

# Globalization and Economic Growth in Nepal An ARDL Approach to Co-Integration

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## Abstract

Nowadays, globalization has become a buzzword. Covering the wide range of economic, political, social and cultural trends, growing integration of economies and societies all over the world has been one of the most burning topics that are being debated in international economics. The impact of globalization differs from country to country, however, globalization is the demand of the hour and no country can bear the cost of living in isolation. This paper attempts to enquire into the fact; how globalization impacting the economic growth of Nepal by using novel but robust econometric tool ARDL approach to co-integration. In order to examine the globalization and economic growth relationships empirically, this study considers trade openness and financial integration, capital investment and labor force as macro-economic independent variables expected to influence the economic growth in a regression framework. The ARDL regression results show that globalization (trade openness and financial integration) has no significant impact on economic growth of Nepal both in the long run and the short run. Johansen's co – integration procedure showed that all the above - mentioned variables are co – integrated implying these macro-economic variables have long run equilibrium relationship with economic growth via GDP growth. Equilibrium or error correction model results also supported the co – integration results. **Keywords:** Globalization, economic growth, ARDL approach to co-integration, Nepal

## 1. Introduction

Globalization became a buzzword and has diverse definitions and concepts<sup>1</sup>. Globalization has many facets and has a variety of social, political and economic implications. It is one of the hottest issues central to the several heated debates in business and economics. This term introduced in early 1980, which has never been precisely defined, is a frequently used word in political economy. Globalization simply describes an ongoing process by which regional economies, societies and cultures have become integrated through a globe spanning network of communication and execution. It is mostly promoted by openness to trade, financial flows, foreign direct investment, and the increasing interaction of people in all facets of their lives. Globalization also implies internationalization of production, distribution and marketing of goods and services.

The term globalization was first coined by Theodore Levitt in a Harvard Business Review article in which he maintained that new technology had “proletarian zed” communication, transport, and travel, creating worldwide markets for standardized consumer products at lower prices. He maintained that future belonged to global corporations that did not cater to local differences in taste but, instead, adopted strategies that operated “as if entire world (or major regions of it) were a single entity; [such an organization] sells the same things in the same way everywhere.”<sup>2</sup>

According to UNESCO globalization is a relatively new word that is commonly used to describe the ongoing, multidimensional process of worldwide change. It describes the idea that the world is becoming a single global market. It describes the idea that time and space have been shrunk as a result of modern telecommunications technologies which allow almost instantaneous communication between people almost anywhere on the planet. It describes the idea that cultures are blending and mixing and where cultural icons and values from dominant Northern cultures are being adopted in the South, while at the same time unique ethnic differences are being strengthened and local identities are being exerted. It describes that idea that the planet as a whole, rather than individual continents or landscapes, is considered as 'our home' and that some human activities can have a negative effect on people and environments far from their source or have a negative effect on the planet as a whole.<sup>3</sup>

Economic liberalization was a key to opening up of Nepalese economy to the outside world. The rapid process of liberalization began in Nepal when for the first time it faced the problem of BOP deficit in 1982/83 due to the excessive liquidity pumped into the economy by the then government in order to win the referendum. It devalued the Nepalese currency vis-à-vis to US dollar by 14.7 percentage point in 1985 in order to overcome to the BOP deficit problem. But it could not solve the problem, therefore, the government approached to the IMF

<sup>1</sup> Streeten (1999) devoted three and half pages to the definitions of globalization used by different authors. He has discussed at greater length different aspects of globalization.

<sup>2</sup> Theodore Levitt, “The Globalization of Markets,” Harvard Business Review 61, no.3 (May-June 1983), pp.92-93.

<sup>3</sup> For further information see <http://www.takebackwisconsin.com/Documents/Glossary.htm>

and the World Bank for their assistance in order to absorb the excess liquidity and for that matter 18 month standby arrangement program was implemented as a tool of stabilization. From 1987, Nepal entered into the WB and IMF initiated reform programs named under Structural Adjustment Facility-SAF and Structural Adjustment Program-SAP in order to break the supply side bottlenecks.

Since the inception of plan development concept in 1960s, Nepal adopted the Import Substitution Industrialization (ISI) trade policy and accordingly foreign exchange policies were pursued. In the early period of 1990s, trade policy had been changed from ISI policy to export led economic growth strategy. Stringent restrictive barriers in the form of high tariff wall and quantitative restrictions were rationalized. Imports were freed to assist exports.<sup>1</sup>

Government had taken a number of measures during 1990s that includes: privatization, liberalization of trade and foreign exchange, and opening up its capital markets to foreign investors. Vigorous trade liberalization converted the economy from a relatively inward looking to an open and outward looking economy.

In its march to globalization, on 23 April 2004, Nepal became a member of the WTO. It has exposed Nepal to the array of opportunities associated with openness. Nepal's membership with WTO has been a notable endeavor for opening up of Nepalese market to the out-side world.

Differing in perspectives (benefits and costs), globalization has its both proponents and opponents. The idea of globalization became more and more controversial when describing the future of the world economy. Proponents regard globalization as an extraordinary force for social good and for the reason it must be embraced. They believe that one day, markets for all sorts of goods and services would become integrated and the benefits would be clear. The standard of living would be raised everywhere as barriers to trade, production, and capital fell.

Bhagwati (2004) has discussed at length the benefits and costs of globalization. He attacked the anti-globalization movement and refuted the false notions associated with major criticisms of globalization. His major argument was that economic globalization is on balance contributes to economic growth and reducing poverty and thus would be the benign force for social change. He also, however, mentioned the need for appropriate governance to manage the phenomenon.

Similarly, Mandle (2003) stated that globalization is concerned with economic growth necessary to take care of poverty and therefore, globalization is promoted because development and integration of the global markets have a substantial impact on poverty reduction.

Todaro and Smith (2003) have stated that globalization presents new possibilities for eliminating global poverty and globalization can benefit poor countries directly and indirectly through cultural, social, scientific and technological exchanges as well as trade and finance. Some very important low income countries like India and China have used globalization to their advantage and have succeeded in achieving enviable economic growth rate and thus reducing some international inequalities.

There is also downside aspect associated with globalization. Opponents of globalization, cite the dramatic and ever-growing gaps that this process has created between developed and developing countries. It is for this reason, they argue, that globalization is an evil process and must be stopped. According to Streeten (1999) economic liberalization, technological changes, competition in both labor and product markets have contributed to economic failure, weakening of institutions and social support systems, and erosion of established identities and values. Globalization has been bad for Africa and in many parts of the world for employment.

According to Rodrik (2011) Globalization, by its very nature, is disruptive - it rearranges where and how work is done and where and how profits are made. It is creating large pools of winners and losers. The paradox, he sees is that globalization will work for everyone only if all countries abide by the same set of rules, hammered out and enforced by some form of technocratic global government. The reality is, however, that most countries are unwilling to give up their sovereignty, their distinctive institutions and their freedom to manage their economies in their own best interests. In this way, there is a fundamental incompatibility between hyper-globalization on the one hand and democracy and national sovereignty on the other. He concluded that we cannot simultaneously pursue democracy, national self-determination, and economic globalization. When the social arrangements of democracies inevitably clash with the international demands of globalization, national priorities should take precedence.

There are divergent views regarding the adequacy and desirability of globalization. There is a need to study, which view is supported by Nepal's experience based on sound empirical evidence? This paper attempts to enquire into the fact by using novel but robust econometric tool ARDL approach to co-integration.

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<sup>1</sup> The above review of Nepal's economic liberalization draws on web blog of Santosh Baral, [http://www.santoshbaral.blogspot.com/2010/05/economic-liberalization\\_14.html](http://www.santoshbaral.blogspot.com/2010/05/economic-liberalization_14.html)

## 2. Model and Data Sources

Observing from theory the possible growth promoting roles of globalization (trade openness and financial integration), the data analysis of this study has been modeled in an aggregate production function (APF) framework. The APF assumes that, along with conventional inputs of labor and capital used in the neoclassical production function, unconventional inputs like FDI and trade may be included in the model to capture their contribution to economic growth (Magnus and Fosu 2006).

The general APF model to be estimated can be derived as:

$$Y_t = A_t K_t L_t \text{-----}(1)$$

Where  $Y_t$  denotes the aggregate production of the economy (real GDP per capita) at time  $t$ , and  $A_t$ ,  $K_t$ ,  $L_t$  are the total factor productivity (TFP), the capital stock and the stock of labor respectively. The possible impacts of trade openness and financial integration on economic growth would be expressed through the TFP ( $A_t$ ) in the mentioned APF model. Since this study intends to investigate the impacts of trade openness (TO) and financial integration (FI) in economic growth through changes in TFP, it assumes therefore that TFP is a function of trade openness and financial integration and, other exogenous factors, ( $C_t$ ). Thus:

$$A_t = f(TO_t, FI_t, C_t) \text{-----}(2)$$

Combining equation (2) with (1)

$$Y_t = C_t K_t L_t TO_t, FI_t \text{-----}(3)$$

For our study, economic growth would be proxied by real GDP or real per capita GDP, is influenced by a variety of factors. The importance and relevance of these factors may differ from country to country and may also change overtime. Since capital stock is not available for most developing countries because of inherent difficulties of measurement, the study has used the real value of gross fixed capital formation as proxy for capital stock. This proxy for capital stock has also been used by Balasubramanyam et al. (1996), Kohpaiboon (2004), Mansouri (2005). Two measures of globalization have been used to measure the degree of integration of Nepali's economy with the rest of the world. First is the ratio of the sum of imports and exports to GDP, second is the ratio of sum of capital inflow and capital outflow to the GDP. The former measure represents the trade openness and financial integration has been represented by the later. For capital inflow this study use sum of official aid and foreign direct investment in Nepal. Since consistent and regular time series data is not available for capital out flow, capital outflow has been proxied by debt servicing. Similarly, labor force is measured as ratio of population ages between 15 and 64 to total population.

Therefore, using neoclassical production function in log liner form, the following regression equation would be obtained:

$$\ln Y = C + \beta_1 \ln K + \beta_2 \ln L + \beta_3 \ln TO + \beta_4 \ln FI + \varepsilon \text{-----} (4)$$

The expected sign of all the coefficients is positive. Where,  $\ln$  is the natural log,  $Y$  denotes the aggregate production of the economy (real GDP per capita),  $K$  is the capital stock proxied by real gross fixed capital formation,  $L$  is labor force,  $TO$  is trade openness,  $FI$  is financial integration and  $\varepsilon$  is the white noise error term. Equation (5) represents only the long run equilibrium relationship and may form a co-integration set provided all the variables are integrated of order 1, i.e.  $I(1)$ .

Needed data on GDP, real gross fixed capital formation, trade, official aid, FDI and debt servicing are sourced from World Development Indicators (2011) published by the World Bank.

## 3. Methodology

To empirically analyze the long-run relationships and dynamic interactions among the variables of interest, the model provided by equation (4) has been estimated by jointly applying Johansen co-integration test and autoregressive distributed lag (ARDL) co-integration procedure, developed by Pesaran et al. (2001).

Initially, the existence of long run co-integration relationship between real per-capita GDP (dependent variable) and other right hand side (dependent) variables has been conformed through Johansen co-integration test. When the variables are found to have long run co-integrating relationships, long run and short run regression coefficient associated with equation (4) have been estimated by applying OLS based MICROFIT – ARDL approach.

An econometric time series software that automatically and conveniently selects an optimal ARDL lag structure for each of several model selection criteria after the researcher has set the maximum lag length is

MICROFIT (Pesaran and Pesaran, 1997). An additional advantage of the MICROFIT approach is that it can be applied without needing to know the order(s) of the integration of the variables even when the variables are a mixture of I(0)'s and I(1)'s. Because annual data have been used in the study the maximum lag was set at 2. The lag selection was based on Schwarz Bayesian Criterion (SBC).

### 3.1 Test of Time Series Data by Unit Root

First of all, time series data unit root test is conducted to test the stationarity status of all variables to determine their order of integration. The existence of unit root has been confirmed by using Augmented Dickey – Fuller (ADF) tests at log-levels and first difference of the variables. Not rejection of null hypothesis implies the process of unit root and stationarity otherwise. If null hypothesis cannot be rejected at log-levels but found stationarity when first differences of the variables are taken, the data series is said to be integrated of order (I). The ADF test, without a deterministic time trend, runs the following regression:

$$q_t = c + \alpha q_{t-1} + \sum_{i=1}^k \psi_i \Delta q_{t-i} + \mu_t \text{-----(5)}$$

where  $q_t$  is the natural logarithm of individual series. This regression includes  $k$  lagged first differences to account for serial correlation.

### 3.2 Johansen Co-integration Test and Long run ARDL Estimates

In order to test the long term co-integrating relationship between variables, Trace test and Maximum – Eigenvalue test based Johansen co-integration test has been performed.

In the second step, once co-integration is established the conditional ARDL ( $p_1, q_1, q_2, q_3, q_4$ ) long run model for dependent variable has been estimated as:

$$\ln Y_t = c_0 + \sum_{i=1}^p \delta_1 \ln Y_{t-i} + \sum_{i=0}^{q_1} \delta_2 \ln K_{t-i} + \sum_{i=0}^{q_2} \delta_3 \ln L_{t-i} + \sum_{i=0}^{q_4} \delta_4 \ln TO_{t-i} + \sum_{i=0}^{q_3} \delta_5 \ln FI_{t-i} + \varepsilon_t \text{-----(6)}$$

### 3.3 Error Correction Model (Short run ARDL Estimates)

In the third step, the short-run dynamic parameters associated with the ARDL long run estimates have been obtained by estimating an error correction model. It is specified as follows:

$$\Delta \ln Y_t = \mu + \sum_{i=1}^p \phi_i \Delta \ln Y_{t-i} + \sum_{j=1}^q \kappa_j \Delta \ln K_{t-j} + \sum_{l=1}^q \Phi_l \Delta \ln L_{t-l} + \sum_{m=1}^q \gamma_m \Delta \ln TO_{t-m} + \sum_{p=1}^q \eta_p \Delta \ln FI_{t-p} + \acute{u}ecm_{t-1} + \varepsilon_t \text{-----(7)}$$

Where  $\phi, \kappa, \Phi, \gamma,$  and  $\eta$  are the short-run dynamic coefficients of the model's convergence to equilibrium, and  $\acute{u}$  is the speed of adjustment.

## 4. The Empirical Analysis

The ADF unit root tests results reported in Table 1 indicate that the null hypothesis of unit root could not be rejected at log levels but has been rejected at the first difference. In this way, all the variables are declared to be integrated of order I(1) based on Schwarz Bayesian Criterion.

**Table 1 : ADF Unit Root Test on Variable**

Log Levels ( $Z_t$ )				First Difference ( $\Delta Z_t$ )				
Variable	SBC lag	ADF Stat	Prob.	Variable	SBC lag	ADF Stat	Prob.	I(d)
IN Y	0	-0.48	0.8804	$\Delta$ IN Y	0	-5.99**	0.0001	I(1)
IN K	0	-0.41	0.8937	$\Delta$ IN K	0	-5.32**	0.0002	I(1)
IN L	0	2.67	1.0000	$\Delta$ IN L	0	-4.16**	0.0038	I(1)
IN TO	0	-1.66	0.4403	$\Delta$ IN TO	0	-3.61*	0.0134	I(1)
IN FI	2	-0.31	0.9098	$\Delta$ IN FI	1	-4.90**	0.0007	I(1)

Note: All variables are in logs.  $\Delta$  is a difference operator. The ADF statistics are compared to the critical values from the simulated MacKinnon (1996) one side p-values. \*\* (\*) denotes the rejection of null at 1% and (5%) significance level. Test regression included a constant but no trend. Results obtained from EViews 7.0

The Johansen co-integration test results are shown in Table 2 and Table 3. The Trace test indicates that 2 co-integrating equations while Maximum Eigenvalue test indicates one co-integrating relationship at 10% level

of significance. Therefore, economic growth and all right hand side variables are co-integrated thus having long – run relationship.

**Table 2 : Johansen Trace Test:**  
 Variables: INY, INK, INL, INTO, INFI

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.10 Critical Value	Prob.**
None *	0.812676	85.11154	65.81970	0.0019
At most 1 *	0.640301	44.91353	44.49359	0.0921
At most 2	0.446565	20.37381	27.06695	0.3978
At most 3	0.196762	6.175169	13.42878	0.6748
At most 4	0.037475	0.916676	2.705545	0.3383

Trace test indicates 2 cointegrating eqn(s) at the 0.10 level

\* denotes rejection of the hypothesis at the 0.10 level

\*\*MacKinnon-Haug-Michelis (1999) p-values.

**Table 3 : Johansen Maximum Eigenvalue Test:**  
 Variables: INY, INK, INL, INTO, INFI

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.10 Critical Value	Prob.**
None *	0.812676	40.19801	31.23922	0.0077
At most 1	0.640301	24.53972	25.12408	0.1170
At most 2	0.446565	14.19864	18.89282	0.3490
At most 3	0.196762	5.258493	12.29652	0.7089
At most 4	0.037475	0.916676	2.705545	0.3383

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.10 level

\* denotes rejection of the hypothesis at the 0.10 level

\*\*MacKinnon-Haug-Michelis (1999) p-values.

Results obtained from EViews 7.0

Once it has been established that a long – run co-integration relationship existed, equation (6) is estimated using the following ARDL (1, 0, 0, 0, 0) specification. The results obtained by normalizing on real GDP per capita (Y), in the long – run are reported in Table 4.

**Table 4 : Estimated Long Run Coefficients using the ARDL Approach**

Equation (6) ARDL(1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is INY. 26 observations used for estimation from 1985 to 2010

Regressor	Coefficient	Standard Error	T-Ratio	T-Probability
C	-6.7940	3.9011	-1.7415*	0.097
INK	0.36837	.15749	2.3389**	0.030
INL	1.0803	1.3871	0.77877	0.445
INTO	0.03200	.15321	0.20886	0.837
INFI	0.060732	.11077	0.54827	0.590

Note: \*\*(\*) denotes 5% (10) significance level. Results obtained from MICROFIT 4.0.

The estimated coefficients of the long run relationship show that capital investment proxied by real gross fixed capital formation has a very high significant impact in real GDP per capita (economic growth). A 1% increase in capital investment leads to approximately 0.37% increase in real GDP per capita, all things being equal. The labor force variable is positively signed but not significant. This is the indicative of the lack of employment and poor productivity of labor in Nepal.

Considering the impact of trade openness and financial integration (measures of globalization), they have the expected positive sign but only significant at 84% and 59% respectively. It means that globalization has positive impact on economic growth of Nepal; however, the impact is highly insignificant.



**Table 5 : Error Correction Representation for the Selected ARDL Model**

Equation (7) ARDL (1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is  $\Delta$ INY. 26 observations used for estimation from 1985 to 2010

Regressor	Coefficient	Standard Error	T-Ratio	T-Probability
$\Delta$ C	-1.5461	.85793	-1.8021*	0.087
$\Delta$ INK	.083827	.053282	1.5733*	0.131
$\Delta$ INL	.24583	.29763	0.82597	0.419
$\Delta$ INTO	.0072821	.034540	0.21083	0.835
$\Delta$ INFI	.013820	.023909	0.57804	0.570
ecm(-1)	-.22756	.096675	-2.3539**	0.029

ecm = INY -.36837\*INK -1.0803\*INL -.032000\*INTO -.060732\*INFI + 6.7940\*C

Note: \*\* (\*) denote 5% (10%) significance level. Results obtained from MICROFIT 4.0.

The results of the short run dynamic coefficients associated with the long run relationships obtained from the ECM equation (7) are provided in Table 5. The signs of the short run dynamic impacts are maintained to the long run. At this time capital investment is only significant at 13.10%. Alike to the long run the labor force, trade openness and financial integration have not significant impacts on economic growth even in the short run.

The equilibrium correction coefficient, estimated -0.22756 (0.096675) is significant at 3%, has the correct sign, and imply the moderate speed of adjustment to equilibrium after a shock. Approximately 23% of disequilibria from the previous year's shock converge back to the long run equilibrium in the current year.

**Table 6 : Summary Statistics of the Selected ARDL Regression**

R-Squared	.99219	R-Bar-Squared	.99024
S.E. of Regression	.015401	F-stat. F( 5, 20)	508.2095[.000]
Mean of Dependent Variable	5.3367	S.D. of Dependent Variable	.15588
Residual Sum of Squares	.0047437	Equation Log-likelihood	75.0252
Akaike Info. Criterion	69.0252	Schwarz Bayesian Criterion	65.2509
DW-statistic	2.4356		

The summary of the regression statistics are given in the Table 6. The high value of  $R^2$  for the ARDL model shows that overall goodness of fit of the model is satisfactory. The F-statistics measuring the joint significance of all regressors in the model is statistically significant at 1% level. Similarly, the Durbin – Watson statistics for the selected ARDL model is more than 2.

**Table 7 : Diagnostic Tests of the Selected ARDL Regression**

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ ( 1) = 1.7011[.192]	F( 1, 19) = 1.3302[.263]
B: Functional Form	CHSQ ( 1) = .070769[.790]	F( 1, 19) = .051857[.822]
C: Normality	CHSQ ( 2) = .65453[.721]	Not applicable
D: Heteroscedasticity	CHSQ ( 1) = 1.3265[.249]	F( 1, 24) = 1.2902[.267]

A: Lagrange multiplier test of residual serial correlation  
 B: Ramsey's RESET test using the square of the fitted values  
 C: Based on a test of skewness and kurtosis of residuals  
 D: Based on the regression of squared residuals on squared fitted values

The diagnostic test results shown in Table 7 indicate that the underlying ARDL regression passes the diagnostic tests against serial correlation, functional form misspecification, non-normal errors and heteroscedasticity. It confirms the validity of the statistical findings.

## 5. Conclusions

This study explores the impact of globalization on economic growth of Nepal for the period from 1985 to 2010. In order to examine the globalization and economic growth relationships empirically, this study considers trade openness and financial integration, capital investment proxied by real gross fixed capital formation and labor force as macro-economic independent variables expected to influence the economic growth (real GDP per-capita) in a regression framework modeled in a neo – classical production function. This study applied novel but robust OLS based autoregressive distributed lag (ARDL) approach to co – integration to estimate the long run and short run impacts of globalization on economic growth of Nepal. The ARDL regression results show that none of the macro-economic variables except capital investment has the significant impact on economic growth via GDP growth in the long run. Capital investment, labor force, trade openness and financial integration all have insignificant impact on economic growth in the short run. Johansen's co – integration procedure showed that all

the above - mentioned variables are co – integrated implying these macro-economic variables have long run equilibrium relationship with economic growth via GDP growth. Equilibrium or error correction model results also supported the co – integration results. From the findings, it can be concluded that Nepal has is not being able to capitalize on the opportunities provided by globalization.

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