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Growth Analysis: Convergence and Determinants

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Abstract

This thesis attempts to empirically analysis the neoclassical form of Solow-Swan which mostly construct on recognize the determinants of growth. This thesis is separated in to two parts. In first part we examine convergence hypothesis for Bangladesh by time series data to decide whether Bangladesh will converge to the Developed country and how speedy or slow this convergence process will be in obtaining the balance growth path. In the second part of this thesis we mainly analyses the progress structure for the rising developing countries and to check how their macroeconomic symphony of growth is different from those of the developed countries also we have tried to focus on the aspect that actually work as the driving power towards the growth pathway of developing countries, by panel data approach. To carry out this study 21 South Asian developing countries have been involved over the period of 1985-2013.

Keywords: Convergence, Balanced growth path, Determinates.

Introduction

Growth has always been the major concern to every individual economy in the world. From the very beginning when Economic analyses just started to evolve to today's modern economic theory and practice a huge amount of literature and studies have been conducted on the analysis of growth of countries. Economists and researcher have undertaken many examinations and studies to find out the forces that contribute to boost up the capability of an economy to produce services and good, evaluation from one period to another and even compared to one economy to another. It we could find out the factor affecting the growth of a country then we will be able to formulate policies necessary for that economy. So having considering the importance of growth we have chosen this topic.

In latest years the south Asian rising countries achieve stable economic growth. According to World Bank growth is expected to rise from 7 % in 2015 to 7.6 % throughout maintaining spending and rising investment. Policy maker are over and over again interested in examine the part of macroeconomic structure that add to the growth of a country equally short run and long run. Many studies have been undertaken and lots of assumption has been planning to capture the perception behind the expansion of countries. Surrounded by them the mainly elementary and baseline hypothesis is neo classical growth model urbanized by Solow and Swan. According to the Solow growth form an economy's growth speed mostly depends on its residents, savings rate as well as investment. Apart from between them technological growth operates as a major heavy power of the economic development. . In the long run we require technical innovation to stay that development at a maintaining level. Savings rate can have a powerful influence on economic development in the short run. New studies on economic growth have highlighted that besides attaining technological growth we require to make sure maintain development in individual capital formulation to change our unqualified labor force into a trained productive individual.

Several economies rise quicker though another development is steady. Although economic analyzer has calculated, "the slower increasing economics will finally converge with the quicker growing economy when some point in the future". That acknowledged as the convergence theory. It is very important toward understand that determinant of economic development as well as toward set up even if or not the increase rate of Bangladesh is converging with the urbanized countries.

Hence in that thesis our effort is to empirically test the Solow model of growth in the perspective of 21 South Asian countries by panel data approach and also to find out whether Bangladesh is catching up (converging) by the developed countries in the balanced growth path.

Review of the Literature

Caves (1974) experienced for the force of foreign presence on price added pre worker within Australia locally owned manufacturing area. And found that the inequality between foreigner as well as domestic price added disappears as contribute to sect-oral labor rise , which is consistent with optimistic spillovers as of foreign presence .Technological development is another significant factor which determine growth. In the direction of **Romer (1990)** also further studies, "the world financial system grows due to technological development during the discovery of new thoughts. It should be well-known that a country should be helpful at taking advantage of technologies invented in another place. Technology transfer and distribution are both necessary contributory essentials to the development of a country". **Barro (1991)** state to expansion is inversely correlated and contribute to the government expenditure into GDP except inconsequentially connected to the public investment and savings. . The econometric structure is providing through **King and Levine (1993a, 1993b),** in which development is revert on control variables and quantitative marker measuring the intensity and the size of the monetary system. The financial scheme has an optimistic outcome on growth to the measure that it supports capital buildup and productivity. **Jones (1995a)** "presents several justifications for the contrast relationship between technology and productivity growth, identified in the literature as the

efficiency paradox". These justifications are moderately motivated by an article written by **Romer (1987). "**They are that also some offsetting effect happens in the movement of further variables that undyingly affect economic development, or that persistent change in policy actions which should have stable effects on economic growth, in fact do not. After a lengthy experimental analysis Jones finish that these details cannot be endorsed and that endogenous expansion models are for that reason inconsistent by time series evidence". **Martin as well as Xavier (1997)** also said that "carry the observation that diverse measures of schooling be positively connected to growth" .Sachs along with **Warner 1997** study that, Government saving, improved worldwide incorporation, and improved organization value all raise steady-state returns and, as a result, encourage transitional development. **Borensztein (1998**) argue to the outcome of FDI growth depends on top of the level of human capital. **Brunetti (1998)** "eminent that schooling considered with secondary school enrollment, is optimistically related to development". **Kaufmann (1999a**) , given verification of a strong correlation among the quality of governance as well as per capita GDP. There is in addition a significant body of research on the significance of the bifacial method for economic growth. **Robert E. Lipsey (1999)** assumed internationalized manufacture arises from foreign through investment. This is the investment to engage some quantity of control to obtain or formed firm which is into any other country separately from the investors' state. This participation in the control of the investment is the key feature that tells apart FDI from harbor folio investment. **Robert E. Lipsey (1999)** investigates internationalized manufacture begins from foreign throughout investment. This is the investment to appoint a few amount of control to acquire or twisted firm which is addicted to any other country individually from the investors' state. This involvement in the organization of the savings is the key aspect that tells separately FDI starting harbor folio investment. **Berthélemy and Démurger (2000)** also deliberate the impact of FDI on economic expansion in China. General Method of Moments (GMM) immediate equation estimation model used. Using 24 Chinese zones for the period 1985-1996, optimistic relationship among FDI and economic development was found and be continuous that the foreign technology move is a major determinants of growth of economies which more leads to additional FDI inflows. **Egger (2005)** studies the consequence of investment market incorporation on higher education level and financial expansion by with inner FDI because foreign resources used for "87" countries during 1960 to 2000. This study gets that inmost "FDI" has optimistic result over superior school

participants'. **Adewumi (2006)** also study the incident in 11 countries. Positive impact ofFDI on economic expansion was report employing OLS skillfulness and using yearly time series data since 1970-2003. However, it was inappropriate. **Zhuang in (2008)** calculated that "FDI on human capital" configuration within 29 area of China since 1978 to 1999. This study considered the human resources through the middle school, professionals, technical education and high school, while a proportion of inhabitants to arrest the control of "FDI" inflow in individual economic as well as export zones and technological progress sector on various training levels. **Louzi as well as Abadi (2011)** in their study in Jordan established a positive effect of FDI on economic growth. Using annual time series data from 1990-2009 and employing OLS And VAR techniques, they reported a dependent positive impact of FDI on economic expansion. That is, the impact is realized when it is combined with other factors like high Human capital level, political stability as well as good developed transportation facilities . **Majid and Odoba (2011)** in their recreation to discover the consequence of FDI on economic expansion. Here Nigeria from 1986-2006 employed normal least square technique for their analysis. They concluded that FDI impact positively on Nigerian economy. **Djurovic (2012)** take on a study to look into the impact of FDI on financial growth in developing economies. Ordinary smallest amount square and deductive reason techniques were employed for the study for the period of 2000-2010. Her statement is an independent optimistic relationship between FDI and economic expansion. She furthers that, FDI impacts optimistically on economic growth when joint with higher government expenses. **Azam (2015)** discovers that global remittance inflows, "FDI" in addition to open trade cover important brunt on economic expansion for developing countries of Asian in 1976 to 2012. **Harrod-Domar** form has also been used to make clear the growth of an economy. The form which was developed through Harrod (1939) and Domar (1946) joined the Keynesians as well as the Classical growth theories. The model clarifies the efficacy and function of investment in economic expansion of countries .The mold shows the essential investment plane to be required to reach a certain level of output expansion in an economy.

Methodology

The model used in this thesis is based on the predictable production which status that output of a country at a particular position in time depends on sum capital stock, labor force and as well depends on the productivity of the factor which is captured via a effectiveness parameter. The efficiency parameter captures how efficiently the resources on the economy can be transformed to produce production so basically the efficiency factor captures the technological modernization of the country.

The foundation of the study is based on the production function:

$Yt = F (Kt, Lt, Ht, At)$

Here K, L and H capture the amount of capital stock, labor force and amount of human capital employed in the economy at period t. A is the efficiency parameter which captures the productive capacity of the factors employed in the economy.

Data Description: In the very opening of this empirical analysis this part provides an overview of the source of the data, estimation process and equations used to obtain the variable of interest.

Dependent variable: GDP growth rate of the country (annual %)

 Time series:

● Pre-capita GDP ingress in Bangladesh

●   Average per-capita GDP of developed country. Australia, Canada, United States, United Kingdom, Sweden, Netherlands, Italy, Japan, Germany, France, Spain.

Panel data:

Independent variables:

- Changes in Investment
- Changes in price level is captured by inflation rate
- Growth rate of labor force employed in the economy
- Tariff rate imposed on trade in good of the economy. The rationale of including the variable now is that it is found from various other study is that the decrease on the whole rates of tariff is predictable a new thoughts as well as increased the create competition because household and firms have contribution within increasing productivity and growth.
- Public spending on Education
- Growth rate of total factor productivity &
- Growth rate of labor productivity of per persons employed in the economy.

the entire data are collected from the journal of International Monetary Fund , The Conference Board Total Economy Database and World Bank

The study in take on in the context of 21 South Asian developing and newly rising developing countries. The countries are: Afghanistan, Singapore, Cambodia, Myanmar, Bhutan, Bangladesh, China, India, Indonesia,, Maldives, Nepal, Pakistan Iran, Republic of Korea, Kazakhstan, Malaysia, Philippines, Srilanka, , Thailand, Vietnam and Uzbekistan. The rationale behind preferring the countries is that we required to empirical test the Solow model of growth in the context of developing countries as in an economy several factors with the macroeconomic composition involve the growth path of country. So we wanted to explore whether the predictable growth theory is still appropriate to the context of rising countries with diverse socio economic characteristics.

Test of Convergence

The stationary of the data will be experienced using with 'Augmented Dickey-Fuller' (ADF) for unit root. If a time series is non-stationary, we can observe that its behavior only for the time period every rest of time series data will consequently for this episode. As a result, it is not feasible to simplify it to additional time period. It is intention to discover the long-run interaction among the suitable variables , an analysis for co-integration will be performed using Engle-Granger (EG), and Johansen Test. Short run dynamics will be conducted with Vector Error Correction Mechanism.

The time series break down convergence into two part : long-run convergence and catching up. The basic idea is that, to convergence among two countries, there should be no stable shock among their GDP per capita. With the intention of their dissimilarity of the real GDP per capita must be stationary among these two countries.

GDP per capita is the price of all final goods and services formed within a nation in a given year. To test the convergence hypothesis with time series data, we follow " Ranjpour Reza and Karimi Takanlou Zahra (2008)   Daniel Ventosa-Santaul`aria (2007), and Oxley Manuel G´omez Greasley (1995) methodology of testing the unit root with time trend" .

We will also explore whether the economy is happening the fair growth path. This study use of development economist definition of balanced growth and the macroeconomics,. Balanced growth happens when output and the capital stock raise at the same rate.

Model Specification

To analysis the convergence hypothesis for Bangladesh and Average GDP of developed countries time series data, we follow, Karimi Takanlou Zahra (2008) and Oxley Ranjpour Reza and Greasley (1995) method of testing the unit root with time drift in the subsequent equation by Bangladesh and Average GDP of developed country . The normal method for such tests involves A D Fuller, Phillips-Perron , DF-GLS test and test types test base on the disparity in log per capita output among Bangladesh and Average GDP of developed countries .

The equation is,

$$\Delta\left(GDP_{Average,t} - GDP_{Bangladesh,t}\right) = \beta 0 + \beta 1\left(GDP_{Average,t-1} - GDP_{Bangladesh,t-1}\right) + \epsilon_t$$

Where,

$$GDP\ parcapita_{Average,t} = per\ capita\ output\ for\ avarge\ of\ Developed\ county$$

$$GDP_{Bangladesh,t} = per\ capita\ output\ for\ Bangladesh.$$

All are the log form

$\beta 0$ =intercept

$\beta 1$=slope coefficient

ϵ_t = error

Testing convergence theory come to testing whether the sequence) ($\left(GDP_{Average,t} - GDP_{Bangladesh,t}\right)$, for two demonstrate otherwise not a unit root (Evans and Karas (1996). Used pro convergence hypothesis, differentiation among the log of GDP for average developed country as well as Bangladesh should not grip unit root, so $\alpha<1$. Variation hold unit root if , $\alpha=1$ the two financial side deviate. Nonexistence of unit root show also catch-up as, " if $\beta\neq0$, otherwise long-run convergence if $\beta=0$".

Applying the principle of Akaike as well as Schwarz principle toward determining the lag duration "n" used for, $\sum_{k=1}^{n} \delta k \quad \Delta\left(GDP_{Average} - GDP_{Bangladesh,}\right)$. As a result of doing this, we choose a highest lag duration is five(5) and run dissimilar regressions. So chosen the lag duration with the lowest LL, LR, FPE, AIC, HQIC and SBIC value.

EMPIRICAL RESULTS AND ANALYSIS

That segment discusses the outcome of the analysis and the consequence of the Convergence model

For analysis that theory, the stationary or else the disparity of the log for Bangladesh GDP and Average GDP of urbanized countries tested. By the lag duration should be determined. Applying LL, LR, FPE, AIC, HQIC and SBIC methods used to determining the lag length along with the outcome present below.

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-148.441		5.27432	7.33858	7.36902	7.42217
1	-140.642	15.597*	4.38442*	7.15329	7.2446*	7.40405*
2	-136.624	8.036	4.38898	7.15241*	7.3046	7.57035
3	-132.932	7.3852	4.47455	7.16741	7.38047	7.75253
4	-129.94	5.9845	4.73667	7.21656	7.49051	7.96886
5	-125.397	9.085	4.67051	7.1901	7.52492	8.10958

* indicate lowest LL, LR, FPE, AIC, HQIC and SBIC values.

The rule of thumb intended for selecting the lag duration is to the lag with minimum LL, LR, FPE, AIC, HQIC and SBIC values must be chosen. From the chart, the lag with the minimum, LR, FPE, HQIC and SBIC values must be select is 1. We as a result use 1 lag duration in the

analysis of the convergence theory. To analysis the stationary otherwise if not of the data with the ADFtest , DF-GLS test, Phillips-Perron test .

 The result of the DF test, Augmented Dickey fuller test, Phillips-Perron test are shown below

H0: Variable is   non-stationary.

HA: Variable is stationary   5% Level of significant

That part report the analysis for catching-up and long run convergence.   The GDP of Bangladesh result of the ADF analysis shows that .calculated t -9.157> -1.683 5% Critical value. so we

Variables	Augmented Dickey fuller test	DF-GLS test	Phillips-Perron test
GDPB	-9.157	-5.026	-2.442
GDPA	-4.264	-5.099	-2.095
GDPA-GDPB	-7.422	-4.970	-3.818

Reject the null hypothesis .label formed stationary. .   In the average GDP developed country of the outcome of the ADF test shows that .calculated t -4.264>-1.683 at 5% Critical value. So we reject the null hypothesis and also label formed stationary. The difference of GDP of Bangladesh and average GDP developed country the result of the ADF test shows that calculated t -7.422> -1.683 5% Critical value. so we reject the null hypothesis and label formed stationary. In the GDP of Bangladesh the result of the DF- GLS test shows that calculated t -5.026>-3.202 5% Critical value. So we reject the null hypothesis .label formed stationary. In the average GDP developed

country of the outcome of the DF- GLS test shows that calculated t -4.264>-3.202   5% Critical value. So we reject the null hypothesis and in addition label formed stationary. The gap of GDP of Bangladesh and average GDP developed country the result of the DF- GLS test show that calculated t -4.970>3.202   5% Critical value. So we reject the null hypothesis and label formed stationary. In the GDP of Bangladesh the result of the Phillips-Perron test shows that .calculated t -2.442 > -1.950% Critical value. so we reject the null hypothesis .label formed stationary. .   In the average GDP developed country   t is value   -2.095>-1.950% Critical value. So we reject the null hypothesis and also label formed stationary. The difference of GDP of Bangladesh and average GDP developed country the result Phillips-Perron test shows that calculated t -3.818 > -1.683 5% Critical value. So we reject the null hypothesis and label formed stationary. So, we reject the null of unit root as well as accept the null, no unit root.

Capture the cross country difference in Growth Structure

 In this thesis we will attempt to empirically study the factors that promote to the expansion of an economy in the context of developing countries by panel data approach. So this study will be perform using panel data method of "fixed effect" and " Random effect " estimation followed by Housman test to statistically test which model whether FE or Re can best clarify our underlying model of interest. Finally a indicative checking of the residuals has been completed for Serial correlation and Hereroscedasticity.

	VARIABLE	RE	FE
Dependent	GDP		
Independent	Inflation	-.012078 (.0028224)	-.0151416 (.0031032)
	Investment	-.0126013* (.0268297)	.0041258 * (.0349899)
	Lf	.1055907* (.0962573)	-.0185975 * (.0909108)
	Tariff	-.0263828*	-.0488771 *

		(.034754)	(.0335095)
	Exp_Edu	-.0028197*	-1.206727
		(.1609937)	(.3606122)
	Tfp	-.0333859*	-.108021*
		(.1172937)	(.1253953)
	Lp	.6943638	.5808426
		(.0880765)	(.0903857)

HO: RF Opportunity   HO: Fixed GDP

HA: FE Opportunity   HA:RF GDP

P<0.05 we reject the hypothesis alternative P>.05 we accept the hypotheses

So we * point is we reject the hypothesis

Possible expiation: the developing countries are usually very much labor intensive .if we consider the case of Bangladesh, our is abounded with large pool of semiskilled and unskilled population yet to be entered in labor force .if this large amount of labor force could be converted into skilled productive labor force then it will essentially contribute by large amount to achieve economic growth. For example we can hare about the importance of huge remittance earning of labor force of Bangladesh working abroad and contributing to growth of economy. So this could be possible expiation of why only productivity per person has significant impact on growth than any other factor in the context of developing country

Housman fix random

Test statistic	4.43
P value	0.7296

Test: Ho: in coefficients not systematic

HA: in coefficients systematic

P<.05 We reject the hypothesis hear, p value is <.05 . p<.7296 so we reject the hypothesis

Fixed and Random Effects Estimators

There are two kind of estimator one is "fixed estimator" another is " random estimator The "random effect" estimator is bottom on the subsequent breakdown , " m" where e is an individual effect, "m" is time effect, as well as " B" is predictable by the formation imposed consequent to m by that hypothesis and " h" the just random effect

Equally "fixed effects" and "random effects" model are regulated as Hereroscedasticity. It has two own advantages as well as disadvantages.

 "Fixed effects" model can't estimation a coefficient on one time variant repressor, like schooling, sex, as the individual intercept are open to take any value.   Nevertheless, the individual effects in a "random effects" model are element of the error term, hence it should be uncorrelated by the repressor. Then again, because "random effects" model care for the being effect as branch of the error term and it suffers as of the possibility due to a correlation among it as well as the repressors.

 Hausman (1978) presents a test that, "for discriminating between the fixed effects and the random effects estimators. The test is rooted in comparing the difference among the two estimators of the coefficient vectors, where the random effects estimator is efficient and consistent in the null hypothesis and inconsistent under the alternative hypothesis. The fixed effects estimator is consistent under equally the null and the alternative hypothesis. If the null is correct then the difference among the estimators should be close to zero. The calculation of test statistics requires the addition of the covariance matrix of b1 - b2. In the limit the covariance matrix simplifies to Var(b1) – Var(b2), where b1 is the fixed effects estimator and b2 is the random effects".

Diagnostic test

In the addition we have conducted diagnostic test on residuals to examine the serial correlation and Hereroscedasticity we have done the modified wald test.

Serial correlation test:

Pesaran's test of creoss sectional independent = 0.202 ,pr = 0.8396

Average absolutes value of diagonal elements= 0.404

Hereroscedasticity test

chi 2(21)= 194.12

prob> chi2=0.000

Ho: the Wald test is residual are homoscdastic

Ha: residual are heteroscedastic

P value = less than 5%.

We can reject the null hypothesis of homoscedarsticity of the variance. So variance of the residuals of the FE model suffers from Hereroscedasticity problem. So here we need to use panel robust sander error to take care of Hereroscedasticity problem.

Limitation of study

Major limitation that we face is conducting the study was the data problem .we can hardly found all data for country like Afghanistan, Bhutan and Maldives .there are lage number of missing value. To generate the mission value hear we have used extrapolation interpolation and moving average techniques. This also could have been a possible expiation for the insignificant result of the parameter estimates.

Policy Relevance

As the economy try hard to achieve middle income rank this study can contribute to shed light on the major driving force to boos up the growth rate. We can formulate proper policies necessary to achieve an sustainable growth rate if and only if we could understand what is the actual difference in the growth structure between a developed and developing country. So through this study we hope to impart a little contribution on this issue.

Conclusion

Goal of this paper was establish some of the essential determinants of sustainable economic development in developing country. Examine the factor that contributes to the growth of economy in the context of developing countries using panel data approach. Although we could not find the significant impact on investment labor force , human capital investment in context of developing country .but we have found an interesting insight that growth of labor productivity per person is vary influencing factor for the growth developing county like Bangladesh. so we can forecast of the developing country. A global policy need to be formulation to transform the labor force into a skilled and productive one

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