TESTING IMPORT-LED GROWTH HYPOTHESIS IN NORTH CYPRUS: AN EMPIRICAL INVESTIGATION FROM COINTEGRATION AND CAUSALITY TESTS

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Abstract: ***The present paper empirically tests the Import-led Growth Hypothesis (ILGH) in North Cyprus, which its state is not recognized by countries other than its mainland, Turkey and suffers from the Cyprus problem for more than 40 years. Cointegration test results reveal that long-run equilibrium relationship exists between imports of goods and services and real income growth in this small island state; real income converge to its long term equilibrium level by as high as 99%. However, causality tests in the present study do not validate the existence of the ILGH in Northern Cyprus.***

Keywords: ***Import-led Growth, Economic Growth, Cointegration, Causality, North Cyprus***

Özet: ***Mevcut çalışma, Türkiye Cumhuriyeti'nden başka bir ülke tarafından tanınmayan ve 40 yıldan fazla bir süredir, Kıbrıs sorunun çözümsüzlüğünden dolayı ekonomik sancıları yaşayan, Kuzey Kıbrıs Türk Cumhuriyeti'nde, İthalat'a Dayalı Büyüme Hipotezi'ni test etmeyi hedeflemektedir. Mevcut çalışmada uygulanan eşbütünleme testleri, ithalat ile reel gelir arasında uzun dönemli bir denge ilişkisinin olduğunu ortaya koymaktadır; ithalat'ın katkısı ile reel gelir uzun dönem dengesine 99%'luk hızla yaklaşmaktadır. Fakat, Granger nedensellik testleri, Kuzey Kıbrıs için ithalata dayalı büyüme hipotezinin varlığını onaylamamaktadır.***

Anahtar Kelimeler: ***İthalata Dayalı Büyüme, Ekonomik Büyüme, Eşbütünleme, Nedensellik, Kuzey Kıbrıs***

1. INTRODUCTION

International trade is a major source of foreign exchange for all the countries in the earth but it is more important for smaller countries. Especially, small islands have more dependency on international trade since their economies are based on only a few sectors (Katircioglu, 2010a). For example, according to Kuznets (1966), as the country gets smaller, its dependency on international trade would increase. On the other hand, although many economists agree that small countries have similar advantages and disadvantages when compared to the larger ones, there are differences in the origin of these disadvantages (Katircioglu, 2010a). Among common disadvantages are foreign trade dependency, vulnerability, high population growth, limited labor, low labor efficiency, diseconomies of scale, low GDP (Gross Domestic Product), high dependency on imports of intermediate and consumption goods, and production of only a few basic goods/services (Katircioglu, 2010a).

Since the economy of small islands based on a few sectors, their export capacity is quite limited; therefore, the island economies heavily depend on imports of goods and services from abroad. There have been many studies that investigate the ILGH in the literature (see Deme, 2002 among the others). In addition to cross-country applications, time series and causality analyses examining the concept of the ILGH were also practically considered in addition to the Export-led growth hypothesis. This is mainly due to the fact that imports are vital for raw materials, as well as intermediate goods and capital goods which are used in the production process of exported goods and services. This mechanism stimulates economic growth for many countries.

The present study empirically tests the ILGH in a small island, Turkish Republic of Northern Cyprus (TRNC), which is not a recognized state (only recognized by its mainland, Turkey). This study is important in the sense that it, as a first time, considers the relationship between imports and real income growth in this small island state which suffers from foreign trade relationships with the other countries due to the political reasons. This reality made the Turkish Cypriot economy heavily depending on imports from abroad. The present study also employs the latest econometric techniques of the Johansen cointegration test and Causality test under block exogeneity wald type test to forecast this relationship.

The TRNC was established in 1983 in Cyprus and is not recognized by countries other than the mainland Turkey. North Cyprus has a population over 265,000 and 10,537 US$ per capita income (SPO, 2011). International tourism and the emergence of higher education sector are two major sources of foreign exchange to this small island since TRNC does not have considerable foreign trade relationship with countries other than Turkey due to the political non-recognition (Katircioglu, 2010a). Therefore, results of this study will be important for policy makers in such a import-depended island economy.

The paper proceeds as follows. Section 2 defines the theoretical setting of the present study. Section 3 defines data and methodology. Section 4 provides results and discussions and the paper concludes with Section 5.

2. THEORETICAL SETTING

There are huge amount of studies studying the determinants of economics growth especially within the growth accounting framework (see Katircioglu, 2010a). There are studies that modeled import-led growth equations where imports were assumed to be important determinant of real income. On the other hand, exchange rates are considered as a very important variable affecting international trade (both exports and imports) and its relationship with real income (See Katircioglu, 2009; 2010a; 2010b). Thus, the following relationship can be established in this study:

$$y_t = f(M_t, RER_t) \quad (1)$$

where real income (y) is a function of imports (M) and real exchange rates (RER).

This relationship in equation (1) can then be expressed in logarithmic form to capture the growth impact of independent variables (Katircioglu, 2010a; 2010b):

$$\ln y_t = \beta_0 + \beta_1 \ln M_t + \beta_2 \ln RER_t + \varepsilon_t \quad (2)$$

where at period t, lny is the natural log of real income; lnM is the natural log of imports variable; lnRER is the natural log of real exchange rates; and ε is the error disturbance. The expected sign of coefficent for M is positive in equation (2) implying that growth in imports and real exchange rates are likely to exert positive impact on real income growth; therefore, equation (2) can be expressed as "import-growth model".

As also Katircioglu (2010a and 2010b) suggest real income in equation (2) may not immediately adjust to its long term equilibrium level following a change in any of their determinants; therefore, the speed of adjustment between the short term and the long term levels of real income as dependent variable can be captured by estimating the following error correction model:

$$\Delta \ln y_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln y_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln M_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln RER_{t-j} + \beta_4 \varepsilon_{t-1} + u_t \quad (3)$$

where Δ represents change in y, M, and RER variables and ε_{t-1} is the one period lagged error correction term (ECT), which is estimated from equation (2). The ECT in equation (3) shows how fast the disequilibrium between the short-run and the long-run values of dependent variable is eliminated each period (Katircioglu, 2010a; 2010b). The expected sign of ECT is negative (See Gujarati, 2003).

3. DATA AND METHODOLOGY

Data used in the present paper are annual figures that cover the period 1977 – 2008 and variables are real gross domestic product (GDP), real imports of goods and services, and real exchange rates in the TRNC. Data are taken from State Planning Organization of the TRNC (SPO, 2011) and variables are all at 2005 constant USD prices.

Prior to estimating the models as defined in the previous section, the Phillips-Perron (PP)[9] Unit Root Test was employed to test the integration level and the possible co-integration among the variables (Dickey and Fuller 1981; Phillips and Perron 1988). The PP procedures, which compute a residual variance that is robust to auto-correlation, are applied to test for unit roots as an alternative to ADF unit root test (Katircioglu, 2009).

To investigate long-run relationship in equation (2), the Johansen cointegration test has been employed in this study. Cheung and Lai (1993) mention that the trace test is more robust than the maximum eigen value test for cointegration. The Johansen trace test attempts to determine the number of cointegrating vectors among variables. There should be at least one co-integrating vector for a possible cointegration. The Johansen (1988) and Johansen and Juselius (1990) approach allows the estimating of all possible co integrating vectors between the set of variables and it is the most reliable test to avoid the problems which stems from Engel and Granger (1987) procedure[10]. This procedure can be expressed in the following VAR model:

$$X_t = \Pi_1 X_{t-1} + ... + \Pi_K X_{t-K} + \mu + e_t \qquad (\text{for } t = 1,...T) \qquad (4)$$

Where X_t, X_{t-1}, …, X_{t-K} are vectors of current and lagged values of P variables which are $I(1)$ in the model; $\Pi_1,....,\Pi_K$ are matrices of coefficients with (PXP) dimensions; μ is an intercept vector[11]; and e_t is a vector of random errors. The number of lagged values, in practice, is determined in such a way that error terms are

[9] PP approach allows for the presence of unknown forms of autocorrelation with a structural break in the time series and conditional heteroscedasticity in the error term.

[10] See Kremers et al. (1992) and Gonzalo (1994) for the comments about disadvantages of Engel and Granger (1987) procedure compared with Johansen and Juselius (1990) cointegration technique.

[11] μ is a vector of $I(0)$ variables which represent dummy variables as well. This ensures that errors e_t are white noise.

not significantly auto-correlated. Adding X_{t-1}, …, X_{t-K} *and* $\Pi_1 X_{t-2}$, …, $\Pi_{K-1} X_{t-K}$ to both sides and rearrange term the VAR model will be in the following form[12]:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{K-1} \Delta X_{t-K+1} + \Pi X_{t-K} + \mu + e_t \quad (5)$$

where $\Gamma_i = -(I - \Pi_i - .... - \Pi_i)$; $(i=1, 2, …, K-1)$; $\Pi = -(I - \Pi_1 - .... - \Pi_1)$ and I is the identity matrix. The rank of the matrix of coefficient, Π gives the number of long-run relationships between the variables of the system. Three possible cases are stated by Johansen and Juselius (1990): i) If the ranks equal $P[r(\Pi) = P]$ meaning that Π has full rank, then any linear combination of $I(1)$ series is stationary. ii) If the rank equals zero $(r(\Pi) = 0$, *i.e.* Π is a null matrix), then there is no co integration relationship. Although a long-run relationship seems to be unlikely, a short-run relationship may be identified by the first differences. iii) If the rank is between zero and P $(0 < r(\Pi) < P)$, then there are matrices α and β with (pxr) dimension, so that it is possible to represent $\Pi = \alpha \beta'$. Matrix β is called the 'co integrating matrix' whereas matrix α is referred to as the 'adjustment matrix' or the 'feedback matrix'. Matrix β has the property to transform $\beta' X_t$ into a stationary process even tough X_t is not in the equilibrium relationship. The rank of Π is the number of co integrating relationship(s) (i.e. r) which is determined by testing whether its Eigen values (λ_i) are statistically different from zero. Johansen (1988) and Johansen and Juselius (1990) propose that using the Eigen values of Π ordered from the largest to the smallest is for computation of trace statistics[13].. The trace statistic (λ_{trace}) is computed by Asseery the following formula[14]:

$$\lambda_{trace} = -T \sum Ln(1 - \lambda_i), \; i = r+1, …, n-1 \quad (6)$$

and the hypotheses are :

H_0: r = 0 H_1: r ≥ 1

H_0: r ≤ 1 H_1: r ≥ 2

H_0: r ≤ 2 H_1: r ≥ 3

In the case of cointegration in equation (2), Granger causality tests should be carried out using block exogeneity Wald tests (that use Chi-square tests, χ^2) under vector error correction mechanism to also test for the ILGH in the present study.

[12]This form of the equation is also called vector error correction.

[13] Asymptotic critical values are obtained from Osterwald-Lenum (1992).

[14] At the beginning of the procedure, we test the null hypothesis that there are no co integrating vectors. If it can be rejected, the alternative hypothesis (i.e. $r \leq 1$, …, $r \leq n$) are to be tested sequentially. If $r=0$ cannot be rejected in the first place, then there is no co integrating relationship between the variables, and the procedure stops

Having statistically significant χ^2 ratio as Wald statistic would meet conditions to have long-run causation from independent variable to dependent variable.

Causality tests using block exogeneity approach are carried out under the vector error correction model (VECM) in the case of co-integration By VECM, the short-run deviations of series from their long-run equilibrium path are captured by including an error correction term (Jenkins and Katircioglu, 2010). Therefore, the VECM can be specified in equation (6):

$$\Delta \ln Y_t = \alpha_1 + \varphi_{21}^{p}(L)\Delta \ln Y_t + \varphi_{22}^{q}(L)\Delta \ln X_t + \delta ECT_{t-1} + \mu_t \qquad (6)$$

Where

$$\varphi_{ij}^{p}(L) = \sum_{n=1}^{P_{ij}} \varphi_{ijn} L^1 \qquad \varphi_{ij}^{q}(L) = \sum_{n=1}^{Q_{ij}} \varphi_{ijn} L^1$$

In equations (6), Δ denotes the difference operator and L denotes the lag operator where $(L)\Delta \ln Y_t = \Delta \ln Y_{t-1}$. ECT_{t-1} in equation (6) is the lagged error correction term derived from the long-run co-integration model. Finally, μ_t is serially independent random errors with mean zero and finite covariance matrix.

4. RESULTS AND DISCUSSIONS

The PP unit root test results suggest that real GDP, imports, and real exchange rates in North Cyprus are non-stationary at their levels but become stationary at their first differences; therefore, GDP, M, and RER in the present study are said to be integrated of order one, I (1)[15].

Table 1. Johansen Cointegration Trace Test

Hypothesized No. of CE(s)	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	38.39108	29.68	35.65
At most 1	14.50373	15.41	20.04
At most 2	0.177620	3.76	6.65

Note: Lag length is 1 in this estimation.

[15] Unit root tables and results can be gathered from the authors of the study upon the request.

Since the variables of the study are integrated of order one, there is still a possibility that there might be cointegration relationship in equation (2). Johansen cointegration test has been employed with this respect. As can be seen from Table 1, the null hypothesis of no cointegrating vector is rejected and its alternative of at least one cointegrating vector in equation (2) is accepted according to trace test. This confirms cointegration (long term) relationship in equation (2) using lag one that suggest long term import growth model in the case of North Cyprus.

Having long term relationship in equation (2) the level equation is needed to forecast long term coefficients in equation (2). The estimates of level relationship import-growth model can be given by:

Table 2. Import-Growth Relationship in Equation (2):

Normalized cointegrating coefficients (standard error in parentheses)		
LGDP	LIMPORT	LRER
1.000000	-0.589219	0.004829
	(0.07552)	(0.02357)

Imports have inelastic but positive and statistically significant elasticity coefficient (0.589219) for real income growth in Northern Cyprus. RER is also positive but not statistically significant. Table 2 suggest that one percent variation in imports leads to 0.589 percent variation in real income in the long term and in the same direction.

In the next stage, the error correction model associated with the above level relationship should be estimated. This given in Table 3:

Table 3. Error Correction Model in Equation (3)

Error Correction:	D(LGDP)		
		R-squared	0.251408
		F-statistic	1.343366
CointEq1	-0.990486	Log likelihood	19.01904
	[-2.09367]	Akaike AIC	-1.001464
		Schwarz SC	-0.711134
D(LGDP(-1))	0.137656	Mean dependent	0.082816
	[0.40300]	S.D. dependent	0.137237
D(LIMPORT(-1))	-0.174362		
	[-0.74410]		
D(LRER(-1))	-0.077965		
	[-0.97043]		
C	-0.666965		
	[-1.97396]		
DTREND	0.048984		
	[2.27933]		

Results in Table 3 show that error correction term is very high (0.99), statistically significant and has expected sign (-). This shows that real income in equation (3) converge at a very high level (99.0%) to its long-term equilibrium level; lag length in Table 3 is one. On the other hand, the lagged coefficients in the short term are not statistically significant where intercept and trend dummy are statistically significant. Finally, F ratio of the model in Table 3 is not again statistically significant. But, since t ratio of error correction term is statistically significant, we conclude that real income converge to its long term equilibrium level very high in import growth model.

Table 4. Granger Causality Tests under Block Exogeneity Approach

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LIMPORT)	0.553680	1	0.4568
D(LRER)	0.941725	1	0.3318
All	1.077955	2	0.5833

Dependent variable: D(LIMPORT)

Excluded	Chi-sq	df	Prob.
D(LGDP)	0.695518	1	0.4043
D(LRER)	0.852569	1	0.3558
All	1.540360	2	0.4629

Dependent variable: D(LRER)

Excluded	Chi-sq	df	Prob.
D(LGDP)	0.359925	1	0.5485
D(LIMPORT)	0.758053	1	0.3839
All	0.761020	2	0.6835

Finally, the direction of causality can be now searched within the Block Exogeneity Wald tests under vector error correction framework. Granger causality test results are given in Table 4 with this respect. Granger causality tests have been run under pairwise basis. Table 4 shows that none of the χ^2 statistics are statistically significant. This situation does not identify any long term causality between real income, imports, and real exchange rates in the case of North Cyprus; therefore, this is to conclude that the ILGH hypothesis cannot be inferred in the Turkish Cypriot economy using Johansen methodology. This finding is similiar to the finding of Katircioglu (2010a) where the same conclusion was reached for North Cyprus by employing bounds tests and conditional error correction models.

4. CONCLUSION

This paper empirically tested the import-led growth hypothesis in the case of North Cyprus by estimating long term equilibrium relationship and causality between imports and real income growth. Results of the present study reveal that although long term equilibrium relationship exists between imports and economic growth in this small island, imports have positive long term coefficient for real income, Granger causality tests did not confirm the ILGH in North Cyprus. The study couldn't identify any causality between imports and real income in the long term period of the Turkish Cypriot economy. These results are similiar to the findings of Katircioglu (2010a). But, it is important to note that import growth model is valid in the long term for North Cyprus and real income converge to its long term equilibrium level very high (99%) by the contribution of imports. Furthermore, imports have positive and statistically significant long term elasticity coefficient for

real income, which is 0.589. Although the ILGH couldn't be confirmed for North Cyprus, results of the error correction model shows that imports are still vital for the Turkish Cypriot economy.

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