

Balance of payments constrained growth model: an Application for Morocco (1980-2018)

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Abstract:

The aim of this study is to test the validity of Thirlwall's Law in Morocco from 1980 to 2018 period using an Autoregressive Distributed Lag (ARDL) Bounds testing approach. The empirical results suggest that import is co-integrated with relative price and income, and the actual growth rate was found to be equal to the predicted growth rate by the balance of payments. Thus, The thirlwall's law holds for Morocco. This study proposes, also, some policy recommendations to reduce the trade deficits.

Keywords: balance of payments, Thirlwall's Law, ARDL, growth, import elasticity, Morocco.

JEL Classification : E12, F14,F32, F43,

Paper type: Empirical research

1. Introduction:

In recent years, every economy depends on another to meet its needs for goods and services. In this regard, the external position of a country affects its economy growth trajectory. In this sense, external openness increases the intensity of international trade that affects the balance-of-payments components. This situation could result in the external imbalances that could have negative effects on economic growth.

The relationship between trade, growth and the balance of payments has been for a long time a central issue in recent years. For that reason, the balance of payment constrained growth model (also known as the Thirlwall's law) was used to explore this relationship. This model is attributed to (A. P. Thirlwall, 1979), according to him "no country can grow faster than the rate consistent with the balance of payment equilibrium on current account unless it can finance ever growing deficits which in general it cannot". Contrary to the conventional theories of growth rely on neoclassical models to explain supply side that assumes the growth of the economy as a result of changes in factors of production and technical progress, this alternative theory emphasizes effective demand oriented approach (McCombie & Thirlwall, 2004; A. P. Thirlwall, 1979).

Following (Anthony Philip Thirlwall, 2012), the actual growth rate of a country should be equal to its growth rate of export divided by the income elasticity of import demand. Consequently, the countries are considered to be a balance of payments constrained.

As far as the economy of Morocco is concerned, the central question that naturally arises is whether the actual growth rate of Morocco is growing faster than the predicted growth rate by the balance of payments.

To this purpose, our paper examines the existence of balance-of-payments constraint on the long run economic growth of the Moroccan economy.

The Moroccan's economy has shown, over the last three decades, remarkable resilience despite an international environment experiencing recurrent crises. The growth rate of real GDP has improved significantly, going from 3.1% in the 1990s to almost 4.2% on average per year between 2000 and 2018. This favorable development of national economic activity is further attributed to the component of domestic demand (namely household consumption). Nevertheless, the contribution of net foreign trade to national economic growth was negative (0.3 points) between 2000 and 2018. This is because the trade deficit of the Moroccan economy had been a chronic problem, given the deterioration export performance and, the constant rise in import demand.¹

Nowadays, the balance of payments constrained growth model has been applied in many countries and its validity has been proved. However, to the best of our knowledge, no studies exist in Moroccan cases taken individually in which this model was applied. The previous studies have been applied to a sample of a country including Morocco. Thus, this study contributes to the literature by analyzing the Moroccan case in depth. This study contributes, also, to the empirical literature by using the recent advances series econometrics such as the ARDL bounds testing, developed by (Pesaran et al., 2001)

The rest of the paper is organized as follows. A brief review of the existing literature is discussed in Section 2. The Model is discussed in Section 3 and the methodology for estimation is contained in Section 4. Next, the empirical results are the focus of Section 5, while Section 6 concludes the paper.

¹ According to the Moroccan Exchange Office, Since 2000, the value of imports has increased significantly to triple the value of export.

2. Review Literature:

A growing empirical literature has attempted to investigate the Thirlwall's law in the last three decades for a large number of countries. In general, these empirical literature is divided into two main groups; the time series analyses on a single country and panel data analysis. The results suggest that Thirlwall's law holds for a majority of countries.

(Moreno-Brid, 1999) applies the BPCG model to Mexico. He finds a positive and significant cointegration between Mexico's real export and real economic growth.

(BÉRTOLA et al., 2002) find a long-run relationship between Brazilian terms of trade, world income, and national GDP as Thirlwall's Law predicts; but the terms of trade coefficient is not statistically significant. (Jayme Jr, 2003) examines the validity of thirlwall's model in Brazil in the period 1955-98, using co-integration technique. He finds that there is a positive co-integration between growth in exports and long-term growth.

(RAZMI, 2005), by using Johansen's co-integration technique, apply the balance-of-payments-constrained growth BPCG model to India over the 1950-99 period. He finds that average growth rates predicted by various forms of the BPCG are found to be close to the actual average growth rates.

(Bagnai, 2010) concludes that the Thirlwall's Law is valid for 22 Organization for Economic Cooperation and Development (OECD) countries, using econometric techniques that allow for the presence of a shift of unknown date in the long-run parameters.

(Öztürk & Acaravci, 2010) apply Thirlwall's law to South Africa for the period of 1984:1-2006:1 by using ARDL co-integration model. They find that the law holds for South Africa and its growth is constrained by its balance of payments. (Samimi & Hosseinzadeh, 2011) apply thirlwall's law to Iranian economic growth for the period of 1971-2007 by using (ARDL) Bounds testing approach. The results show that import is co-integrated with relative price and income, and the predicted growth rates coincide with actual growth rates. However, the thirlwall's law has been rejected.

(Halicioglu, 2012), using Bounds test approach for co-integration, suggests that thirlwall's law holds for Turkey. He shows that the predicted growth rate is close to the actual growth rate. (Gökçe & Çankal, 2013) examine the model in Turkey using the test of stationarity and co-integration methods. The findings have proven that the Thirlwall's law is valid for the Turkish economy.

(Tharnpanich & McCombie, 2013) apply the balance-of-payments constrained growth model for Thailand. It is found that Thailand's long-run economic growth over the period 1962-2009 is balance-of-payments constrained.

(Alencar & Strachman, 2014), by using vector error correction, conclude that the rate of economic growth in Brazil was restricted by the external sector, validating the thirlwall's law.

(Lanzafame, 2014), using annual data during 1960-2010 period for a panel of 22 OECD countries, find significant support for the law.

(Bagnai et al., 2015), using a multicountry balance-of-payments-constrained growth model, study the long-run relation between economic growth and current account equilibrium in Vietnam. Their results indicate that for the whole sample (1985–2010) Vietnam grew less than the rate predicted by the model. They also find that the balance-of-payments-constrained growth rate shifted after the 1997 Asian crisis.

(Elish, 2018) examines the validity of thirlwall's model in the case of Egypt in the period 1980-2016 using the bounds testing Auto Regressive Distributed Lag (ARDL) approach. The results suggest the validity of Thirlwall's assumption of a long run relation between imports, gross domestic product (GDP) and relative prices having a negligible effect. The actual growth rate was found to be equal to the calculated potential growth rate, validating the thirlwall's law.

(Fasanya & Olayemi, 2018), using the bounds testing Auto Regressive Distributed Lag (ARDL) approach concludes that the equilibrium growth rates coincide with actual growth rates. Thus, the growth in Nigeria is a balance of payment constrained.

Back to Morocco (A. P. Thirlwall & Hussain, 1982), in their study of twenty developing countries including Morocco over the period of 1960-73, proved the validity of the first and second generations of BPCG models. (Perraton, 2003) examined the first version of Thirlwall's law over the period of 1973-1995 for developing countries including Morocco. The results showed that the law holds in these countries. (Khasawneh et al., 2012), in their study of MENA countries including Morocco, find some support for the BPCG model in the MENA countries.

3. The model:

According to the theory of the balance of payments constrained growth (BPCG) model, the economic growth rate is constrained by the balance of payments (Gouvea & Lima, 2010). (A. P. Thirlwall, 1979) develops a balance of payments constrained growth (BPCG) model. It is based on the balance of payments equilibrium condition:

$$P_H X = P_F M \quad (1)$$

Where P_H and P_F are the local price of export (X) and the international price of import M respectively.

By log-linearizing (1), and differentiating with respect to time, we can write:

$$p_h + x = p_f + m \quad (2)$$

Where lower case letters show growth rates of variables in the equation (1).

The demand functions for exports and imports are expressed respectively as in equations (3) and (4) below:

$$X = a \left(\frac{P_H}{P_F} \right)^\theta Z^\alpha \quad (3)$$

$$M = b \left(\frac{P_F}{P_H} \right)^\varphi Y^\pi \quad (4)$$

$\theta, \varphi < 0$ and $\alpha, \pi > 0$

Where a and b are constants, Z is the world income, Y is national income. α and π are the income elasticities of export and import respectively. θ and φ are the price elasticities of exports and imports respectively.

Taking logs and differentiating equations (3) and (4) with respect to time, we can obtain the growth rate of all variables expressed as below:

$$x = \theta(p_H - p_F) + \alpha z \quad (5)$$

$$m = \varphi(p_F - p_H) + \pi y \quad (6)$$

By substituting equations 5 and 6 into equation (2), we can obtain the growth rate of domestic income consistent with the balance of payments equilibrium:

$$y^{**} = \frac{(p_H - p_F)(1 + \varphi) + \alpha z}{\pi} \quad (7)$$

Substituting equation (5) into (7) and, assuming relative prices remain constant in the long-run,² then we have:

² Because the international prices are fixed in oligopolistic markets (A. P. Thirlwall, 1986), the role of prices is neglected in the international market competition.

$$y^* = \frac{x}{\pi} \quad (8)$$

Equation (8) is the key equation of this study. It expresses Thirlwall's law where the growth rate of national income predicted by the balance of payments equilibrium is equal to the ratio of export to income elasticity of imports.

To estimate the growth rate of national income predicted by the balance of payments, we need the estimation of income elasticity of imports. This estimation is achievable by the import demand function in equation (4) that is expressed in the logarithm of the variables as follows:

$$\text{Ln}M_t = k + \varphi \text{Ln}(TT_t) + \pi \text{Ln}(Y_t) + \mu_t \quad (9)$$

Where TT is defined as terms of trade ($\frac{P_F}{P_H}$), Y is the gross domestic product, π is income elasticity of import and M is the value of import.

4. Econometric methodology:

The ARDL Model

For empirical analysis, we use the ARDL co-integration bounds test to show the long run relationships and short run interactions between import, term of trade and GDP. In contrast to studies that used traditional co-integration approach (like Engle-Granger (1987), Johansen (1988) and Johansen and Juselius (1990)) to estimate the BPC growth model, the ARDL co-integration bounds test has some advantages. First, The ARDL method does not require knowledge of the order of integration of variables. It means that pre-test like unite root is not necessary. Second, it estimates the co-integration relationship by OLS once the lag of order is calculated. Third, The ARDL approach allows to estimate the long run and the short run parameters of the model simultaneously and to avoid problems related to omitted variables and autocorrelations.

Equation (9) may be written at the following form proposed by (Pesaran et al., 2001):

$$\Delta \text{Ln}M_t = \gamma + \sum_{i=1}^p \alpha_i \Delta \text{Ln}(M_{t-i}) + \sum_{i=0}^q \varphi_i \Delta \text{Ln}(TT_{t-i}) + \sum_{i=0}^r \pi_i \Delta \text{Ln}(Y_{t-i}) + \delta_1 \text{Ln}(M_{t-1}) + \delta_2 \text{Ln}(TT_{t-1}) + \delta_3 \text{Ln}(Y_{t-1}) + \varepsilon_t \quad (10)$$

Where ε_t and Δ are the white noise term and the first difference operator, respectively. The order of the lags in the ARDL model is selected by using the Akaike or the Schwartz criteria. If there is a co-integration between the variables, the long-run model (equation 11) is estimated:

$$\text{Ln}M_t = \alpha_1 + \sum_{i=1}^p \alpha_{1i} (\text{Ln}M)_{t-i} + \sum_{i=0}^q \varphi_{1i} (\text{Ln}TT)_{t-i} + \sum_{i=0}^r \pi_{1i} (\text{Ln}Y)_{t-i} + \mu_t \quad (11)$$

The short-run model can be represented by the following model:

$$\Delta \text{Ln}M_t = \gamma + \sum_{i=1}^p \alpha_i \Delta \text{Ln}(M_{t-i}) + \sum_{i=0}^q \varphi_i \Delta \text{Ln}(TT_{t-i}) + \sum_{i=0}^r \pi_i \Delta \text{Ln}(Y_{t-i}) + \mu \text{ECM}(-1) + r_t \quad (12)$$

Where μ is the coefficient of error correction model. ECM is defined as:

$$\begin{aligned} \text{Ln}M_t &= k + \varphi \text{Ln}(TT_t) + \pi \text{Ln}(Y_t) + e_t \\ -e_t &= k + \varphi \text{Ln}(TT_t) + \pi \text{Ln}(Y_t) - \beta \text{Ln}M_t \\ -e_{t-1} &= k + \varphi \text{Ln}(TT_{t-1}) + \pi \text{Ln}(Y_{t-1}) - \beta \text{Ln}M_{t-1} \\ e_t &= \text{ECM} \end{aligned} \quad (13)$$

The coefficient μ is the speed adjustment parameter. It should have a statistically significant coefficient with a negative sign.

To test the validity of Thirlwall's law, the first step is to estimate the income elasticity of import from estimation of equation(10). Then, we calculate the predicted growth rate (also called the balance of payments constrained growth rate) based on the ratio of export growth rate, divided by the income elasticity of imports in the hope that the predicted growth rate y^* will be regressed against the actual growth rate y_t as below:

$$y_t^* = a + by_t \quad (14)$$

H0: a=0, b=1

If Wald test cannot reject H0, the Thirlwall's holds.

This paper uses annual data from 1980 to 2018 for the Moroccan economy. The data come from the World Bank Database for imports, gross domestic product, export, and terms of trade.

5. Empirical results and discussion of findings:

Table 1: Unit root test results.

Variable		ADF		PP	
		value	proba	value	proba
LN_TOT	level	-0.53	0.98	-0.52	0.87
	1st difference	-6.13	0.00***	-11.91	0.00***
LN_GDP	level	-4.63	0.0006***	-4.26	0.0017***
	1st difference				
LN_M	level	-1.24	0.64	-1.39	0.57
	1st difference	-6.6	0.00***	-7.62	0.00***

Note: TOT, GDP, M are the terms of trade, domestic GDP, the imports
*** denotes statistical significance at the 1 per cent level.

Source: Authors

As stated above, ARDL bound testing implies that unit root testing is not necessary. But we must apply this test to ensure that none of the variables are integrated of an order exceeding one. This is because, ARDL bound test becomes not applicable in the case of I(2) variables. To this end, the unit root tests of Philip-Perron(1988) and Augmented Dickey-Fuller(ADF) have been used to test the stationarity of the variables. The results are reported in table 1.

As can be seen from table 1, the results of both ADF and PP unit root testing show that all variables(LN-TOT, LN_M) are I(1) except LN_GDP which is I(0). None of them are I(2). Thus, it allows us to apply ARDL model to estimate the import demand function.

Table2. ARDL Bounds Testing to Co-integration Results

Lag length	F-statistic	
ARDL (1,2 ,0) based on AIC	10.35	
Significance level	Critical values	
	I(0)	I(1)
1%	4.13	5
2.5%	3.55	4.38
5%	3.1	3.87
10%	2.63	3.35

-Critical values are taken from Pesaran, Shin and Smith (2001)

Source: Authors

To study the existence of a long-run relationship between the variables, the Bound test for co-integration is employed. The results are reported in table 2. It involves the comparison of the F-statistics with the critical values provided by (Pesaran et al., 2001). The results show that

the computed F-statistic exceeds the upper critical boundary. It rejects the null hypothesis of no co-integration among import, relative prices and, GDP. These variables have long-run relationship.

Table 3. Diagnostics tests for the ECM

Test	Statistic	Proba
Serial correlation (LM Test)	2.17	0.13
Heteroscedasticity(Breash-Pagan-Godfrey test)	0.89	0.49
Normality (Jarque-Bera)	2.32	0.31

Source: Authors

The results of diagnostic tests show that the ARDL model is correctly specified, there is homoscedasticity, the error is normally distributed and, there is no serial correlation (table 3). The parameters stability were tested using cumulative sum(CUSUM) and cumulative sum of squares (CUSUMSQ) tests. Fig. 1 presents the plot of CUSUM and CUSUMSQ test statistics that fall inside the critical bounds of 5% significance. This implies that the estimated parameters were stable over 1980-18 period.

Table 4. Estimated long-run coefficients of the import demand equation

Dependent variable : LN_M			
Regressor	Coefficient	T-Ratio	p-value
Constant	6.86	-1.90	0.066
LN_GDP	0.95	2.99	0.005
LN_TOT	-1.65	-1.09	0.282

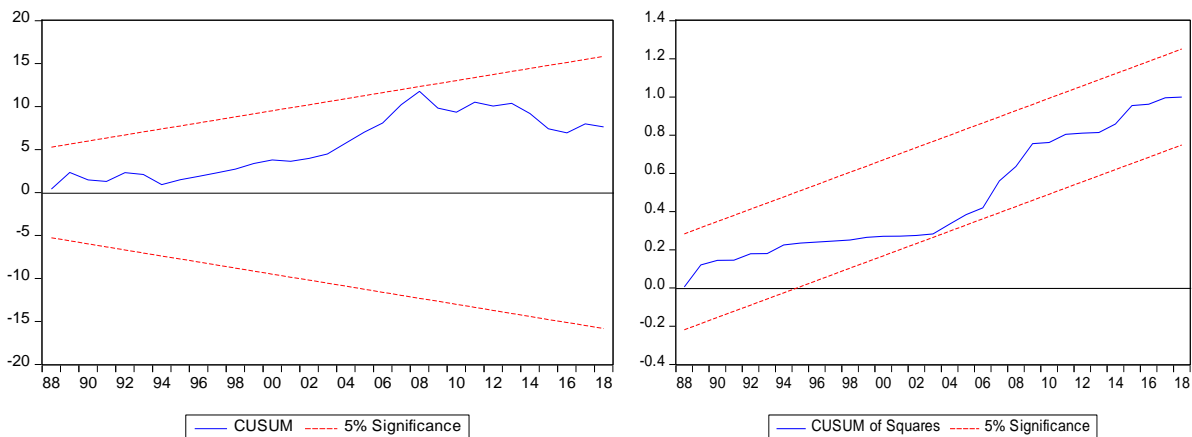
Source: Authors

Table 5. Error correction model

Dependent variable : LN_M			
Regressor	coefficient	T-Ratio	p-value
D(LN_TOT)	-0.2	-1.13	0.26
D(LN_TOT(-1))	0.66	3.58	0.0011
ECM(-1)	-0.15	-6.74	0.000
R-squared	0.31		

Source: Authors

Figure 1. Plot of Cumulative Sum Test and Cumulative Sum of Squares



Source: Authors

The estimated long-run income elasticity of demand for import is found to be positive and significant as suggested by the Thirlwall's law. A 1% increase in economic growth in Morocco leads to 0.95% increase in import.

The coefficient of the term of trade has the expected result, it has insignificant effect on the dynamic of import in Morocco, and it has a negative sign. Thus, in the long-run, one percent increase in the term of trade is likely to induce a 1.65 percent decrease in imports.

The error correction term has the right negative sign and is statistically significant. The coefficient of ECM(-1) is -0.15 in the short-run model, suggesting that the deviation from the long-run equilibrium of import demand is corrected by about 15 percent each year.

The next step is to test whether or not the BPCG model holds in Morocco. To this end, equation (14) is estimated by ordinary least squares method. The result of the Wald F-statistic support the Thirlwall's law for the Moroccan economy (see equation 15 below). It indicates the acceptance of the null hypothesis that $a=0$ and $b=1$ for the regression of the predicted growth rates against the actual growth rates. This means that the actual growth rate y_t was found to be equal to the predicted growth rate by the balance of payments y_t^* . Thus, the growth in Morocco is a balance of payment constrained.

Regressing predicted (y^*) Growth Rate.

$y_t^* = 0.039 + 0.5y_t$	(15)
Wald(F-Stat)=0.062	

6. Conclusion:

This paper tested the application of Thirlwall's law on Moroccan's economy. To this end, the import demand function was estimated using ARDL Bounds testing method. After the confirmation of the existence of co-integration, the predicted growth rate was regressed on the actual growth rate. The main findings can be summarized as follows:

- The result indicated that import, GDP and, the relative prices of import are co-integrated in the long-run.
- The estimated income elasticity of import is positive and statistically significant. However, the coefficient of the term of trade is statistically insignificant and negative. This means that relative prices have no effect on the pattern of imports in Morocco.
- The results from Wald test support the Thirlwall's law for Morocco during the period analyzed. This means that the Moroccan's economy depends on international trade.

This study recommends that the government of Morocco should encourage the export sector and, reduce the income elastic of import to improve the growth rate without deteriorating the balance of payment. This can be achieved through the improvement in export competitiveness by stimulating investment in the export sector, diversifying export partners, reducing the dependence on primary commodity exports and raising the quality of export products.

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