than the growth rate estimated in the baseline. In other words, a demand-led expansion in South–South trade may be a weak alternative engine of export expansion. Whatever scenario is undertaken, the ongoing recession reveals the vulnerability of Vietnam’s growth to the external economic climate, as the production networks built in the Asian area work to its disadvantage. To illustrate this argument, Scenario 3 results in more optimistic projections by assuming that the Asian area is sheltered from the global crisis. In this case Vietnam’s BoP-constrained-growth rate is close to the target (6.2 percent against 6.5 percent), allowing the government to achieve the medium-run growth rate without further increases in capital inflows to bridge the financing gap. In other words, continued robust economic expansion in the Asian
region would attenuate the negative impact on Vietnam of what would otherwise be a global economic downturn.

Conclusion

Vietnam has made important progress in achieving economic and social development over the past two decades. The country’s accession to the WTO paved the way to greater market liberalization and foreign investment inflows. However, recent developments in Vietnam’s economic conditions suggest that the country’s BoP problems come from its integration into global and regional economies. In the face of rapid growth with structural change in trade partnerships, the connection between BoP and growth cannot be ignored.

In view of this, our paper examines the long-run relation between economic growth and the current account balance equilibrium, using a multicountry BoP-constrained-growth model. This model allows us to assess whether the country growth was compatible with its BoP equilibrium, and to identify which international factors could prevent any attempt to achieve a sustained growth rate. The model specified was estimated using annual data for the period between 1985 and 2010, and we analyzed the two subsamples before and after the 1997 Asian crisis separately, looking at the possible role of the different trading partners in the evolution of the BoP constraint.

Our results show that over the whole sample, Vietnam respected its BoP constraint. However, our decomposition allows us to identify the international mechanisms through which Vietnam’s BoP position worsened, in relation to the nature of the country’s trade partnership before and after the Asian crisis. While before the crisis (1985–97) the Vietnamese economy was well inside its BoP constraint, after the crisis the constraint tightened quickly. The estimation results show that this outcome does not depend on the evolution of relative prices, whose effect is neutral. The evolution of the BoP constraint is dominated by changes in the market shares and in the partners’ growth rate. In particular, Vietnam has partially benefited from a change in bilateral or multilateral trade policies with advanced countries (for instance, through the United States–Vietnam bilateral trade agreement). However, Vietnamese growth is hindered by the “appetite” for imports coming from the whole of Asia. This feature is consistent with a production-oriented trade structure that has proliferated in the region, often as a part of triangular
(South–South–North) trading networks. Finally, the study addressed the issue of the impact of global recession on Vietnam’s growth for the period 2011 to 2017. The scenario analyses show that slower growth in the partner areas will result in a BoP constraint well below the government medium-run growth target. However, the capital inflows needed to fill the foreign exchange gap are relatively limited if the Asian partners keep growing and remain unaffected by the global economic turmoil.

Since exports represent a source of foreign exchange, the analysis developed here provides a rationale for an export-led growth strategy. However, our results suggest that this strategy is highly vulnerable to the external economic environment, notably through the constraint imposed by the pace of growth of high-income countries’ demand for exports.

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**Appendix A. Countries**

**Group A** (Developing Asia, DA): Bangladesh, Bhutan, Cambodia,
China, India, Indonesia, Lao PDR, Malaysia, Mongolia, Nepal,
Pakistan, Philippines, Sri Lanka, Thailand.

**Group B** (Rest of Asia, RoA): Australia, Brunei, French Polynesia,
Hong Kong, Japan, Macao, New Caledonia, New Zealand,
Northern Mariana Islands, Singapore, South Korea.
**Group C** (EU15): Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

**Group D**: USA

**Group E**: Rest of the world (RoW)

**Appendix B. Data sources and definitions**

The bilateral trade flows of Vietnam to and from each partner region were reconstructed using the Comtrade database. The sample runs from 1985 through 2010. Missing data in the bilateral trade series have been reconstructed as follows: if either of the two flows is missing, we use its “mirror.” If instead they are both reported but with different values, the bilateral series are reconstructed as a weighted average of the import and the export ones (where imports receive a weight of two-thirds). The data on the bilateral trade relations between Vietnam and the RoW are missing from the beginning of the sample through 1997. The two series were constructed by taking for each the difference between the total flow, extracted from the World Development Indicators (WDI) database, and the sum of the other bilateral flows. Then we calculated the RoW flows by subtracting the other four bilateral trade series from the total.

Since the Comtrade series are in U.S. dollars at current prices, in order to get their real counterparts, the import series $M_j$ were deflated using country $j$ aggregate export deflator (evaluated as the ratio of nominal to real exports in U.S. dollars), while the export series $X_j$ were deflated using Vietnam’s export deflator (evaluated accordingly). Vietnam’s export deflator was missing from 1985 to 1988. The missing data were retrojected using the GDP deflator growth rate. The data on nominal and real aggregate exports and the GDP come from the 2012 edition of the WDI database. All real variables are measured in U.S. dollars at 2000 prices.

Relative prices were constructed as the ratio of domestic prices (measured by Vietnam export deflator) to foreign prices (measured by partner $j$ GDP deflator). The estimation was also performed using a terms-of-trade variable constructed as the ratio of Vietnam’s export deflator to the partner export deflator (i.e., to Vietnam’s import deflator). The empirical results (available upon
request) did not compare favorably with those presented in the paper.

Appendix C. Unit root tests

As is well-known, the results of unit root tests are strongly dependent on the correct specification of the deterministic component (drift and trend) of the underlying data generating process (DGP). Misspecification of the deterministic component may entail a loss of power (see Campbell and Perron, 1991). In order to cope with this issue, we adopted the testing strategy proposed by Elder and Kennedy (2001). In short, this strategy uses the a priori information, provided by the pattern of the time series, in order to rule out those alternative hypotheses that are inconsistent with the observed behavior of the data. This allows the researcher to decide on both the correct specification of the deterministic component and the presence of a unit root using a single test, thus reducing the multiple hypotheses testing issues presented by other testing strategies (such as the one proposed by Dolado et al., 1990).

First, the plot of the series is inspected, in order to verify whether it exhibits a trending behavior. If the series is trending, we perform an $F$-test for the null hypothesis $H_0: \rho = 1, \beta = 0$ in the model:

$$y_t = \alpha \beta t + \rho y_{t-1} + \epsilon_t.$$ 

This $F$-statistic has a nonstandard distribution under the null and is compared with the critical values of the $\Phi_3$ statistic provided by Dickey and Fuller (1979). Failure to reject the null implies that the series is $I(1)$ with drift, while rejection implies that it is $I(0)$ around a deterministic trend (namely, $\rho < 1, \beta \neq 0$). The other possible alternatives are ruled out, being inconsistent with the observed data behavior (see Elder and Kennedy, 2001).

If instead the series does not display a regular trending behavior, we test the null hypothesis $H_0: \rho = 1, \alpha = 0$ in the model:

$$y_t = \alpha + \rho y_{t-1} + \epsilon_t.$$ 

In this case the $F$-statistic follows the $\Phi_1$ distribution by Dickey and Fuller (1979). Failure to reject implies that the series is $I(1)$ without drift, while rejection implies that the series was generated by an $I(0)$ process with unconditional mean different from zero. In both cases, lags of the differenced dependent variable were added.
to the equation in order to whiten its residuals. The lag length was
determined by reduction, starting from a maximum order of lags
equal to 2, which was deemed appropriate considering the sample
length and the fact that we are using annual data.

The results of the tests are summarized in Table A1. All the vari-
ables, except relative prices, display a clear trending behavior,
which could be compatible with either an $I(1)$ with drift process,
or with an $I(0)$ process with deterministic trend. The relative price
series, instead, display a pronounced reversal occurring at the
beginning of the 1990s, which is incompatible with the presence
of a deterministic trend. The results show that in all cases we were
unable to reject the unit root null.

For trending series, we applied the $\Phi_3$ test and for nontrending
series the $\Phi_1$ test by Dickey and Fuller (1981). The 5 percent criti-
cal values are 7.24 and 5.18, respectively. The unit root null is
never rejected by the data.

| Variable | Behavior | Statistic | Lags | Variable | Behavior | Statistic | Lags |
|----------|----------|-----------|------|----------|----------|-----------|------|
| $m_{A,t}$ | Trending | 3.17 | 0 | $x_{A,t}$ | Trending | 2.20 | 0 |
| $m_{B,t}$ | Trending | 2.46 | 1 | $x_{B,t}$ | Trending | 1.53 | 0 |
| $m_{C,t}$ | Trending | 3.63 | 0 | $x_{C,t}$ | Trending | 1.76 | 0 |
| $m_{D,t}$ | Trending | 2.27 | 0 | $x_{D,t}$ | Trending | 5.33 | 0 |
| $m_{E,t}$ | Trending | 0.77 | 0 | $x_{E,t}$ | Trending | 5.60 | 1 |
| $y_{A,t}$ | Trending | 2.20 | 1 | $r_{A,t}$ | Nontrending | 2.31 | 0 |
| $y_{B,t}$ | Trending | 3.84 | 0 | $r_{B,t}$ | Nontrending | 2.73 | 0 |
| $y_{C,t}$ | Trending | 3.25 | 1 | $r_{C,t}$ | Nontrending | 2.75 | 0 |
| $y_{D,t}$ | Trending | 4.59 | 2 | $r_{D,t}$ | Nontrending | 2.17 | 0 |
| $y_{E,t}$ | Trending | 2.79 | 0 | $r_{E,t}$ | Nontrending | 2.15 | 0 |
| $y_t$ | Trending | 5.77 | 1 |