

India Led Growth in South Asia: Empirical Analyses

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Abstract: Strategic lessons are drawn based on Ramsey model of growth for the South Asia region and empirical panel data analysis on the determinates of growth in it. Given its size of population this region should push for growth and increase its share of global GDP up to 20 percent from roughly 6.5 percent in 2014. Such growth requires increasing the ratio of saving and investment from about 10 percent above the current averages to around 35 percent. Process of structural transformation should continue till both the output and employment in the agriculture sector are less than 5 percent from around 17 and 50 percent at this moment. Such transformation will occur as this region moves towards urbanization so that about 90 percent of the population lives in urban areas. The student teacher ratios should be reduced from 40 to around 16 to raise the cognitive skill of children to create human capital in science and technology. The trade ratio be increased to around 100 percent from the 50 percent to enhance both the supply and demand sides of these economies. The liquidity of the financial system should at least treble from now to have a smooth flow of credits for new and existing enterprises. Free convertibility of currency may protect this region from international shocks. Fruits of growth should be distributed more equally so that the gini coefficients remain under 35 percent.

1. INTRODUCTION

Election of pro-growth Modi government in India in May 2014 and initiation of growth oriented policies had raised optimism not only in India but also in each of eight countries located in the South Asia region. India counts for about 80 percent of GDP and population of South Asia. It is growing rapidly since pro-liberalisation policies were adopted in 1991 and is promising and already becoming to be the next

growth miracle from Asia with continuing bold reforms in economic policies put by the current government. India also has shown keen interest in harnessing the natural and human resources for economic development of the regions by taking international initiatives in establishing the BRICS Bank, concept of trans-Himalayan growth axis, road, rail and information networks to strengthen SAARC regional economic cooperation. It has provided vision and leadership for growth.

A large size of population, 1.3 billion in India, not only generates the huge amounts of demand for consumption but also provides factors of production required to produce goods and services. Being the home of nearly two billion people comprising about 20 percent of the global population living in the Southern Himalayan belt the South Asia has full potential for becoming the most dynamic region of the world. Its share in the global economy can increase at least up to the 20 percent from 7 percent existing today. China's 16 trillion dollar economy (in PPP) is about three times of 5.8 trillion dollars of India. China's per capita in PPP is 2.5 times bigger than that of India (10.7 thousands in comparison to 4.2 thousands).

Table 1: Consumption, GDP, Labour Force and Population in South Asia

	<i>Consumption</i>	<i>GDP</i>	<i>Labour Force</i>	<i>Population</i>
Bangladesh	0.06	0.06	0.12	0.10
India	0.79	0.81	0.74	0.75
Nepal	0.01	0.02	0.02	0.02
Pakistan	0.10	0.08	0.10	0.11
Sri Lanka	0.03	0.03	0.01	0.01
Others	0.01	0.001	0.01	0.01
Total Share	1.00	1.00	1.00	1.00
Total	1,904,961,181,434	2,666,094,332,135	674,393,119	1,744,161,298

Data source: World Bank Economic Indicators, 2015, accessed from the World Bank Web.

GDP is in constant 2012 PPP Int \$; consumption is in current US \$. Others ; Afg., Bhutan, Maldives See Figures 1, 2 and 3 in the appendix for the 1st, 3rd and 1st largest position of India in the global economy.

It has taken more than seven decades to come to have an urgent sense of right direction to growth and development as is seen today. Many argue that about six decades were lost in process of finding right ideas, philosophies and techniques re-

quired for speedy economic growth in India. India's neighboring countries Afghanistan, Pakistan, Nepal and Sri Lanka are still struggling to have a firm and solid strategy for growth. India is leading by an example and contributing to create atmosphere for structural changes and development of economic and social institutions required for such growth through out the region. The actions for liberalisation and economic reforms now being discussed and implemented in India will have far reaching and more transformative effects on the long run growth not only of India but also in its neighbours.

By maintaining average 8 percent growth rate, it is possible that India will catch up the advanced countries in the West and the East in per capita income within a generation. Other SAARC member countries, may be able to converge to India in per-capita income creating appropriate and stable institutions and socioeconomic conditions required for growth. By the size of the economy and manpower-strength, India is the centre of the economic gravity with seven smaller economies surrounding it. Considering the growth success story of China since 1980s, which is in the eastern neighborhood of this region, it is very essential and beneficial to India to have an integrated approach for the development of these countries in South Asia. Modi's HIT-ways, highways, information technology and transmission ways, focus for the region is a timely and visionary initiative to spur economic growth. In an address on the Independence Day 2014 he had proposed new strategies including i) "no defect" and "zero effect" approach to sustainable growth of manufacturing, ii) a model village in each constituency and development of smart cities iii) new initiative for expanding bank accounts to million of poor households, iv) massive investment on skills and sanitation iv) fight against poverty in all SAARC countries and v) an open approach to the foreign direct investment or "make in India" movement. Bold steps have been taken including implementation of demonitisation, GST and degitisation of the payment system to fulfill these objectives.

Capital accumulation is the key for economic growth. It includes construction of highways, schools and universities, information networks for speedy communication, generation and transmission lines of electricities, centres of research and technologies to create public infrastructure. These are essential for flourishing of businesses and industries in the private sector.

Objective of this paper is to show how a Ramsey model of economic growth is helpful in the analysis of growth trajectories that may fit well to emerging stylized

facts of the South Asian economies from rapid rate of capital formation based on intertemporal choices of households and firms. It also provides panel data based evidence to test validity of these hypothesis for SAARC countries. Section 2 gives the specification and derivation of the Ramsey growth model. Section three provides random and fixed effect estimates to test the theoretical propositions on this growth model followed by conclusions in the last section.

Several strategic points for growth emerging from analysis of facts and model based analysis in this study are worth considering in this context which are as follows:

1. Given that 20 percent of the global population is residing in the South Asia, this region should push for growth and increase its share of global GDP up to 20 percent from roughly 6.5 percent in 2014.
2. Such growth requires increasing the ratio of saving and investment from about 10 percent now at least to above 35 percent of GDP.
3. Process of structural transformation should continue so that output and employment increases substantially in industrial and services sectors and till both output and employment in the agriculture sector are less than 5 percent from around 17 and 50 percent in recent years.
4. Such transformation will occur as this region moves towards urbanisation so that about 90 percent of the population in this region starts living in urban area with facilities. Building mega smart cities will create not only employment but also income. It also will gradually free up rural lands for more scientific cultivations and other meaningful economic uses.
5. On manpower issues it is important to reduce the student teacher ratio from 40 to close to 16 to raise the quality of education and cognitive skill among children. This is essential for human capital required for science and technology and for improving the PISA scores.
6. Revenue and spending of government should balance at least in the medium term and debt to GDP ratio should not increase over 50 percent of GDP; the size of the public sector should not be over 30 percent of GDP.
7. Trade ratio should increase to around 100 percent from the 50 percent at this time. Free trade regimes can enhance both the supply and demand sides of the economy.
8. Liquidity of the financial system need at least to treble to have a smooth flow of credits required for new and existing enterprises.

9. Free convertibility of currency is essential to protect this region from international shocks.
10. A high 8 percent growth strategy is consistent with all above and requires good governance, firm commitment, efficient and strong public administration. Gini coefficient should not be above 35 percent for social integrity and cohesion.

2. RAMSEY MODEL OF GROWTH FOR SOUTH ASIA

Growth models show how the level of GDP or per capita output increases over time with accumulation of physical and human capital and improvement in technology (Solow (1956), Lucas (1988), Romer (1990)). Growth rates differ significantly by countries and the degree of convergence towards the steady state per capita income varies substantially across nations (Batabyal and Nijkamp (2014)). Ramsey growth model is applicable to SAARC countries as it can provide an analytical foundation on how the trajectories of growth are based on parameters of preferences and technology of this region. A single country representative agent model in Bhattarai (2005) is modified here to make it applicable to analysis of growth in the South Asia region consisting of eight countries in the lap of the mighty Himalayas. We could not find any other study comparing growth scenarios for all eight SAARC countries in the literature in this manner.

2.1 Ramsey Growth Model for South Asia

A central planner maximises life time utility of a representative household

$$\max_{C_{i,t}} U_{i,0} = \sum_{t=0}^{\infty} \beta_i^t \ln(C_{i,t}) \quad (1)$$

Subject to Technology ($0 < \alpha_i < 1; 0 < \beta_i < 1; A_{i,t} > 0$)

$$Y_{i,t} = A_{i,t} K_{i,t}^{\alpha_i} \quad (2)$$

Capital Accumulation

$$K_{i,t} = (1 - \delta_i) K_{i,t-1} + I_{i,t} \quad (3)$$

Market Clearing

$$Y_{i,t} = C_{i,t} + S_{i,t} I_{i,t} = S_{i,t} \quad (4)$$

Initial (boundary) condition

$$K_{i,0} = K_{i,0}$$

Thus determinants of steady state in the Ramsey growth model are subjective discount factor (β_i) that denote preferences of households for current consumption relative to future consumption, productivity of capital (α_i) and the rate of depreciation of capital (δ_i) and finally the technology of production, (A_i). Analytical solution and numerical examples are in the next section.

2.1 Analytical solutions the Ramsey Model

Reduced form equation of the model is inserting equations (2), (3) and (4) into (1) as:

$$C_{i,t} = Y_{i,t} - S_{i,t} = A_{i,t} K_{i,t}^{\alpha_i} - l_{i,t} = A_{i,t} K_{i,t}^{\alpha_i} - \{K_{i,t} - (1 - \delta_i)K_{i,t-1}\} \quad (5)$$

$$U_{i,t} = \ln(C_{i,t}) = \ln A_{i,t} K_{i,t}^{\alpha_i} - \{K_{i,t} - (1 - \delta_i)K_{i,t-1}\} \quad (6)$$

Then the present value of lifetime utility with the subjective discount rate $\hat{a}t$ is:

$$\max_{K_{i,t}} U_o = \sum_{t=0}^{\infty} \beta_i^t \ln \left[A_{i,t} K_{i,t}^{\alpha_i} - \{K_{i,t} - (1 - \delta_i)K_{i,t-1}\} \right] \quad (7)$$

Social planner chooses consumption path (and saving) to maximise U_o . Consumption ($C_{i,t}$) is a control variable and capital is a state ($K_{i,t}$) variable. That means capital accumulation is a result of consumption choices. Optimal conditions for infinite horizon in (7) should also be optimal for any two periods

$$\begin{aligned} U_o = & \dots + \beta_i^t \left[\ln A_{i,t} K_{i,t}^{\alpha_i} - \{K_{i,t} - (1 - \delta_i)K_{i,t-1}\} \right] \\ & + \beta_i^{t+1} \left[\ln A_{i,t+1} K_{i,t+1}^{\alpha_i} - \{K_{i,t+1} - (1 - \delta_i)K_{i,t}\} \right] \end{aligned} \quad (8)$$

This generates an Euler equation for intertemporal optimisation as:

$$\frac{\partial U_o}{\partial K_{i,t+1}} = -\frac{\beta_i^t}{C_{i,t}} + \frac{\beta_i^{t+1}}{C_{i,t+1}} \left[\alpha_i A_{i,t+1} K_{i,t+1}^{\alpha_i-1} + (1 - \delta_i) \right] = 0 \quad (9)$$

$$\frac{C_{i,t+1}}{C_{i,t}} + \frac{\beta_i^{t+1}}{\beta_i^t} \left[\alpha_i A_{i,t+1} K_{i,t+1}^{\alpha_i-1} + (1 - \delta_i) \right] \quad (10)$$

In steady state $C_{i,t} = C_{i,t} = \bar{C}_i, K_{i,t} = K_{i,t} = \bar{K}_i$ with this we can solve for the steady state sapital stock in this version of the Ramsey model as:

$$1 = \beta_i \left[\alpha_i A_i \bar{K}_i^{\alpha_i - 1} + (1 - \delta_i) \right] \quad (11)$$

$$\bar{K}_i^{\alpha_i - 1} = \frac{1}{\alpha_i A_i} \left[\frac{1}{\beta_i} - (1 - \delta_i) \right] = \frac{1 - \beta_i (1 - \delta_i)}{\alpha_i A_i \beta_i} \quad (12)$$

$$\bar{K}_i = \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} \quad (13)$$

The the steady state output becomes:

$$\bar{Y}_i = A_i \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} \quad (14)$$

Steady state investment and consumption:

$$\bar{I}_i = \bar{K}_i - (1 - \delta_i) \bar{K}_i = \delta_i \bar{K}_i = \delta_i \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} \quad (15)$$

$$\bar{C}_i = \bar{Y}_i - \bar{I}_i = A_i \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} - \delta_i \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} \quad (16)$$

Discounted life time utility of a representative household is obtained in terms of the model parameters substituting (16) into (7) as:

$$U_o = \sum_{t=0}^{\infty} \beta_i^t \left[\ln A_i \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} - \delta_i \frac{1 - \beta_i (1 - \delta_i)^{\frac{1}{\alpha_i - 1}}}{\alpha_i A_i \beta_i} \right] \quad (17)$$

In a dynamic stochastic general equilibrium (DSGE) model A_i is stochastic as:

$$\ln(A_{i,t}) = \rho_i \ln(A_{i,t-1}) + \frac{\varepsilon_{i,t} - (1 - \delta_i)}{\alpha_i A_i \beta_i} \quad (18)$$

where $A_{i,t}$ the current level of technology at period t is autocorrelated to its value in period $t-1$ with $\rho_i < 1$ and subject to a random error $\varepsilon_{i,t}$, $\varepsilon_{i,t} < \sim N(0, \sigma^2)$.

Model simulations confirm to pattern shown in Figures 1, 2 and 3 in the appendix.

Table 2: Pairwise correlation in growth rates in SAARC countries, 1980-2014

	$gIND$	$gNPL$	$gLKA$	$gBGL$	$gPAK$	$gMLD$	$gBTN$
g IND	1.0000						
g NPL	0.0516	1.0000					
g LKA	0.2917	0.4385	1.0000				
g BGL	0.4001	0.4109	0.4749	1.0000			
g PAK	0.3725	0.0593	0.3236	0.4513	1.0000		
g MLD	0.0281	-0.1574	0.0210	0.0991	0.0980	1.0000	
g BTN	-0.0004	-0.1949	-0.0109	-0.126	0.0291	-0.1711	1.0000

3. EMPIRICAL PANEL GROWTH MODEL FOR SAARC REGION

Time series on economic growth rates are available from the international comparison project such as the Summers-Heston Penn world tables, Asian Development Bank and World Development indicators of the World Bank. Correlations and panel data regression estimates are mostly in support of the theoretical simulations presented above.

Now consider a dynamic panel data model of the form where growth rate of output of country i at time t , $y_{i,t}$ is explained by its lagged values and a set of exogenous explanatory variables $x_{i,t}$. Here α_i is individual specific effects and λ_t represents the time specific effects.

$$y_{i,t} = \gamma Y_{i,t-1} + \alpha_i + \beta_i X_{i,t} + \lambda_t + e_{i,t} \quad \gamma < 1 \quad (19)$$

A generalised method of moments (GMM) as proposed by Hansen (1982) for a panel data model generates the unbiased estimate of γ and α_i solving endogeneity and bias in estimation due to the presence of correlation between the lagged values of dependent variables $y_{i,t-1}$ and errors terms $e_{i,t}$. Right instrument for lagged $y_{i,t-1}$ say by $y_{i,t-2}$ solves this inconsistency and generates unbiased estimator (ignoring $X_{i,t}$ and λ_t):

$$Y_{IV} = \frac{\sum_{i=1}^{TN} \mathcal{Y}_{i,t-2} (\mathcal{Y}_{i,t-1} - \mathcal{Y}_{i,t-2})}{\sum_{i=1}^{TN} \mathcal{Y}_{i,t-2} (\mathcal{Y}_{i,t-1} - \mathcal{Y}_{i,t-2})} \quad (20)$$

where $\mathcal{Y}_{i,t-2}$ is used as instrument of $(\mathcal{Y}_{i,t-1} - \mathcal{Y}_{i,t-2})$.

Estimates of the coefficients from the fixed and random effect panel growth re-gressions for SAARC countries with human capital are provided in Table 3.

Table 3: Panel regression of GDP on capital and labour inputs in SAARC countries, 1980-2014 (double log)

<i>Dep Variable: ln(Y)</i>	<i>Fixed Effect</i>	<i>Random Effect</i>
Ink	0.603***	0.699***
Inpop	0.248***	0.280***
human capital	0.151***	0.133***
Constant	3.080	3.040
Tests	$F(3, 201) = (0.000)$	Wald: $\chi^2(2) = 3849 (0.000)$
Sample	$N=6; T=35, NT=210$	$N=6; T=35, NT=210$
Within	0.943	0.943
Between	0.989	0.989
Overall	0.986	0.986

Hausman Test for random effect model $\chi^2(2) = 3.93(0.26)$

Estimated coefficients of the dynamic panel data model of growth for the South Asian economies confirm to the basic results of the simulation. These show the share of capital to be around 60 percent, that of labour and human capital 25 and

15 percent respectively. There are also country and time specific factors at play as growth rate vary significantly across countries and over time. While these results are consistent to panel data estimates of growth for other countries as in Barro and Sala-i- Martin, additional factors such as cognitive skill and openness and joint responsibility of public and private sectors to educate children are examined other studies (Basu and Bhattacharai (2012)). We further test the robustness of the empirical relation with panel instrumental variable and results are reported in Table 4. Instruments are valid by Hansen's J score and they are exogenous by GMM C statistics as shown in Table 4.

Table 4: Coefficients of panel IV growth regression model for SAARC countries, 1980-2014

<i>Dep Variable: ln(Y)</i>	<i>Coefficients of panel IV Regression</i>
grk	0.682*** (z score: 20.83)
grpop	0.264*** (z score: 8.62)
Constant	2.24*** (z score: 7.95)
Robust tests	$F(3, 228) = (0.000)$ for lgk and lgp
Sample	$N = 7; T = 34, NT = 245$
Instrumented	lgk, lgp
Robust instruments	gry for $i = 1$ to 7

GMM C statistic $\chi^2(2) = 3.95702$ ($p = 0.1383$)

Hansen's J $\chi^2(5) = 134.921$ ($p = 0.0000$)

Focus on capital formation and development of human capital is very important according to these empirical estimations to promote growth in SAARC countries. For India Agrawal et al. (2010) had found that higher income per capita and improved access to banking facilities significantly improves savings. Saving ratio now is around 51 percent in China compared to 31.3 percent in India. All other SAARC countries had saving ratios lower than in India except Nepal.

These model results have wider implications for the wellbeing of people living in South Asia at large. This region has made significant improvements in reducing the population living the poverty line in the last decade. After the initiation of the millennium development goals (MDG), percent of population living below the poverty-line had reduced substantially from 38.2 percent to 24.5 percent in India. Incidence of poverty was higher in Bangladesh 30.3 percent but lower in Nepal (19.1%), Pakistan, (18.0%), Sri Lanka (5.4%) and a lot lower in Bhutan (2.6%) and Maldives (2.5%). This success has made it possible to make the "sustainable growth" as the only major policy objective now as the redistribution issue will take care of itself if new generation of workers comes with skills and productivity required for dynamics of growth across sectors of the economy. Based on our theoretical and empirical analysis, rapid rate of capital formation seems to hold they key for sustainable growth of this region. Country specific studies are to follow further.

4. CONCLUSION

Several strategic points for growth emerge from the analysis of facts in this paper: 1) given its size of population this region should push for growth and increase its share of global GDP up to 20 percent from roughly 6.5 percent in 2014; 2) such

growth requires increasing the ratio of saving and investment about 10 percent above the current averages around 35 percent; 3) process of structural transformation should continue till both the output and employment in the agriculture sector are less than 5 percent from around 17 and 50 percent; 4) such transformation will occur as this region moves towards urbanisation so that about 90 percent of the population lives in urban areas with facilities leaving rural areas for meaningful economic uses; 5) it is important to reduce the student teacher ratios from 40 to around 16 to raise the cognitive skill of children to create human capital in science and technology; 6) then trade ratio should increase to around 100 percent from the 50 percent at this time; free trade enhances both the supply and demand sides of these economies; 7) the liquidity of the financial system need at least to be treble to have a smooth flow of credits required for new and existing enterprises; 8) free convertibility of currency is essential to protect this region from international shocks; 9) a high 8 percent growth strategy is consistent with all above and requires firm commitment, efficient and strong public administration but the fruits of growth should be distributed more equally so that the gini coefficient remain under 35 percent. Based on our theoretical and empirical analysis, rapid rate of capital formation seems to hold the key for sustainable growth of this region.

Momentum of economic growth in the South Asian economies can be based on these stylized facts along with the right set of fiscal, monetary, trade, education and income distribution policies. Achieving higher rates of economic growth requires more systematic and scientific analysis of potentials, existing strengths and comparative advantages of these economies so that they can march ahead in the growth competition in the global economy. Policies should be consistent and comprehensive to link various sectors, regions and nations in the path for long run growth. A strong pro-growth government in India with a good vision for the regional integration and development can turn this region into another example of economic miracles in the global economy within the next few decades.

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APPENDIX

Figure 1: India as the 3rd largest economy in the world by GDP in PPP in 2019

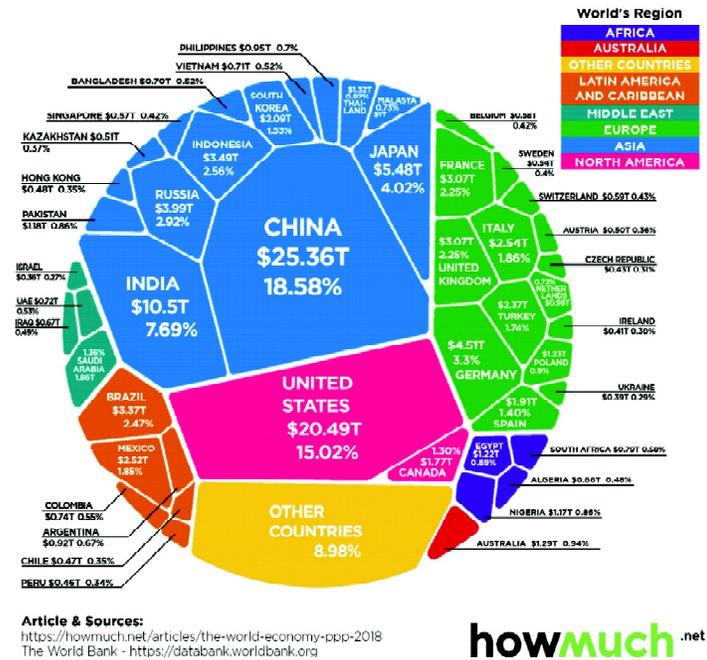


Figure 2: Indian economy was the largest economy in the world 1 AD

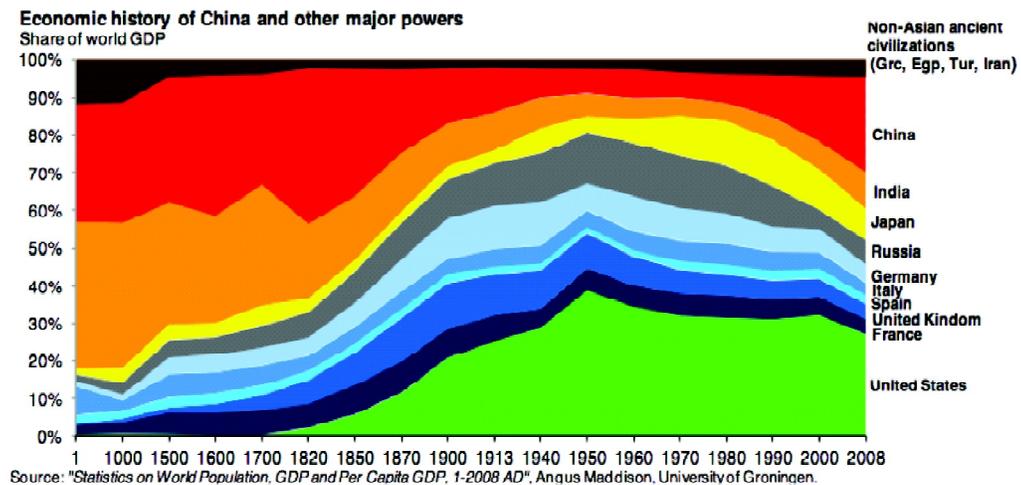


Figure 3: India will be the largest country by population and GDP by 2100

