IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 6, Issue 4. Ver. II (Jul. - Aug. 2015), PP 75-85
www.iosrjournals.org

Savings-Growth-Inflation nexus in Asia: Panel Data Approach

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Abstract: *The present study examines the savings-growth-inflation nexus in Asia through panel data approach for the period 1981 to 2011. The inter-relationship between saving and economic growth is found to be significant and unidirectional running from saving to economic growth. Economic growth negatively and significantly affects inflation but inflation positively and significantly affects saving which supports Deaton's hypothesis. The variables such as saving, trade openness and population growth are found to be significant determinants economic growth. Except GDP, variables such as real interest rate, inflation, dependency ratio and literacy rate are found to be significant determinants of saving rate. Similarly, variables such as money supply, growth rate and real interest rate are found to be the major determinants of inflation. No country specific effects has been found for explaining growth rate of per capita real GDP but in case of saving rate and inflation rate, many countries exhibit individual effects which are modeled as fixed effects in the panel data framework. As contrary to the time invariant country fixed effects, there is no consistent country invariant year fixed effect on real GDP per capita growth rate and saving rate, while there is highly significant negative effect on inflation. As saving affects GDP per capita growth positively and significantly, policies should be framed in such a way that encourage savings in Asian economies which in turn may lead sustained higher GDP per capita growth.*

JEL Classification*: E21, C33, E31, E60, O57*
Key Words: *Savings; Growth; Inflation; Asia, Panel Data*

I. Introduction

Since last two decades, the economists and the policy makers have been fascinated towards the growth experience in Asian countries. A number of macroeconomic factors such as inflation, saving, foreign exchange rates etc. largely affect real economic growth across these countries. Savings play pivotal role in the acceleration of real economic growth. The neoclassical growth models predicted that, in the short run, increase in saving rate has positive effect on growth rate mainly due to the subsequent negative effect on the productivity of capital. A plethora of empirical studies have been suggested that savings rate, in the long run, positively affects economic growth (Carden & Escobar 1988; Motely 1994; Krieckhaus 2002). By delinking the productivity of capital from savings, the endogenous growth theory also assigns a positive relationship between the saving rate and economic growth in the long run. The lifecycle theory of saving also explains that there exists positive relationship between savings and income growth (Loayza et al., 2000). Therefore, it is now a focal and unsettled task before policy makers to judge and scan the major determinants of saving rate so that they can go for suitable policy prescriptions which will in turn accelerate economic growth.

A study on the Latin America's saving determinants carried out by Edwards (1996) explained that both the level of GDP and its growth rate were the major determinants of savings and he also talked about the bidirectional relationship between them. At the mean time, the possibility of other factors that affect both the economic growth and the saving cannot be ignored. Literature gives evidence that inflation is one among such factors (Deaton 1977; Chopra 1988; Haslag 1997; Heer and Suessmuth 2006; etc). Importantly, like other researchers we wanted to know whether or not inflation which reflects the stability of the macroeconomic environment play a key role in accelerating both saving and growth rate.

However, both in theory and practice, the effect of inflation on saving is ambiguous (Deaton and Paxson, 1993; and Heer and Suessmuth, 2006). The empirical findings of various studies about the nexus between growth rate and savings differ from one study to another.

While some studies support a negative association (Chopra, 1988; Fischer, 1993; Gylfason and Herbertsson, 2001), some other studied supports positive association (Dhoakia, 1995; Mallik and Chowdhury, 2001) and some more studies found a negligible effect of inflation on growth (Chari et al., 1996). The effect of inflation on economic growth in theory is largely through the sub-optimal use of resources and distorted investment decisions due to inflation (Miller and Benjamin, 2008; Paul et. al., 1997). However, economic

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growth leading to high inflation through overheating of the economy is also found in practice. On the other hand, in a supply constrained closed economy, higher growth rate can lead to reduced inflation (Dholakia R. H., 1990). Hence, there may be bidirectional relationship between inflation and growth. The relationship between inflation and growth is theoretically ambiguous as high growth cost is associated with rising inflation; policy prescriptions to control inflation could negatively affect growth in one hand and allowing inflation at higher rates, on the other hand, could lead to higher growth although some distorted choices may be its outcome. Importantly, the association between inflation and saving is very crucial in recognizing this complex trade-off between inflation and growth for the policy makers in particular.

The section II outlines the theories explaining the association between inflation and economic growth and saving –inflation nexus; and empirical findings that discussed different channels through which they are interrelated. The conceptual framework and regression model are presented in section III. Statistical and econometric estimation are discussed in section IV. In section V, the results of the regression model specifically focusing on saving, economic growth and inflation and their inter-relationship with each other is presented. This section also contains the individual country and year effects. The last section concludes and discusses some important policy relevance coming out of the study.

II. Inflation with Growth and Savings: Theory and Empirical

Evidence on Growth and Inflation

There are mainly two types of theoretical perceptions relating to the effect of change in average inflation on growth and level of real output as well. One expectation that is based on the exogenous growth models holds that inflation does not affect growth rate as well as the level of output. Opposing the former model, the endogenous growth models highlight that money and inflation do affect the growth rate of output. There are two main channels through which inflation may affect real output growth. As per the Mundell-Tobin effect, increase in inflation results in an increase in economic growth through an increase in capital accumulation. It is because of the facts that increase in inflation eases people's wealth. Therefore, in order to accumulate the desired wealth, people save more which in turn reduces the real interest rate and thereby drives up the capital accumulation and results in higher economic growth.

On the contrary, the structural argument emphasizes that rise in inflation leads real growth. There are two schools of thought has been come forward with two possible justifications Firstly, in view of fixed prices in Keynesian economies, increase in inflation promotes real output growth through redistribution channel in which inflation redistributes profits from workers with relatively low marginal saving propensities to entrepreneurs whose marginal propensities to save and invest is high and through increasing the nominal rates of return relative to the cost. Secondly, inflation, in economies with flexible prices, can redistribute money to the monetary authorities obtained from the money holders. This phenomenon is otherwise known as the inflation tax which, in turn, helps the government to expand its investment programs and thereby enhances growth.

The alternative view against this is that inflation retards economic growth. The earlier empirical studies undertaken by Chopra (1988), Paul et al. (1997) and others support this argument. Chopra (1988) documented that higher inflation rates results in higher cost of capital and also higher risk with productive capital as well, which may, in turn, results in misallocation of funds to less productive investments that acts as a hedge against inflation. Similar type of empirical study carried out by Paul et al. (1997) argued that high inflation along with managed exchange rates negatively affects economic growth due to trade imbalances and speculative capital outflows. Another study by Gilman and Kejak (2002) found the negative association between inflation and economic growth. On the other hand, Roubini and Sala-i-Martin (1992) argued that since the policies of financial repression cause both high inflation and low growth, the outcomes by different studies about negative association between growth and inflation can be spurious if not carefully established.

Savings and Inflation

From the theoretical point of view, there is much less consensus concerning the possible channels of the relationship between savings and inflation. A set of hypotheses such as "Real income uncertainty hypothesis" proposed by Juster/Wachtel, "the disequilibrium hypothesis" put forward by Deaton, "the Mismeasurement hypothesis posited by e.g. Hendry/Von Ungern-Sternberg and "the Real balance effect" discussed by e.g. Howard have been formulated and are more optimistic about the idea that inflation affects saving positively. Juster & Wachtel (1972); Katona (1975);Wachtel (1977); Krishnamurthy & Saibaba (1981), Deaton (1989); Kimball (1990); Deaton and Paxson (1993), Hubbard, Skinner & Zeldes (1994) have supported the idea that the feeling of uncertainty and pessimism about the future caused by inflation, in turn, encourages saving. Wachtel (1974) suggested a useful classification for the effects of price inflation on saving i.e. a money illusion effect, an intertemporal substitution effect and an uncertainty effect.

Out of these hypotheses, the most novel hypothesis i.e. Deaton's hypothesis put forward by Angus Deaton (1977) depicts that unanticipated increase in inflation result in involuntary saving. Deaton further

pointed out that if through indexation or wage inflation the real income is correctly anticipated, then unanticipated inflation will increase the rate of saving. On the contrary, a pessimistic thought concerning the impact of inflation on saving has also been known from the most famous concept of "money illusion or price illusion" in macroeconomics firstly coined by Irving Fisher (1928) and later popularized by J.M.Keynes which depicts that money illusion occurs when inflation is not recognized. Consumers overestimate the purchasing power of their nominal income and decide to raise real consumption levels. Consequently, real consumption expenditure is increased and saving is reduced. This idea also got support from the well known equation empirically tested by Branson and Klevorick (1969). Findings of Cukierman (1972), Craigi (1974), Hebbel, Webb & Corsetti (1991), Dayal-Ghulati and Thimann (1997), Miller and Benjamin (2008) are similar with the findings of Branson and Klevorick (1969). Hence, from the literature, it is found that the impact of inflation on saving is ambiguous. Therefore, to capture the macroeconomic uncertainty, we have taken **rate of inflation (WPI)** (Fischer 1993) as the regressor in the saving model.

We can further discuss the effect of inflation on saving through different effects such as the money illusion effect, the intertemporal substitution effect, the uncertainty effect and indirect effect in the following manner.

The Money Illusion Effect

In the macroeconomic literature on consumption, money illusion or price illusion is a well known concept coined by Irving Fisher and popularized by J.M.Keynes in the early twentieth century. Money illusion occurs when people do not able to recognize inflation. Consumers decide to raise real consumption levels by overestimating the purchasing power of their nominal income. Real consumption expenditure, in turn, is increased and savings is reduced. Therefore, money illusion occurs because of the consumer's ignorance. But, the consumers are not always fools and they can recognize the current inflation rate. Thus, it is an empirical question that whether this type of money illusion affects consumption behavior or not. Branson and Klevorick (1969) observed a strong money illusion effect while Wachtel (1977) found a substantially reduced degree of money illusion effect. Importantly, the phenomenon of money illusion is observed in periods of low inflation but, disappears as inflation becomes more severe.

The Intertemporal Substitution Effect

It is also argued that when price increases are expected, expenditures are advanced in time. Measured saving will increase; if the expenditure will be on the investment goods otherwise consumption increases. Intertemporal substitution is relatively rare because rational behavior requires that the expected price increases be sufficiently large and certain to make it worthwhile to maintain goods inventories.

The Uncertainty Effect

The term "uncertainty effect" refers to a set of hypothesis which convey that inflation leads to increased saving. One such finding is based on Katona's finding which states that people have a strong distaste for inflation. Inflation is mostly treated as an undesirable phenomenon whose presence results in pessimism about economic conditions that in turn may lead to increased saving for precautionary purposes. Thus, inflation is a proxy for attitudes about uncertain economic conditions. However, this hypothesis is unsatisfactory as it hinges more upon a tenuous psychological link between uncertainty and inflation to explain the increase in savings during inflationary times. Increased saving, on the other hand, treated as precautionary response to the increase in uncertainty. The expected level of real income and the certainty with which those expectations are held together determine savings. The greater will be the savings if the expectations of uncertainty will be high. There are also other sources of real uncertainty that increase saving. One among these is the effect of unemployment on general economic conditions on money income expectations. The employed people save more in the worsening economic situation in order to be able to smooth their consumption if they become unemployed. But, this effect is offset by the dissaving of the people already unemployed. Importantly, Aggregate saving behavior is mostly affected by the nominal income expectations and their dispersion.

Indirect Effects

Saving behavior is also indirectly affected by inflation through its effect on other determinants of saving. Inflation, in particular, will affect interest rates and the real wealth of households. The real value of household financial wealth is often eroded in inflationary periods. Hence, individuals attempt to save in order to maintain the purchasing power of the stock of their financial assets which lead to higher saving. Inflation reduces financial wealth and thus induces saving only when rates of returns fail to incorporate an inflation premium. Rates of return, in the long run, either adjusts to include an inflation premium or consumers reallocate their portfolios. Any long run effect on saving is likely to reflect uncertainty rather than a wealth effect. The wealth effect, furthermore, should apply primarily to financial assets and not to other forms of saving, since the

real value of the flow of services from the stock of durables is unchanged. The effect of interest rate movements on saving has always been difficult to assess. Saving is not necessarily sensitive to interest changes because the substitution effects and the income effects are offsetting. Inflation obscures this effect since interest rates, particularly those assets held by individuals do not always respond to changes in inflation rate. Relative returns on different assets, at the very least, will change with the rate of inflation.

III. Conceptual Framework

Factors other than inflation and saving such as demographic factors have been also found to be instrumental in affecting economic growth rate. Bloom et al. (1999) highlighted the significance of different age structure on real economic growth. Age structure entails the population distribution among the different age groups. Population below 15 and above 60 years of age is considered as the dependent population and they are largely dependent on the working population. Therefore, 'total dependency ratio' that signifies the ratio of total number of dependent population i.e. population age above 60 and below 15 years on the total working age persons, can be a very important factor in determining the saving rate and economic growth of a country, if it went along with increasing labor productivity. Adult literacy rate represents high labor productivity and thereby, it is a reflection of human capital.

Trade, in the increasingly globalized world, is considered as the most dominant sources of growth and efficient allocation of resources. Hence, the extent of trade openness becomes much crucial for the economic growth of a country. In the similar way, the convergence hypothesis of Solow states that the level of gross domestic product would determine whether an economy will grow at a low or high rate (Barrow and Sala-i-Martin, 1995). Many growth models include only the real variables and neglect monetary variables. This is, however, validated only if there will be no effect of the financial variables on the real variables of the system i.e. money neutrality, the most debated concept since long (Sidrauski, 1967). The effect of growth of money supply is modeled through (Paul et al., 1997).

Saving is also influenced by different variables such as income, inflation, rate of return demographic factors too (Loayza et al., 2000). Both the levels of income and the growth of income also affect the saving rate. According to the Adaptive expectation hypothesis, along with growth of money supply, past values of inflation should be taken into consideration in the determination of inflation.

In the regression equation of inflation, money supply is included but it is not included in the growth equation. This is because inflation is explicitly considered in the growth equation where the production function approach using money as an input augmenting variable is not appropriate (Chaturvedi et al., 2008).

3.1 Functional Form

The models being estimated are:

GDP Per capita Growth Rate = a_1+ b_1*Inflation Rate + c_1*Saving Rate + d_1*Trade Openness Index + e_1*Population Growth Rate+f_1*Dependency Ratio + error (1)

Saving Rate = a_3 + b_3* GDP Per capita Growth Rate + c_3*Real Interest Rate + d_3*Inflation Rate + e_3*Dependency Ratio+ error (2)

Inflation Rate = a_2 + b_2*Money Supply Growth Rate + c_2*GDP Per capita Growth Rate + d_2*Real Interest Rate + error (3)

Here, we are having three equations in the system and there are interrelationships among the variables i.e. saving rate, inflation rate and per capita real GDP growth rate. The model involves presence of simultaneous effect between per capita real GDP growth rate and saving rate, per capita GDP growth rate and inflation rate.

3.2 Data and Variables

The present study mainly focuses on the developing nations pursuing policies to achieve rapid growth from the south-east and south Asian regions. The countries are selected on the basis of the data availability for all variables over the selected period. Eight countries from the region have satisfied for 31 years i.e. from 1981 to 2011. The countries considered for the study are Bangladesh (BGD), China (CHN), India (IND), Malaysia (MYS), Philippines (PHL), Singapore (SGP), Sri Lanka (LKA) and Thailand (THA). All the data are collected from the database of the World Bank's World Development Indicators. The missing values (especially in adult literacy ratio and dependency ratio as these statistics are calculated with a gap of a few years) have been substituted after studying the trend of the variable for that country. Missing values have been computed by extrapolation assuming the constant growth or decline looking at the increasing or decreasing trend. Missing values have been replaced by the mean in case of the fluctuating trend. The following table presents the basic statistics of the variables.

Table 1: Basic Statistics

Variable	Label	Obs	Mean	Std. Dev.	Min	Max
gdp	Per capita real GDP growth rate (%)	248	4.07	3.84	-11.56	13.7
infl	Inflation Rate in (%)	248	6.06	5.52	-8.64	53.34
sav	Saving rate (%)	248	28.64	12.79	6.24	53.01
top	Openness ratio (%)	248	1.08	1.03	.13	4.86
pop	Population growth rate (%)	248	1.79	0.87	-1.61	5.32
dep	Dependency ratio (%)	248	59.47	14.29	35.55	93.79
lit	Adult literacy Rate (%)	248	75.89	20.09	29.23	95.86
rli	Real interest rate (%)	248	5.11	4.189	-16.4	15.12
bms	Broad Money growth (annual %)	248	15.99	9.25	-43.74	71.91

GDP deflator has been taken as inflation. For saving rate, GDS (Gross Domestic Savings) figures have been used. Money supply growth is the broad money growth (annual %) of the country. Real interest rate (%) has been directly taken from World Bank's database. Openness ratio is the sum of exports and imports over GDP. Dependency ratio is the ratio of persons under age 15 and over 65 to working age population i.e. between 15 to 64 years. Persons aged 15 and over who can read and write imply adult literacy rate. All the values, taken for the study, are in percentage terms instead of ratios.

IV. Estimation Issues

For analyzing the panel data, the choice between fixed and random effects model has been discussed below.

4.1 Pooled v/s Individual Effects

Panel date consisting of 8 Asian countries for 31 years, from 1981-2011 has been exercised in the present study. The regression model can assume that there are time and individual country effects present, or these effects are absent in the data. A simple pooled regression would be appropriate, if these effects are missing, for finding parameter estimates. F test, which has null hypothesis that parameters obtained from pooling are more efficient than fixed effects model, has been performed for selecting between pooled and individual fixed effects. It presents the model selection between pooling regression and fixed effect model. The F test result for no fixed effects is presented in the following table.

Table 2: Test statistics of Pooled versus Fixed Effects

F Test for No Fixed Effects				
Models	Num DF	Den DF	F Value	Pr>F
Growth	5	242	21.21	<.0000
Inflation	5	242	74.64	<.0000
Saving	2	245	67.66	<.0000

For all the three models, the F test supports fixed effect specification over the pooled regression specification.

Fixed Effects v/s Random Effect

After rejecting the pooled regression specification, the next step is to examine whether we should go for fixed effect or random effect model. The choice between fixed effect and random effect model has been carried out by performing the Hausman test in which the null hypothesis is that random effect estimators are more efficient than fixed effect model. The Hausman test for selecting between fixed effect and random effect model is depicted in the following table.

Table 3: Hausman Test for Random Effect

Hausman Test Results			
Variables	**Chi2 value**	**Prob>Chi2**	**Decision**
GROWTH	0.8505	1.99	Go for Random Effect
SAVING	0.5490	4.00	Go for Random Effect
INFLATION	19.88	<0.0002	Go for Fixed Effect

The Hausman test results support the random effects approach for two equations in the system (GROWTH and SAVING) and fixed effect for one equation (INFLATION). Therefore, on the basis of the test results, for GROWTH and SAVING equation, random effect model have been performed and for the INFLATION equation, fixed effect model has been executed to estimate the parameters for all the three equations.

V. Results and Discussion

5.1 Examining Economic Growth

The variables such as saving, trade openness and population growth, explaining growth are coming out to be significant 5%, 1% and 10% respectively. The parameter estimates of the explanatory variables are depicted in the following table.

Table 4: Parameter Estimates of Per Capita Real GDP Growth Rate

Dependent Variable= Per capita Real GDP Growth Rate			
R^2= 0.8817			
Variables	**Coef.**	**Std. Err.**	**P>|z**
infl	-0.04	0.04	0.38
sav	0.11**	0.04	0.01
top	-1.23*	0.46	0.00
pop	-0.57***	0.34	0.09
dep	-0.05	0.04	0.16
cons	6.47**	2.85	0.02

*Significant at 1% level, **Significant at 5% level, *** Significant at 10% level

The coefficient of saving rate (i.e. .11) in GROWTH equation is positive and significant at 5 % level which implies that saving rate is an important variable through which growth rate can be affected. The result is similar with the result obtained by Loayza et al. (2000) who strongly argue that growth through savings accrues mostly across cohorts. This result also completely agree with Deaton and Paxon (1993) who concluded broad patterns of East Asia's economic growth as exhibiting high rates of economic growth accompanied by high saving rates.

A negative relationship between trade openness and economic growth has been observed from the empirical analysis. Bangladesh, India, Sri Lanka and Thailand have been the net importers during this period while the other countries CHN, MYS, PHL and SGP have been net exporters. High growth of exports, for most of the net exporter countries, is a significant source of growth like technical progress achieving high growth rates in the economy. However, for all countries having predominance of imports, there is a net pay out and the growth may statistically suffer. Also, these countries are experiencing many infrastructural bottlenecks and policy inefficiencies. All these interactions might have resulted in the negative parameter of the openness ratio. However, the empirical finding of the present study may imply that south Asian countries should focus on exports for fostering growth as experienced by the East Asian economies rather than focusing on increasing the degree of openness.

From the empirical study it is also found that increase in population growth puts pressure on the resources of a country which pulls down the rate of growth as being indicated by its negative and significant value of its parameter. This finding is contrary to the finding of Bloom et al. (1999), who show that population has an insignificant effect on economic growth. But, it supports the findings of the Chaturvedi, Kumar & Dholakia (2008) that population growth has adverse effect on economic growth rate.

5.2 Examining Saving

All the variables such as real interest rate, inflation, dependency and literacy rate, except GDP are found to be significant determinants of saving rate. Real interest rate, inflation and literacy rate positively determine saving rate while dependency ratio is negatively and significantly explaining saving rate. The result of the empirical study is given in the following table:

Table 5: Parameter Estimates of Saving Rate

Dependent Variable= Saving			
R^2=0.5204			
Variables	**Coef.**	**Std. Err.**	**P>|z|**
gdp	0.05	0.07	0.41
rli	0.24*	0.08	0.00
infl	0.29*	0.07	0.00
dep	-0.27*	0.04	0.00
lit	0.21*	0.04	0.00
cons	25.69*	5.89	0.00

*Significant at 1% level

Although the estimated coefficient of GDP in the SAVING equation is not significant but still it is having the correct sign as has been predicted by the LCM and Harrod-Domar model.

The effect of real interest on gross domestic saving rate is statistically significant and positive which supports the classical theory of positive relationship of savings with real interest rates. The study also does not refute Mackkinon-Shaw's hypothesis that increase in real interest rate will result in increase in domestic saving and total financial saving of the country. This finding is consistent with the findings of Athukorala and Sen (2004) who found a positive impact of the real interest rate on savings in India. But, this result is a contrary to Chaturvedi, Kumar & Dholakia (2008) who concluded that real interest rate has insignificant and negative effect on saving rate.

The coefficient of dependency ratio is negative and significant which supports the findings of Loayza (2000) and Chaturvedi, Kumar & Dholakia (2008) about the LCM (Life Cycle Model) that as dependency ratio increases, saving rate would decrease.

Adult literacy rate has positive and significant effect on saving as it represents high labor productivity and thereby, it resulted in higher savings.

The effect of inflation is found positively and statistically significantly related to savings in the current study. Hence, the empirical result confirms the Deaton's hypothesis that unexpected increase in inflation results in involuntary saving. This empirical findings support the findings of Chopra (1988) who obtained a significant positive impact of inflation on savings in case of Indian economy prior to 1982. The coefficient of inflation is positive because people want to preserve value of their wealth in presence of inflation as the social security and health concerns are not adequately addressed by the existing institutional net work in these countries. The inflation that resulted in macroeconomic uncertainty forces people to save more. This finding contradicts the findings of Heer and Suessmuth (2006) and Chaturvedi, Kumar & Dholakia (2008).

5.3 Examining Inflation

All the variables such as money supply, growth rate and real interest rate. The results are presented in the following table.

Table 6: Parameter Estimates of Inflation Rate

Dependent Variable=Inflation			
R^2= 0.5738			
Variables	**Coef.**	**Std. Err.**	**P>|z|**
bms	0.11*	0.02	0.00
gdp	-0.24*	0.06	0.00
rli	-0.91*	0.05	0.00
cons	9.99*	0.55	0.00

*Significant at 1% level

Growth of money supply turns out to be positive and statistically significant at 1% level in affecting the inflation rate. This empirical finding is contrary with the findings of Saini (1982) and Chaturvedi, Kumar & Dholakia (2008) who found that growth in money stock was not the primary source of inflation for some Asian countries.

The effect of per capita real GDP growth rate is also statistically significant but negative effect at 1% level on the inflation rate. The inverse relationship between inflation and growth rate supports Gilman and Kejak (2002) but contradicts with Dholakia (1990) who in his analysis recommended that high growth of income would tackle the problem of high inflation; and Roubini and Sala-i-Martin (1992).

The coefficient of real interest rate is negative and significant at 1% level. Therefore, real interest rate and inflation rate are negatively related.

5.4 Simultaneity Evidence

The regression model was based on the hypothesis that there is a simultaneous relationship between saving and growth; and inflation and growth. The evidence from Asian countries rejects the hypothesis of a two way relationship between growth and savings. Thus, savings affects growth positively (0.11) but growth does not affect saving significantly though the coefficient is positive. It is also found from the study that growth negatively and significantly affects inflation but inflation does not affect growth significantly. On the other hand, inflation affects saving positively and statistically significantly.

5.5 Country and Year Specific Effects

Country Effects

No country specific effects has been found for explaining growth rate of per capita real GDP but in case of saving rate and inflation rate, many countries exhibit individual effects which are modeled as fixed effects in the panel data framework. Bangladesh has been taken as the reference country and all the analysis has been done with reference to this country. China, Malaysia, Singapore show presence of time invariant fixed

effects influencing both saving rate and inflation rate (see Appendix). But, CHN, IND, MYS, PHL, SGP, LKA exhibit the time invariant fixed effects influencing saving and the countries such as CHN, MYS, SGP and THA portray the time invariant fixed effects influencing inflation rate.

CHN, IND, MYS and SGP show evidence of positive individual effect on saving rate, while PHL and LKA posit negative fixed effect on the saving rate. The degree of positive fixed effect of CHN, MYS and SGP on saving rate is very high, which is expected given the policies favoring high saving rate adopted in these East Asian countries. CHN, MYS and SGP, in case of inflation, all show positive individual fixed effects while THA has a negative fixed effect on inflation.

Year Effects

As contrary to the time invariant country fixed effects, there is no consistent country invariant year fixed effect on real GDP per capita growth rate and saving rate, while there is highly significant negative effect on inflation (see Appendix). 1981 is taken as the reference year and all the analysis is done with reference to this year. This effect is consistently exhibited from 1998 to 2011. The negative and significant year effect can be strongly related to the East Asian financial crisis which began in mid 1997 and affected many economies, particularly in Asia. This crisis mainly affected THA, PHL, and MYS and affected the other south-east Asian countries to a lesser degree. In many of these countries, the stock markets, currency rates and asset prices were affected which can be supposed to have impact on the inflation rates of the Asian economies.

VI. Concluding Remarks

The exercise executed in the present analysis, mainly reflects two important things such as (i) methodological and (ii) related developmental policies arising from Asian countries. In the literature, many theoretical and empirical studies have carried out to examine the major determinants of economic growth and savings separately. However, few studies have been under taken to analyze the same in a simultaneous equation framework. The simultaneous effect on both saving and economic growth has also not been inspected so far in a comprehensive framework. From the methodological point of view, the most relevant outcome of the present study is that there is a unidirectional relation exists between saving and growth and also between growth and inflation. The savings affects growth positively and significantly but growth does not affect savings. It is also clearly observed that growth negatively and significantly affects inflation but inflation does not affect growth. On the other hand, inflation affects saving positively and significantly. Therefore, we found a unidirectional relationship between saving and growth; and between growth and inflation.

From the developmental policy prospective, our finding of a unidirectional relationship between savings and growth suggests that, in order to achieve high income growth and to improve standard of living, policies must be focused on increasing saving rate, so that, increase in savings would ultimately lead to higher output growth and employment in the economy.

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Appendix-1: Country and Year Effects for predicting GDP Growth Rate

Dependent Variable = GDP Growth Rate							
R Square= 0.3918							
Variables	**Label**	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.Interval]**	
2	CHN	1.976501	2.242848	0.88	0.378	-2.4194	6.372403
3	IND	0.154568	1.028813	0.15	0.881	-1.86187	2.171004
4	MYS	-0.70202	2.07538	-0.34	0.735	-4.76969	3.36565
5	PHL	-1.31683	0.839127	-1.57	0.117	-2.96149	0.327828
6	SGP	-1.59027	4.328687	-0.37	0.713	-10.0743	6.893802
7	LKA	-0.7163	1.828481	-0.39	0.695	-4.30006	2.867455
8	THA	-1.95532	2.200352	-0.89	0.374	-6.26793	2.35729

Reference Country: BGD

Dependent Variable=GDP Growth Rate							
R Square= 0.3918							
Variables	Label	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Y2	1982	-1.27556	1.379278	-0.92	0.355	-3.97889	1.427777
Y3	1983	-0.04167	1.383332	-0.03	0.976	-2.75295	2.669607
Y4	1984	-0.14694	1.398857	-0.11	0.916	-2.88865	2.594771
Y5	1985	-3.62557	1.413432	-2.57	0.01	-6.39585	-0.8553
Y6	1986	-2.75675	1.456214	-1.89	0.058	-5.61088	0.097376
Y7	1987	-0.37327	1.447112	-0.26	0.796	-3.20955	2.463022
Y8	1988	1.56364	1.473916	1.06	0.289	-1.32518	4.452463
Y9	1989	-0.26654	1.502829	-0.18	0.859	-3.21204	2.678947
Y10	1990	0.058123	1.528854	0.04	0.97	-2.93838	3.054622
Y11	1991	-1.5053	1.559186	-0.97	0.334	-4.56124	1.550653
Y12	1992	-0.43854	1.600517	-0.27	0.784	-3.5755	2.698411

Y13	1993	0.691053	1.630838	0.42	0.672	-2.50533	3.887436
Y14	1994	0.876772	1.665856	0.53	0.599	-2.38825	4.141789
Y15	1995	0.459446	1.735642	0.26	0.791	-2.94235	3.861242
Y16	1996	-0.40534	1.7786	-0.23	0.82	-3.89134	3.080649
Y17	1997	-1.92039	1.838071	-1.04	0.296	-5.52294	1.682169
Y18	1998	-6.77977	1.838244	-3.69	<0.00	-10.3827	-3.17687
Y19	1999	-2.2711	1.960701	-1.16	0.247	-6.114	1.571804
Y20	2000	-1.07083	2.015814	-0.53	0.595	-5.02176	2.880091
Y21	2001	-4.89288	2.045753	-2.39	0.017	-8.90249	-0.88328
Y22	2002	-2.63659	2.092116	-1.26	0.208	-6.73706	1.463884
Y23	2003	-1.21188	2.156772	-0.56	0.574	-5.43907	3.015319
Y24	2004	-0.2371	2.197402	-0.11	0.914	-4.54393	4.069724
Y25	2005	-0.77693	2.252658	-0.34	0.73	-5.19206	3.638195
Y26	2006	-0.14511	2.303978	-0.06	0.95	-4.66083	4.370601
Y27	2007	0.242	2.325709	0.1	0.917	-4.31631	4.800305
Y28	2008	-2.80639	2.367431	-1.19	0.236	-7.44647	1.833693
Y29	2009	-5.33989	2.372095	-2.25	0.024	-9.98911	-0.69067
Y30	2010	1.080106	2.404575	0.45	0.653	-3.63277	5.792987
Y31	2011	-2.20505	2.449194	-0.9	0.368	-7.00538	2.595279

Reference year: 1981

Appendix-2: Country and Year Effects for predicting Saving Rate

Dependent Variable: Saving							
R Square= 0.5892							
Variables	**Label**	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.Interval]**	
2	CHN	15.12419	2.840068	5.33	<0.000	9.557758	20.69062
3	IND	6.424902	1.144108	5.62	<0.000	4.182493	8.667312
4	MYS	13.51081	2.68413	5.03	<0.000	8.250011	18.77161
5	PHL	-10.7347	3.034797	-3.54	<0.000	-16.68279	-4.786607
6	SGP	16.69506	3.576135	4.67	<0.000	9.685965	23.70416
7	LKA	-14.79246	2.976253	-4.97	<0.000	-20.62581	-8.959112
8	THA	1.546922	3.205481	0.48	0.629	-4.735704	7.829549

Reference Country: BGD

Dependent Variable: Saving							
R Square= 0.5892							
Variables	**Label**	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.**	**Interval]**
Y2	1982	.3949573	1.55007	0.25	0.799	-2.643124	3.433039
Y3	1983	.8550853	1.544266	0.55	0.580	-2.171619	3.88179
Y4	1984	.7803201	1.566283	0.50	0.618	-2.289539	3.850179
Y5	1985	-.2686344	1.592921	-0.17	0.866	-3.390703	2.853434
Y6	1986	1.171934	1.618068	0.72	0.469	-1.999421	4.343289
Y7	1987	1.281627	1.593741	0.80	0.421	-1.842048	4.405303
Y8	1988	1.794367	1.606831	1.12	0.264	-1.354965	4.943698
Y9	1989	1.886672	1.620075	1.16	0.244	-1.288617	5.061961
Y10	1990	1.468425	1.633041	0.90	0.369	-1.732278	4.669128
Y11	1991	.4997801	1.675052	0.30	0.765	-2.783261	3.782821
Y12	1992	1.44176	1.69241	0.85	0.394	-1.875304	4.758823
Y13	1993	1.859894	1.69696	1.10	0.273	-1.466085	5.185874
Y14	1994	2.786884	1.708828	1.63	0.103	-.5623577	6.136126
Y15	1995	2.618188	1.725693	1.52	0.129	-.7641073	6.000484
Y16	1996	2.541217	1.755562	1.45	0.148	-.8996213	5.982056
Y17	1997	3.563672	1.798842	1.98	<0.048	.038006	7.089339
Y18	1998	4.114321	1.896565	2.17	<0.030	.3971213	7.831521
Y19	1999	4.007266	1.886674	2.12	<0.034	.3094534	7.705079
Y20	2000	1.832212	1.916111	0.96	0.339	-1.923298	5.587721
Y21	2001	-.5098523	2.045411	-0.25	0.803	-4.518784	3.499079
Y22	2002	-.0604815	2.048041	-0.03	0.976	-4.074567	3.953604
Y23	2003	.9585702	2.060892	0.47	0.642	-3.080704	4.997844
Y24	2004	2.661411	2.079534	1.28	0.201	-1.4144	6.737222
Y25	2005	3.198243	2.104912	1.52	0.129	-.9273085	7.323794
Y26	2006	3.697613	2.111501	1.75	<0.080	-.4408535	7.836079
Y27	2007	4.107878	2.117895	1.94	<0.052	-.0431209	8.258876
Y28	2008	2.314493	2.174877	1.06	0.287	-1.948187	6.577174
Y29	2009	2.767622	2.259919	1.22	0.221	-1.661739	7.196983
Y30	2010	3.155134	2.276714	1.39	0.166	-1.307143	7.617411
Y31	2011	1.603422	2.316242	0.69	0.489	-2.936329	6.143173

Reference year: 1981

Appendix-3: Country and Year Effects for predicting Inflation Rate

Dependent Variable= Inflation Rate							
R Square= 0.7062							
Variables	**Label**	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.Interval]**	
2	CHN	-5.171122	.8967086	-5.77	<0.000	-6.928639	-3.413606
3	IND	.1026717	.7224835	0.14	<0.887	-1.31337	1.518713
4	MYS	-6.054655	.7517824	-8.05	<0.000	-7.528122	-4.581189
5	PHL	.4246583	.7346955	0.58	0.563	-1.015318	1.864635
6	SGP	-6.681087	.7512353	-8.89	<0.000	-8.153481	-5.208693
7	LKA	.9189116	.7452315	1.23	<0.218	-.5417152	2.379538
8	THA	-2.89815	.7259681	-3.99	<0.000	-4.321022	-1.475279

Reference year: 1981

Dependent Variable= Inflation Rate							
R Square= 0.7062							
Variables	Label	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Y2	1982	-.3000767	1.406728	-0.21	0.831	-3.057213	2.45706
Y3	1983	-.5459618	1.40719	-0.39	0.698	-3.304003	2.212079
Y4	1984	2.591194	1.401926	1.85	0.065	-.1565308	5.338918
Y5	1985	-.4397663	1.422004	-0.31	0.757	-3.226842	2.34731
Y6	1986	-2.867838	1.419071	-2.02	0.043	-5.649165	-.0865107
Y7	1987	-1.46654	1.399886	-1.05	0.295	-4.210267	1.277187
Y8	1988	-.4003782	1.409401	-0.28	0.776	-3.162754	2.361998
Y9	1989	-.258084	1.399837	-0.18	0.854	-3.001713	2.485545
Y10	1990	1.075651	1.407967	0.76	0.445	-1.683913	3.835216
Y11	1991	1.183617	1.400838	0.84	0.398	-1.561976	3.929209
Y12	1992	.2410723	1.417052	0.17	0.865	-2.536298	3.018443
Y13	1993	-.0019543	1.412459	-0.00	0.999	-2.770323	2.766414
Y14	1994	-.1347356	1.406136	-0.10	0.924	-2.890711	2.62124
Y15	1995	-.07046	1.405206	-0.05	0.960	-2.824614	2.683694
Y16	1996	-.1705518	1.410145	-0.12	0.904	-2.934385	2.593281
Y17	1997	-1.020941	1.412021	-0.72	0.470	-3.788451	1.746569
Y18	1998	-1.217983	1.439665	-0.85	0.398	-4.039675	1.60371
Y19	1999	-2.530586	1.433697	-1.77	<0.078	-5.340581	.2794089
Y20	2000	-3.62557	1.413432	-2.57	<0.017	-6.39585	-0.8553
Y21	2001	-2.779743	1.420965	-1.96	<0.050	-5.564782	.005297
Y22	2002	-3.330939	1.416559	-2.35	<0.019	-6.107344	-.5545353
Y23	2003	-3.66968	1.415439	-2.59	<0.010	-6.443889	-.8954706
Y24	2004	-3.637159	1.417357	-2.57	<0.010	-6.415127	-.8591913
Y25	2005	-3.609388	1.414692	-2.55	<0.011	-6.382134	-.8366423
Y26	2006	-3.173345	1.408378	-2.25	<0.024	-5.933716	-.4129748
Y27	2007	-2.023321	1.419255	-1.43	<0.095	-4.80501	.7583688
Y28	2008	-2.388102	1.40292	-1.70	<0.089	-5.137774	.3615709
Y29	2009	-4.249089	1.415427	-3.00	<0.003	-7.023275	-1.474904
Y30	2010	-3.988193	1.440975	-2.77	<0.006	-6.812451	-1.163934
Y31	2011	-4.494938	1.405663	-3.20	<0.001	-7.249987	-1.73989

Reference Country: BGD