Balance-of-Payments Constrained Growth: the Case of Turkey

Halicioglu, Ferda

Department of Economics, Yeditepe University

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Abstract

In order to test the existence of Thirlwall's law for Turkey during the period of 1980-2008, bounds test approach to cointegration is applied. The empirical results suggest that Thirlwall's law holds for Turkey. This study also suggests some policy recommendations to curb the deficits in the balance-of-payments.

Keywords: Thirlwall's law, balance-of-payments constraint, cointegration, growth, import elasticity, Turkey.
JEL classifications: E12; F43; C22; O24.

Correspondence to:

Ferda HALICIOGLU
Professor of Economics

Department of Economics
Yeditepe University
34755 Istanbul
Turkey
Tel: +90 (0) 216 5780789
Fax: +90 (0) 216 5780797
e-mail: fhalicioglu@yeditepe.edu.tr

Introduction

The aim of this paper is to empirically test the validity of Thirlwall's law of economic growth for Turkey. In Thirlwall's law, a relation between the growth rates of gross domestic income and exports, and the long-run income elasticity of imports are established in the long-run. This law states that an economy's growth is sustainable only if the growing demand for imports is related to economic growth when it is financed by the revenues from exports. Therefore, economic growth is constrained at a rate that is imposed by the requirement of balance-of- payments.

The model of the balance-of-payments constrained growth offers a Keynesian demand-side explanation of the process of economic growth and growth differences among countries. The theory places emphasis on demand as the main vehicle of growth rather than factors of production and technical change in the neoclassical view. McCombie and Thirlwall (1997) provides a detailed account of the approaches of the economic growth between the neoclassical and post Keynesian economists. Since 1980, Turkey has been trying to achieve a sustainable economic growth through export-led policies. In the course of transforming economy from import-substitution to export led growth strategy, Turkey has been implementing reforms that are mainly in areas of deregulation, privatization, and foreign trade liberalization which influence not only the exports and imports of goods and services but also other balance of payments variables, such as lifting the restrictions on capital movements and allowing convertibility in the foreign exchange markets. Nevertheless, except for a few years during 1980-2008, Turkey has experienced persistent trade deficits which have had adverse effects on the rate of economic growth. Thus, this study aims at testing the validity of Thirlwall's law to identify the relationship between the economic growth and the growth of exports.

The empirical validity of Thirlwall's law has been tested for a large number of countries in the last three decades. The majority of the empirical results are in support of the law. The empirical evidence obtained to test the existence of the law can be classified broadly into three categories: cross-section, traditional and modern time series (cointegration). The empirical evidence obtained from the cross-section countries employs the traditional econometric techniques of the Ordinary Least Squares (OLS) or Two Stage Least Squares (TSLS) but the hypotheses for the law are jointly set. Examples of cross-section country evidence include Bairam (1988) for eighteen European and North American countries, plus Turkey; and Bairam and Dempster (1991) for eleven Asian countries, inclusive of Turkey. The traditional time series evidences obtained from the OLS and TSLS techniques for the law can be found in the following studies: Thirlwall and Hussain for twenty developing countries including Turkey; Bairam (1990) for fifteen oil exporting and other developing countries including Turkey; Atesoglu (1993) for the USA; Atesoglu (1994) for Germany; Leon-Ledesma (1999) for Spain; Perraton (2003) for fifty-one developing countries including Turkey; and Elitok and Campbell (2008) for Turkey. The applications of different cointegration techniques to test the validity of the law started in the 1990s. Some examples of this approach contain Bairam (1993) for five European countries; Atesoglu (1997) for the USA; Moreno-Brid (1999) for Mexico; Bairam and Ng (2001) for Canada, New Zealand and the UK; Razmi (2005) for India; Britto and McCombie (2009) for Brazil; Jeon (2009) for China; Gouvea and Lima (2010) for some Latin American and South Asian countries; and Bagnai (2010) for twenty-two OECD countries including Turkey.

This study aims at extending the literature by providing fresh evidence on the law from the cointegration technique of Pesaran *et al.* (2001). Unlike the previous studies

on Turkey, the estimation period of this study covers 1980-2008 which coincides with the replacement of the import-substitution growth strategy with the export-led growth.

Theoretical model of Thirlwall's law

The pioneering study of Thirlwall (1979) is based on the dynamic Harrod foreign trade multiplier which determines long-term economic growth. Thirlwall (1979) revitalized the balance-of-payments constraint model of Harrod (1933). The initial model consists of the following three equations:

$$x_t = \eta(p_{ft} + e_t - p_{dt}) + \varepsilon z_t \quad (1)$$

$$m_t = \psi(p_{dt} - p_{ft} - e_t) + \pi y_t \quad (2)$$

$$p_{dt} + x_t = p_{ft} + m_t + e_t \quad (3)$$

Equation (1) represents export demand function, equation (2) illustrates import demand function and equation (3) shows balance of payments equilibrium condition. All variables are expressed in their growth rates. Thus, x_t is the growth rate of real exports, m_t the growth rate of real imports, y_t is the growth rate of real domestic income, and z_t is the growth rate of real world income, p_{dt} is the growth rate of domestic prices, p_{ft} is the growth rate of import prices, e_t is the nominal exchange rate defined as the home price of one unit foreign price. The expression of $(p_{dt} - p_{ft} - e_t)$ represents the rate of change of the real terms of trade for the country. The price elasticity of demand for exports is given by the parameter, η. The price elasticity of demand for imports is measured by the parameter, ψ. The parameter ε

indicates the world income elasticity of demand for exports, and π is the income elasticity of demand for imports.

It is assumed that the relative prices stay invariant in the long-run, $(p_{ft} + e_t - p_{dt}) = 0$. According to Thirlwall (1986), international prices are fixed in oligopolistic markets. Thus, the role of prices is minimal in international market competition. As a result of this assumption and by substituting equations (1) and (2) into equation (3), one can obtain:

$$y_t^* = \left(\frac{\varepsilon z_t}{\pi} \right) \tag{4.1}$$

or

$$y_t^* = \left(\frac{1}{\pi} \right) x_t \tag{4.2}$$

where y_t^* is the long-run economic growth. The pionering work of Thirlwall (1979) and many subsequent empirical studies have concentrated on the dynamic Harrod foreign trade multipliers expressed by equations (4.1) and (4.2). Both equations (4.1) and (4.2) represent Thirlwall's law, stating that the long-run economic growth is determined by the growth of exports and the inverse income elasticity of demand for imports. Equation (4.2) suggests further that the rate of the exports growth is relative to the income elasticity of demand for imports. In other words, the balance-of-payments constrained growth rate is given by the growth rate of exports and the dynamic Harrod foreign trade multiplier. Therefore, it is income that adjusts to restore equilibrium and not relative prices. If a country desires to control external deficits, it should increase the constraint on the balance-of-payments, either through an increase in exports growth or a decrease in the income elasticity of the demand for imports, or combining both cases.

The main proposition of Thirlwall is that whenever an economy grows at a rate higher than that consistent with the balance-of-payments equilibrium, it will run into external deficits which are not sustainable in the long-run, unless capital inflows can finance the ever-growing imbalances. If a country falls into this situation, domestic production will eventually decrease resulting in higher unemployment. The restoration of the balance-of-payments can not be achieved via relative prices as the neoclassical theory assumes. Compatible devaluations are not the solution since, in the long-run, they aggravate domestic inflation lowering competitiveness and worsening even farther external imbalances. Therefore, economic policies should concentrate on increasing exports and making imports less sensitive to changes in domestic income. A country is said to be balance-of-payments constrained if its actual growth rate is such that the current account is in balance in the long-run and actual growth rate is below the growth of productive potential growth rate. This is referred to as the balance-of payments equilibrium growth rate.

Model and econometric methodology

Thirwall's law is typically tested by matching the predictions of equation (4.2) with the actual long-run growth rate of real output. Therefore, the income elasticity of demand for imports plays a crucial role in determining the test outcome. Following the literature on Thirlwall's law, the long-run relationship traditional import demand function is expressed in the logarithm of the variables as follows:

$$LM_t = \alpha + \pi LY_t + \beta LRP_t + \omega_t \quad (5)$$

where LM_t is the logarithm of real imports, LY_t is the logarithm of real income, LRP_t is the logarithm relative prices which are defined as the ratio of domestic to foreign prices, and ω_t is the classical regression error term.

The recent advances in econometric literature dictate that the long-run relation in equation (5) should incorporate the short-run dynamic adjustment process. It is possible to achieve this aim by expressing equation (5) in an error-correction model as suggested in Pesaran *et al.* (2001)[1].

$$\Delta LM_t = b_0 + \sum_{i=1}^{m1} b_{1i}\Delta LM_{t-i} + \sum_{i=0}^{m2} b_{2i}\Delta LY_{t-i} + \sum_{i=0}^{m3} b_{3i}\Delta LRP_{t-i} + b_4 LM_{t-1} + b_5 LY_{t-1} + b_6 LRP_{t-1} + v_t \quad (6)$$

This approach, also known as autoregressive-distributed lag (ARDL), provides the short-run and long-run estimates simultaneously. Short-run effects are reflected by the estimates of the coefficients attached to all first-differenced variables. The long-run effects of the explanatory variables on the dependent variable are obtained by the estimates of b_5 and b_6 that are normalized on b_4. The inclusion of the lagged-level variables in equation (6) is verified through the bounds testing procedure, which is based on the Fisher (F) or Wald (W)-statistics. This procedure is considered as the first stage of the ARDL cointegration method. Accordingly, a joint significance test that implies no cointegration hypothesis, (H_0: all b_4 to $b_6 = 0$), against the alternative hypothesis, (H_1: at least one b_4 to $b_6 \neq 0$) should be performed for equation (6). The F/W test used for this procedure has a non-standard distribution.

[1] Pesaran *et al.* (2001) cointegration approach has some methodological advantages in comparison to other single cointegration procedures. The main advantage is that the ARDL approach is applicable irrespective of whether the underlying regressors are purely *I*(0), purely *I*(1) or mutually cointegrated. The other major advantage of this approach is that small sample properties of bounds testing are far superior to that of multivariate cointegration, as discussed in Narayan (2005).

Thus, Pesaran *et al.* (2001) compute two sets of critical values for a given significance level with and without a time trend. One set assumes that all variables are *I*(0) and the other set assumes they are all *I*(1). If the computed F/W-statistic exceeds the upper critical bounds value, then the H_0 is rejected, implying cointegration. In order to determine whether the adjustment of variables is toward their long-run equilibrium values, estimates of b_4-b_6 are used to construct an error-correction term (EC). Then lagged-level variables in equation (6) are replaced by EC_{t-1} forming a modified version of equation (6) as follows:

$$\Delta LM_t = c_0 + \sum_{i=1}^{m1} c_{1i}\Delta LM_{t-i} + \sum_{i=0}^{m2} c_{2i}\Delta LY_{t-i} + \sum_{i=0}^{m3} c_{3i}\Delta LRP_{t-i} + \lambda EC_{t-1} + \mu_t \qquad (7)$$

where λ is the speed of adjustment parameter. Equation (7) is re-estimated one more time using the same lags previously. A significantly negative coefficient obtained for the EC_{t-1} will support adjustment toward long-run equilibrium or, again cointegration among variables.

Empirical results

Annual data over the period 1980-2008 were used to estimate equations (6) and (7), respectively, by the ARDL cointegration procedure of Pesaran *et al.* (2001). Data definitions and sources of data are cited in the Appendix. To implement the Pesaran *et al*. (2001) cointegration procedure, one has to ensure that none of the variables in equation (5) is above *I*(1). In the presence of *I*(2), the critical values computed by the Pesaran *et al.* (2001) cointegration procedure are not valid.

Three tests were used to test the time properties of the variables in equation (5): Augmented Dickey-Fuller (henceforth, ADF) (1979, 1981), Phillips-Perron (henceforth, PP) (1988), and Elliott-Rothenberg-Stock (henceforth, ERS) (1996).

The results are displayed in Table 1. Table 1 indicates that the variables are either stationary in their levels or in their first differences. Consequently, the results warrant implementing the Pesaran *et al*. (2001) procedure.

Table 1: Unit root results.

Variables	ADF	PP	ERS
LM_t	5.04*	5.72*	5.62*
LY_t	2.39	2.72	2.43
LRP_t	2.55	2.71	2.32
ΔLM_t	7.39*	7.71*	6.02*
ΔLY_t	3.79*	6.34*	3.72*
ΔLRP_t	4.02*	5.95*	3.88*

Notes: Sample levels are 1980-2008 and differences are 1982-2008. The sample level unit root regressions include a constant and a trend. The differenced level unit root regressions are with a constant and without a trend. All test statistics are expressed in absolute terms for convenience. Rejection of unit root hypothesis is indicated with an asterisk. Δ stands for first difference.

The presence of long-run relationship was established implementing a bounds test to equation (6). Considering that this paper is utilizing annual data with a relatively small sample including only 29 observations, the maximum lag length in the ARDL model was set equal to 2. The results of the bounds testing are presented in Table 2. The results provided in Table 2 illustrate that the computed F/W statistics are higher than the upper bound critical values at the 1 % level of significance confirming the existence of a cointegration relationship between the variables of equation (5).

Table 2: The results of F and W tests for cointegration

The assumed long-run relationship: $F/W(LM \mid LY, LRP)$				
F-statistic	95% LB	95% UB	90% LB	90% UB
10.06	4.24	5.40	3.44	4.46
W-statistic				
30.20	12.73	16.20	10.32	13.38

If the test statistic lies between the bounds, the test is inconclusive. If it is above the upper bound (UB), the null hypothesis of no level effect is rejected. If it is the below the lower bound (LB), the null hypothesis of no level effect cannot be rejected.

On establishing a long-run cointegration relationship amongst the variables of equation (5), a two-step procedure to estimate the ARDL model was carried out. First, in search of the optimal lag length of the differenced variables of the short-run coefficients, the Akaike Information Criterion (AIC) was utilized and in the second step, ARDL model was estimated by the OLS technique.

The results of AIC based ARDL model is reported in Panel A, B, and C of Table 3. The results of long-run coefficients are displayed in Panel A of Table 3, whereas the short-run estimates are presented in Panel B of Table 3. Finally, Panel C of Table 3 demonstrates the short-run diagnostic test statistic results. The overall regression results are satisfactory in terms of statistical significances and sign expectations for the slope parameters. The short-run diagnostics obtained from estimation of equation (6) suggest that the estimated model passes a series of standard diagnostic tests such as serial correlation, functional form, normality, and heteroscedasticity.

The long-run elasticity of imports, with respect to income, is 1.82 suggesting that for each 1% increase in the growth rate of real income, the growth rate of real imports will rise by 1.82 %. This value is close to those estimates of 1.98 of Bagnai (2010) and 2.11 of Perraton (2003). The differences in estimation of the coefficient magnitude might be related to the fact that their regression equations were run with different time spans and econometric techniques. The long-run elasticity of imports,

with respect to growth rate of relative price, is 1.15. The speed of adjustment parameter is – 0.56, suggesting that when the import demand equation is above or below its equilibrium level, it adjusts by 56% within the first year. The full convergence to its equilibrium level takes a little less than two years. The stability of coefficients in the error correction model was also tested[2].

Table 3 : ARDL cointegration results for the import demand equation

Panel A: the long-run results			Panel B: the error-correction representation results		
Dependent variable LM_t			Dependent variable ΔLM_t		
Regressors	Coefficient	T-ratio	Regressors	Coefficient	T-ratio
LY_t	1.82*	12.17	ΔLY_t	1.74*	4.42
LRP_t	1.15*	3.17	ΔLY_{t-1}	-0.56	1.40
Constant	-16.61*	5.96	ΔLRP_t	0.66*	4.00
			EC_{t-1}	-0.56*	5.27
			Constant	-9.44*	3.12

Panel C: the short-run diagnostic test statistics							
$\overline{R}^2$	0.74	F-statistic	21.49*	$\chi^2_{SC}(1)$	0.21	$\chi^2_{FF}(1)$	3.76
RSS	0.20	DW-statistic	1.98	$\chi^2_N(2)$	1.42	$\chi^2_H(1)$	3.15

* indicates 1% statistical significance level. RSS stands for residual sum of squares. T-ratios are in absolute values. χ^2_{SC}, χ^2_{FF}, χ^2_N, and χ^2_H are Lagrange multiplier statistics for tests of residual correlation, functional form mis-specification, non-normal errors and heteroskedasticity, respectively. These statistics are distributed as Chi-squared variates with degrees of freedom in parentheses. The critical values for $\chi^2(1) = 3.84$ and $\chi^2(2) = 5.99$ are at 5% significance level.

The validity of testing of Thirlwall's law for the Turkish economy is conducted according to the procedure outlined in Atesoglu (1993, 1994). Thirlwall's law states that there is a long-run relationship between the balance of payments and the growth rate of income. Therefore, the validity of this law should be based on longer periods rather than year by year. Thus, the average decennial rates of growth of the variables in overlapping periods starting from 1985-94 and ending in 1999-08 have been utilized. The balance of payments constrained real income growth predictions (y_t^*)

[2] The graphical representations of CUSUM and CUSUMSQ tests of Brown *et al*. (1975) display that all coefficients in the error-correction model are stable and there exists no structural break. These results are not presented here but they are available upon on request.

are obtained from equation (4.2) with the long-run ARDL estimate of the income elasticity of demand for imports, 1.82. These findings are displayed in Table 4. Table 4 also presents the average growth rates of the actual real income and the average growth rates of the actual export demand in the same periods. According to the results revealed in Table 4, the average predicted growth rate of income is, by and large, close to the average actual growth rate of income. There are also periods of dissimilarities between the actual and predicted rate of real incomes. For example, some periods such as 1985-94, 1986-96, 1996-05, and 1999-08 seem to suggest that the predicted and actual growth rate of the real income is converging but on the other hand, this conclusion is not valid for the other periods. For example, the periods of 1986-1995, 1989-98, 1992-01, 1993-02, and 1994-03 are far from convergence. The divergence is especially more apparent for those years when the Turkish economy suffered very high inflationary periods from 1992 through 2003. As a result, Turkish economic growth dropped below its potential growth rates. From 1995 onwards, it appears that the Turkish growth rate is above its potential economic growth equilibrium. On the whole, one could say that the empirical results are in line with the previous studies such, as Bairam and Dempster (1991), Perraton (2003) and Bagnai (2010). According to Thirlwall and Hussain (1982), countries may grow above the equilibrium rate of growth for long-periods because they attract strong capital inflows. An empirical version of this expanded Thirlwall model which allows for capital flows was applied to Canada by Atesoglu (1993-94).

Establishment of the customs unions in 1996 between the European Union and Turkey might have resulted in an increase in foreign direct investment flows. Turkey has also been acquiring strong capital inflows since 2002. Thus, these factors may

confirm the proposition of Thirlwall and Hussain (1982). In conclusion, the results of Table 4 suggest that Thirlwall's law holds for Turkey.

Table 4: Actual and balance of payments constrained average growth rates, % per year, 1980-2008

	Actual growth rates		Predicted growth rates	
Periods	x_t	y_t	y_t^*	$y_t^* - y_t$
1985-94	7.03	4.01	3.86	- 0.15
1986-95	5.90	4.27	3.21	- 1.06
1987-96	8.15	4.12	4.47	0.35
1988-97	6.59	4.09	4.32	0.23
1989-98	5.82	4.19	3.20	- 0.99
1990-99	5.01	3.68	2.72	- 0.96
1991-00	6.84	3.51	3.76	0.25
1992-01	9.46	2.64	4.02	1.38
1993-02	8.17	2.82	4.48	1.66
1994-03	7.48	2.61	4.11	1.50
1995-04	6.23	2.73	2.69	- 0.04
1996-05	4.71	3.08	2.73	- 0.35
1997-06	4.35	4.27	3.39	- 0.88
1998-07	2.53	3.02	2.52	- 0.50
1999-08	1.95	3.28	3.03	- 0.25

Conclusions

The article has attempted to test the validity of Thirlwall's law. This law is based on a demand-oriented theory of economic growth in an economy with the major constraint on demand is the balance-of-payments offering an alternative approach to the supply-oriented neoclassical growth theory. The theoretical framework of Thirlwall (1979) is adopted to compute the balance-of-payments equilibrium growth, assuming constant relative prices in the long-run and an initial equilibrium on current account. The import demand function is estimated to obtain the income elasticity with respect to imports, which is a crucial parameter for computing Thirlwall's law, using the ARDL cointegration procedure of Pesaran *et al*. (2001). The balance-of-payments equilibrium growth rates are computed for a series of 10-year overlapping periods and are compared to the actual growth rates. The approximation of the two rates seems to

be close in general, validating Thirlwall's law for most of the prediction periods. Recent developments in Turkey's economic conditions have caused some concerns over the sustainability of growth rates considering the sharp downturns of 1994, 2001 and 2009. The current account deficits in the past were partly financed by short-term international borrowings which always bring out the concerns of capital flight and collapses in the exchange rate market due to their highly volatile nature. Therefore, Turkish economic policy should be designed with a view to increase the rate of growth of exports. Turkey will not succeed to support a stable long-term growth path unless the country beats its balance-of-payments constraint. The economic policy implication of this law for Turkey proposes that the income elasticity of demand for imports must be reduced so that the balance-of payments constrained is relaxed on growth, allowing faster growth. In order to implement this economic policy objective, Turkey should develop economic policies promoting domestic production in response to rising income. Therefore, the strategic planning of the target industries for export based growth is required along with curbing excess liberalization policies in the foreign trade. This policy choice is compatible with the increase in the balance-of-payments equilibrium growth rate.

Appendix

Data definition and sources

Due to lack of consistent data spans from one statistical source, data are collected from three different sources, namely; International Financial Statistics of the International Monetary Fund (IMF), Main Economic Aggregates of Organization for Economic Cooperation and Development (OECD), and Annual Statistics of Turkish Statistical Institute (TSI).

y : the rate of growth of real GDP. The GDP in current TL (Turkish Lira) is deflated by the GDP deflator. Source: GDP and its deflator come from TSI.

x : the rate of growth of real exports. The exports in current TL are deflated by the Turkish consumer price index. Source: exports and consumer price index come from IMF.

LM: the logarithm of real imports. The imports in current TL are deflated by the import price deflator. Sources: imports come from IMF and import price deflator comes from OECD.

LY: the logarithm of real GDP. The GDP in current TL is deflated by the GDP deflator. Source: GDP and its deflator come from TSI.

LRP: the logarithm of relative prices. The relative prices are defined as the ratio of domestic to foreign prices. The implicit GDP deflator is used as a proxy for domestic price and the implicit import price deflator is selected as a proxy for foreign price. Sources: implicit GDP deflator comes from TSI and implicit import price deflator comes from OECD.

References

Atesoglu, H. S. "Balance of Payments constrained Growth: Evidence from the United States." *Journal of Post Keynesian Economics*, 1993, 15 (4), 507-514.

Atesoglu, H.S. "Exports, Capital Flows, Relative Prices, and Economic Growth in Canada", *Journal of Post Keynesian Economics*, 1993-94, 16, 289-97.

Atesoglu, H. S. "Balance of Payments Determined Growth in Germany." *Applied Economic Letters*, 1994, 1(6), 89-91.

Atesoglu, H. S. "Balance of Payments Constrained Growth Model and its Implications for the United States." *Journal of Post Keynesian Economics*, 1997, 19 (3), 327-335.

Bagnai, A. "Structural Changes, Cointegration, and the Empirics of Thirlwall's Law." *Applied Economics*, 2010, 42(10), 1315-1329.

Bairam, E. "Balance of payments, the Harrod foreign Trade Multiplier and Economic Growth: the European and North American Experience, 1970-1985." *Applied Economics*, 1988, 20 (12), 1635-1642.

Bairam, E. "The Harrod Foreign Trade Multiplier Revisited." *Applied Economics*, 1990, 22 (6), 711-718.

Bairam, E. "Static versus Dynamic Specifications and the Harrod Foreign Trade Multiplier." *Applied Economics*, 1993, 25 (6), 739-742.

Bairam, E., and Dempster, G. "The Harrod Foreign Trade Multiplier and Economic Growth in Asian Countries." *Applied Economics*, 1991, 23 (11), 1719-1724.

Bairam, E., and Ng, L. "Thirlwall's Law and the Stability of Export and Import Income Elasticities." *International Review of Applied Economics*, 2001, 15 (3), 287-303.

Britto, G., and McCombie, J.S.L. "Thirlwall's Law and the Long-term Equilibrium Growth Rate: an Application to Brazil." *Journal of Post Keynesian Economics*, 2009, 32(1), 115-136.

Brown, R. L., Durbin, J., and Evans, J. M. "Techniques for Testing the Constancy of Regression Relations over Time." *Journal of the Royal Statistical Society*, Series B, 1975, 37 (2), 149-163.

Dickey, D. A., and Fuller, W. A. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root." *Journal of American Statistician Association*, 1979, 74 (366), 427-431.

Dickey, D. A., and Fuller, W. A. "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root." *Econometrica,* 1981, 49 (4), 1057-1072.

Elitok, S.P., and Campbell, A. "The Balance of Payments as a Constraint on Turkey's Growth: 1960-2004." Working Paper no. 2008-13, Department of Economics, Salt Lake City, University of Utah, 2008.

Elliott, G., Rothenberg, T., and Stock, J. "Efficient Tests for an Autoregressive Unit Root." *Econometrica*, 1996, 64 (4), 813–836.

Gouvea, R.R., and Lima, G. T. "Structural Change, Balance of Payments Constraint, and Economic Growth: Evidence from the Multisectoral Thirlwall's Law." *Journal of Post Keynesian Economics*, 2010, 33(1), 169-204.

Harrod, R. *International Economics.* Cambridge University Press, 1933. [Reprinted. Chicago: University of Chicago Press, 1963].

Jeon, Y. "Balance of Payment Constrained Growth: the Case of China, 1979-2002." *International Review of Applied Economics*, 2009, 23 (2), 135-146.

Leon-Ledesma, M. "An Application of Thirlwall's Law to the Spanish Economy." *Journal of Post Keynesian Economics*, 1999, 21(3), 431-439.

McCombie, J.S.L., and Thirlwall, A.P. "The Dynamic Harrod Foreign Trade Multiplier and the Demand Oriented Approach to Economic Growth: an Evaluation." *International Review of Applied Economics,* 1997,11(1), 5-26.

Moreno-Brid, J. C. "Mexico's Economic Growth and the Balance of Payments Constraint: a Cointegration Approach." *International Review of Applied Economics*, 1999, 13(1), 149-159.

Narayan, P.K. "The Saving and Investment Nexus for China: Evidence from Cointegration Tests." *Applied Economics*, 2005, 37 (17), 1979-1990.

Perraton, J. "Balance of Payments Constrained Growth and Developing Countries: an Examination of Thirlwall's Hypothesis." *International Review of Applied Economics*, 2003, 17(1), 1-22.

Pesaran, M. H., Shin, Y., and Smith, R. J. "Bounds Testing Approaches to the Analysis of Level Relationships." *Journal of Applied Econometrics*, 2001, 16 (3), 289-326.

Phillips, P.C.B., and Perron, P. "Testing for a unit root in time series regression." *Biometrika*, 1988, 75 (2), 335–346.

Razmi, A. "Balance of Payments Constrained Growth Model: the Case of India." *Journal of Post Keynesian Economics*, 2005, 27(4), 655-687.

Thirlwall, A. P. "The Balance of Payments Constraints as an Explanation of International Growth Rate Differences." *Banca Nazionale del Lavoro Quarterly Review*, 1979, 32(128), 45-53.

Thirlwall, A. P. "Balance of Payments Constrained Growth: a Reply to McGregor and Swales." *Applied Economics*, 1986, 18 (12), 1256-1263.

Thirlwall, A. P., and Hussain, M. N. 1982 "The Balance of Payments Constraint, Capital Flows and Growth Rate Differences between Developing Countries." *Oxford Economic Papers*, 1982, 34 (3), 498-510.