



## HAS INDIA'S GROWTH STORY WITHERED?

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### Introduction

This paper analyses the growth performance in India over the past two decades. It uses several statistical and economic methodologies to estimate the growth rate of potential output. The annual growth rate of potential output is estimated for 2011 to be in the range of 7.7-8.2%. All the estimation techniques suggest that there was a big boost to potential growth between 2002 and 2007, but since then it has not increased significantly. Based on statistical approaches and conditional on moderate annual growth forecasts of 7-7.5% between 2012 and 2014, there is some evidence that the recent decline in growth is likely to be driven by structural factors. Most of the methodologies indicate that the output gap continues to be positive, suggesting caution in further loosening of the monetary policy stance. Overall, while the Indian growth story may/may not have withered, the evidence does give indications that the growth story may have faltered.

### 1. Motivation and Key Questions

*"India's sustainable growth rate dips to 7% ... What is our potential growth rate, non-inflationary stable growth rate? Non-inflationary growth rate is about 7% or so."*

--- (Governor D Subbarao,  
*The Wall Street Journal, February, 24, 2012*)

*"India's growth story is intact .. , current downturn is short-term phenomenon".*

--- (Governor D Subbarao, April 15, 2012)

*"India's long-term growth potential is 8 to 9 per cent"*

--- (Montek Singh Ahluwalia, April 26, 2012)

The recent deceleration in India's real GDP growth has raised questions about the potential growth rate of the economy and the size of the output gap. Based on data from the Central Statistical Office (CSO), India's annual growth rate of real GDP (measured at market prices) has fallen to 7.0% in the calendar year 2011 from 10.5% in 2010: a sharp decline of 3.5 percentage points within one year (Figure 1a, p 52). The first quarter of 2012 was further marked by a decline in growth to 5.6%. This decline in growth has been accompanied by a slowdown in investment (both gross fixed capital formation and infrastructure investment, Figures 1b and 1c, p 52). In addition, India's ranking in the overall global competitiveness index by the World Economic Forum slipped five positions in 2011-12. In April 2012, Standard and Poor's revised India's credit outlook to negative from stable with a one-third chance of a sovereign downgrade, which would result in India dropping off the list of countries with an investment-grade rating. The scope for reducing interest rates by the Reserve Bank of India (RBI) to boost investment is limited due to high and persistent inflationary pressures, way beyond RBI's comfort zone of 3.5-4. These developments have created pessimism in the policy circles including the government and the Reserve Bank of India (RBI).

Against this background, this paper seeks to shed light on potential growth and economic cycle in India. Specifically, it asks: (i) What is the potential growth rate for the Indian economy, and how has it changed over time? In particular, to what extent is the deceleration in growth in 2011 structural? (ii) What is the estimated output gap (i.e., the difference between actual and potential output)? Can it shed light on the monetary policy stance? (iii) What explains variations in potential growth over the long term?

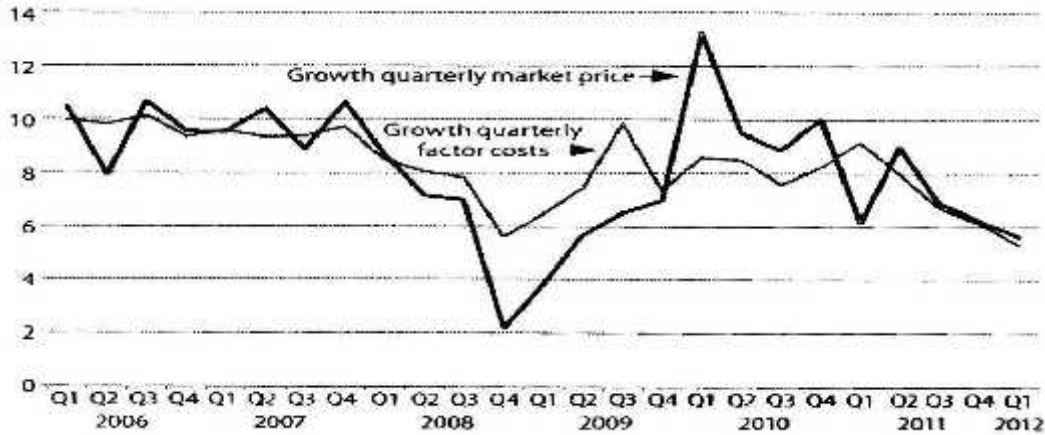
Differentiating higher potential growth from cyclical factors is important for understanding economic developments. If the recent deceleration in growth is largely cyclical, then there will be cyclical components in declines in government revenue and bank credit to the private sector. If the cycle were to turn for some reason, for example, due to positive external shocks, then revenues could increase sharply and bank portfolios benefit, with favourable repercussions for fiscal policy and financial sector. Therefore, discerning higher potential growth from cyclical factors is crucial.

There are papers which have estimated the potential output for other emerging markets like China (e.g., Borensztein and Ostry, 1996 and more recently, Gerlach and Peng, 2006) and Brazil (Goyal 2010). To my knowledge, this paper presents the first serious attempt to measure potential output in India using a variety of different methods. The paper is also related to the growth literature on India and in particular, I extend the growth accounting exercise for India and China in Bosworth and

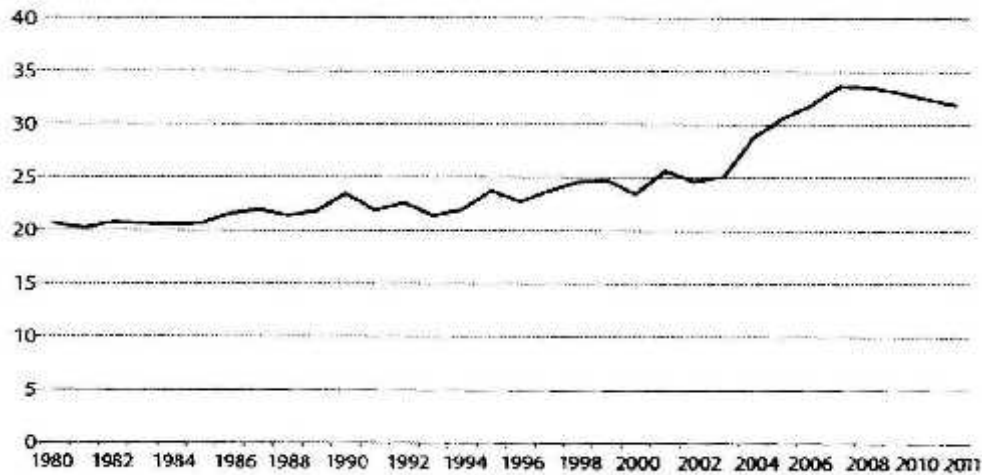


Collins (2008) (which analysed data up to 2004) and for India in Rodrik and Subramanian (2005) (data up to 1999) using the most recent data till 2011.

**Figure 1a: GDP Growth Rates: Year: Factor Costs and Market Prices**



**Figure 1b: Investment (Gross Fixed Capital Formation/GDP)**



Source: Havre Analytics.

**Figure 1c: New Infrastructure Project (in % of GDP)**

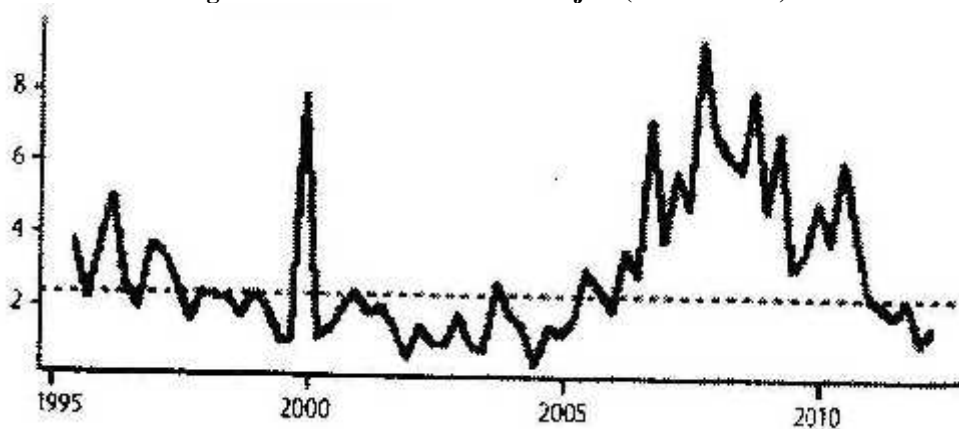




Figure 1c: Monetary Policy Stance in India  
Repo Rate: India

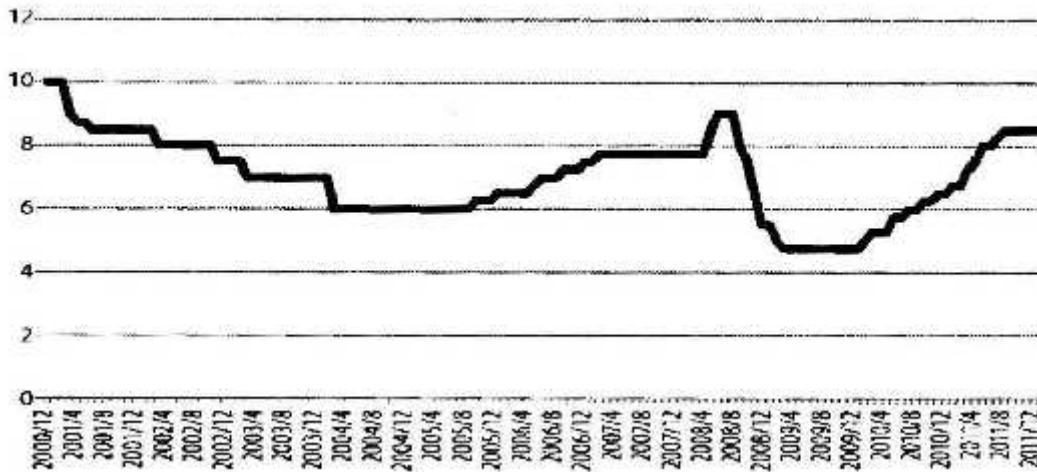
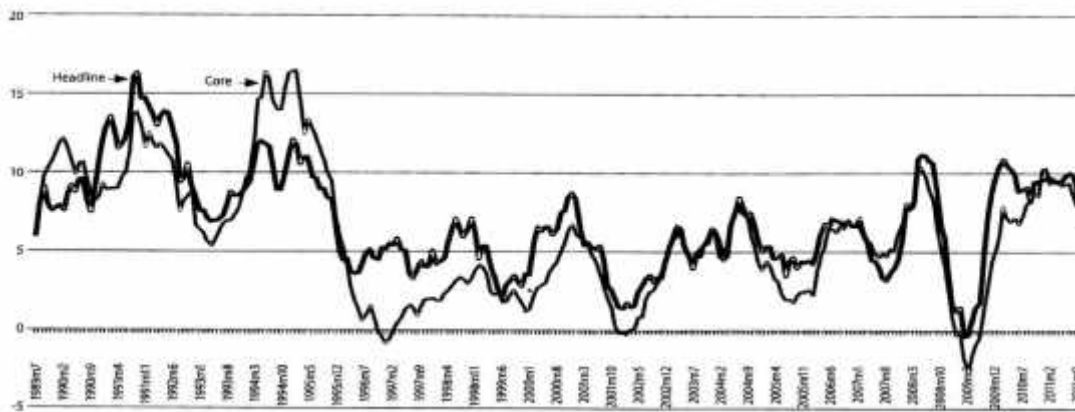


Figure 1d: Inflation Rate (Year-on-Year Changes in WPI)



## 2. Methodology

What is potential output? As illustrated in Basu and Fernald (2009), potential output can be associated with two distinct but related concepts. The first concept is often referred to as a steady state measure. It is something akin to a "forecast" for output and its growth rate in the longer run. The idea is consistent with Solow type growth models and forms the basis of the "production function approach" to measure potential output, as illustrated below. According to this concept, potential output is exclusively a long-run phenomenon.

In the short run, the steady state is often less relevant for policymakers who wish to stabilise output and inflation at high frequencies. This leads us to the second concept which corresponds to the older Keynesian notion whereby potential output is defined as "maximum production without inflationary pressure" (Okun 1970). It is the level of output at which there is no pressure for inflation to increase or decrease. This concept is consistent with the New-Keynesian models where there are nominal rigidities. Wages and prices adjust slowly; in the short run, actual output would deviate from short-run measure of potential. In a flexible price real business cycle (RBC) model, prices adjust instantaneously, potential is always equal to actual.

This paper uses several techniques to measure potential output. These techniques, which decompose output into permanent and cyclical components, may be grouped into three broad categories: (i) univariate statistical procedures, (ii) production function approach, and (iii) a simple macroeconomic model-based approach. While both univariate filters as well as multivariate ones (used in the macroeconomic model-based approach) are consistent with the second notion of potential output, the production function approach corresponds more to the steady state notion.



### Univariate Statistical Procedures

Univariate statistical procedures use the real GDP series to identify the permanent and cyclical output components. Three sets of univariate procedures are used in this paper: (i) piece-wise linear detrending; (ii) three filters that isolate the high-frequency from low-frequency components: the Hodrick-Prescott filter, the Baxter and King, and the Christiano and Fitzgerald filter; and (iii) running median smoothing. The last procedure is non-standard, and has the advantage of being flexible and adaptable, which is important given existing data limitations.

### Production Function Approach

One disadvantage of statistical techniques is that they provide no economic intuition associated with the measure of potential GDP. A popular compromise is to use the "production function" approach, which attributes changes in output to movements in capital and labour. Assuming a Cobb-Douglas production function with constant returns to scale,

$$Y = AK H^{1-\alpha} \quad \dots (1)$$

Where  $Y$  is real GDP,  $A$  is total factor productivity (TFP),  $K$  is the stock of physical capital,  $H$  is total hours worked,  $ER$  is the share of GDP paid to capital.

Total hours worked in the economy can be derived as follows:

$$H = WAP * LFPR * ER * AHW$$

Where  $WAP$  is the working-age population,  $LFPR$  is the labour force participation rate,  $ER$  is the employment rate, and  $AHW$  is average hours worked per worker.

Taking logs of (1), and denoting the logs by lower case,

$$y = a + \alpha k + (1 - \alpha) h \quad \dots (2)$$

TFP can be derived as a residual from (2),

$$a = y - \alpha k - (1 - \alpha) h \quad \dots (3)$$

The share of GDP paid to capital is assumed to be constant at 0.3.

In order to assess underlying trends, we use an HP filter (assuming a smoothing parameter of 100 - traditional value for annual frequency data) to smooth many of the above input factors. The smoothed values are denoted by bars. We first use trend values of  $LFPR$ ,  $ER$ , and  $AHW$  to derive the trend in  $H$  as follows:

$$\bar{H} = WAP * \bar{LFPR} * \bar{ER} * \bar{AHW} \quad \dots (4)$$

Next, we used the smoothed hours, capital and TFP to get the potential or trend GOP as follows:

$$\bar{y} = a + \alpha \bar{k} + (1 - \alpha) \bar{h} \quad \dots (5)$$

"Output gap" as defined above is the percent deviation of real GDP from its potential.

$$Gap = (Y - \bar{Y}) / \bar{Y} * 100$$

### Simple Macroeconomic Model-Based Approach

Finally, we use a simple macroeconomic model developed by the modeling unit of the research department at the IMF to estimate the potential output (Benes et al 2010). Unlike the statistical filters or the production function approaches, the



Figure 2a: Potential Growth: Statistical Filters

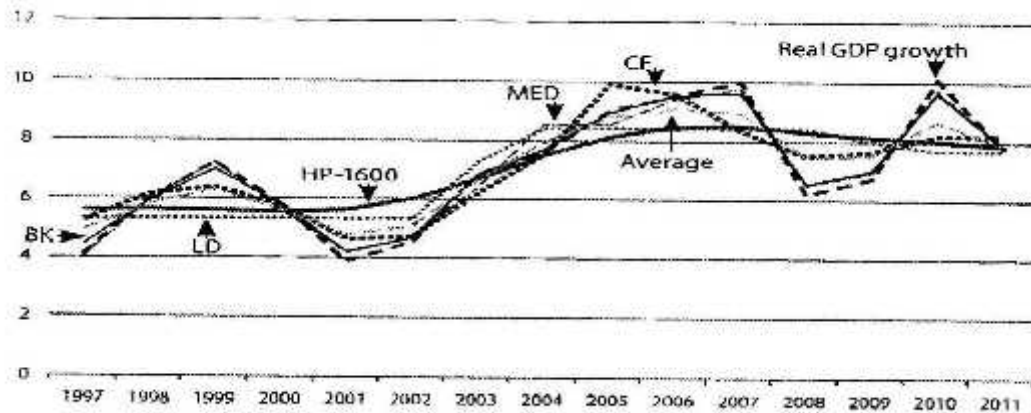
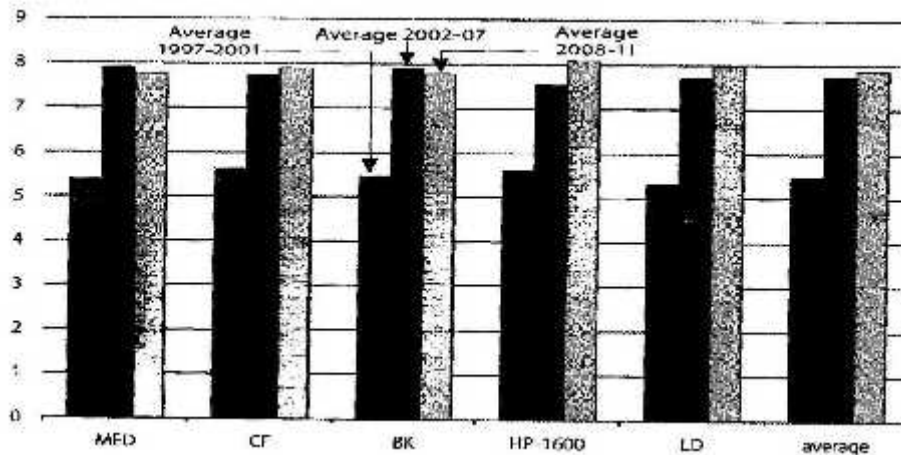


Figure 2b: Potential Growth: Sub-samples



model-based approach is more flexible in that it allows the potential growth to vary with recent information (like inflation) along with stable trends. The model is simple and incorporates relationships between actual and potential GDP, unemployment, core inflation, and capacity utilisation in manufacturing. The model is estimated by Bayesian methodology (Regularised Maximum Likelihood) (Ljung 1999). One disadvantage of this approach, however, is that unlike the statistical filters, this approach is specific to the model we layout.

#### 4. Main Findings

A uniform finding across all the methodologies is that potential growth rate increased sharply between 2002 and 2007. On average, across all the methodologies, potential growth increased from 5.1% in 2002 to 9.0% in 2007. Comparing across sub-samples, the average between 1997 and 2001 is 5.5%. It increased by more than 2 percentage points during the period between 2002 and 2007 to 7.8%. Simple structural break tests based on Clemente, Montafies and Reyes (1998) suggest a clear break in the real GDP series in 2002 (last quarter).

Since 2008 we do not find any perceptible increase in the potential growth rate. In 2011, potential growth is in the range of 7.7-8.2%, with an average of 7.9%. Although it may be too early to come up with a definitive answer, there is some evidence that the deceleration in 2011 was structural. Overall, the basic findings suggest that while the Indian growth story may/may not have withered, the evidence does give indications that the growth story may have faltered.

#### Findings from the Production Function Approach

We move on to a long-run analysis of growth in India over the past four decades. First, we start with a simple growth decomposition exercise (assuming two factors, labour and capital, and a fixed labour share of 0.7% of GDP). The results are shown in Table 1. We divide the sample from 1982-2011 into sub-periods



**Table 1: India: GDP Growth and Its Components, 1982-2011**

	Real GDP	Total Hours	TFP	Capital
1982-85	4.8	2.4	1.4	4.7
1986-90	5.8	2.8	2.1	5.0
1991-96	5.0	1.9	2.2	5.0
1997-2001	5.7	2.7	1.8	5.6
2002-07	6.8	3.3	2.1	6.7
2008-11	7.7	3.6	2.0	8.9

of 4-5 years. A few striking facts emerge. The big push to economic growth occurs not immediately after the 1991 reforms, rather during the period from 2002 to 2007. The average annual growth rate during 1991-96 was 5.0%, lower than that between 1986 and 1990 (5.8%). Since 1997, growth picked up with an annual average of 5.7, 6.8 and 7.7 during 1997-2001, 2002-07 and 2008-11, respectively. The biggest contributor to economic growth over the last few decades has been the growth capital stock. For example, the average annual growth rate in capital stock almost doubled between 1982-85 and 2008-11 from 4.7 to 8.9%. TFP growth has also exhibited some increase over the same period from 2.4 to 3.6%. In contrast, the growth in hours has been more or less stagnant.

The rate of growth of potential output is estimated at 7.7% of GDP in 2011, with no evidence for a recent decline. Looking at five-year sub-periods, we find a distinct jump in potential growth between 1991-96 and 1997-2001 (from 5.3 to 6.1%) and an even bigger increase during 2002-07 (to 7%) (Table 2). A decomposition of trend

**Table 2: India: Trend GDP Growth and Its Components, 1982-2011**

	Real GDP	Total Hours	TFP	Capital
1982-85	5.1	1.8	2.4	4.8
1986-90	5.3	2.1	2.3	4.9
1991-96	5.3	1.9	2.4	5.1
1997-2001	6.1	2.1	2.8	6.0
2002-07	7.0	2.0	3.4	7.6
2008-11	7.5	2.0	3.6	8.5

GDP growth suggests that the boost in potential is explained partly by a growth in TFP, but primarily by growth in the capital stock. Between 1982-85 and 2008-n, the average annual growth in capital stock increased from 4.8 to 8.5%, with an increase from 6.0 to 7.6% between 1997-2001 and 2002-07. The growth in capital stock is reflected in a steady rise in the capital-labour ratio. The rise in potential growth since 2002 can be attributed to both global as well as domestic factors. This was a period when the potential growth in other emerging markets like Brazil also picked up. The output gap from the production function approach is positive, and estimated at 1% of GDP.

What do these potential growth rates mean in terms of per capita income and catch-up with other advanced economies? First, we look at India's growth in per capita incomes over the last six decades. Although annual growth rates have been volatile, there has been a steady upward long term trend since the mid-1970s. In order to answer what the increase in per capita incomes has meant in terms of catch-up,

**Table 3a: India: Catch Up with Other Countries: Optimistic**

	GDP	GDP	In(x/Ind) (India-x)	Distance	No of	No of
	Per Capita	Per Capita		Growth	In PCY to	Years
	(Constant	Growth		In PCY	become	to
	2000US\$) - (Annual %)	-			Half as	Catch Up
	2007	2007			Rich	Catch Up
United States	38,701	0.9	4.0	7.4	3.3	54
Korea, Republic of	15,158	4.8	3.1	3.6	2.4	86
Singapore	31,118	4.1	3.8	4.2	3.1	90
UMIC-WB cut-off 1/	3,976	5.0	1.4	3.0	0.7	46
Memorandum items						
IndiaGDP						
per capita - 2007	688	8.4				
IndiaGNI						
per capita - 2007	1,000	8.0				



1/based on 2010 GNI per capita Atlas method. The growth rate is for GNI per capita, average over all upper middle-income countries.

**Table 3b: India: Catch Up with Other Countries: Pessimistic**

	<b>GDP</b>	<b>GDP</b>	<b>In(x/Ind) (India-x)</b>	<b>Distance</b>	<b>No of</b>	<b>No of</b>
	<b>Per Capita</b>	<b>Per Capita</b>	<b>Growth</b>	<b>In PCY to</b>	<b>Years</b>	<b>Years to</b>
	<b>(Constant</b>	<b>Growth</b>	<b>In PCY</b>	<b>become</b>	<b>to</b>	<b>Half</b>
	<b>2000US\$) - (Annual %) -</b>			<b>Half as Catch Up Catch Up</b>		
	<b>2007</b>	<b>2007</b>		<b>Rich</b>		
United States	38,701	0.9	4.0	5.5	3.3	61
Korea, Republic of	15,158	4.8	3.1	1.6	2.4	146
Singapore	31,118	4.1	3.8	2.3	3.1	136
UMIC-WB cut-off 1/ Memorandum items	3,976	5.0	1.4	1.0	0.7	68
IndiaGDP per capita - 2007	688	6.4				
India GNI per capita - 2007	1,000	6.0				

1/based on 2010 GNI per capita Atlas method. The growth rate is for GNI per capita, average over all upper middle-income countries.

We develop two scenarios. The first is the optimistic scenario whereby India continues to grow at its peak growth rate of close to 10% in 2007 (which translates into a per capita GDP growth rate of 8.4%). The second is a (relatively) pessimistic scenario with a per capita GDP growth rate of 6.4% (Tables 3a and 3b). In the most optimistic scenario, it would take India 45 years to catch up half way to the US, 67 years to Korea, 73 years to Singapore and 23 years to become an upper middle-income country by World Bank classification. In the pessimistic scenario, things look much worse. It would take India 61 years to catch up half-way to the US, 146 years to Korea, 136 years to Singapore and 68 years to become an upper middle-income country. The bottom line is that even assuming the most optimistic growth path, India has a long way to catch up in the process of convergence.

### Findings from the Macroeconomic: Model

The findings from estimating the macroeconomic model presented above are summarised in Figures 8a and 8b (p 57). The potential growth is estimated at 8% in 2011, once again with no evidence for a recent decline. However, it is imprecisely estimated with a 95% confidence interval ranging between 6% and 10%. Looking at sub-samples, similar to the findings from other techniques, we find that the average annual potential growth increased sharply from 5.6% during 1997-2001 to 7.4% during 2002-07, reaching up to 7.6% during 2008-11. The output gap is positive and is estimated at 0.8% of GDP. The 95% confidence bands are again quite wide, and range between -1.3 to +2.0% of GDP. The point estimates suggest a decline in the magnitude of the output gap between 2010 and 2011 (from 1.1 to 0.8% of GDP).

### Summary of Findings

Finally, in order to get an overall picture, we take an average of the estimates of potential growth across all the methodologies.

The range of estimates for the potential growth and the output gap are shown in Figures 9a and 9b. On average, we estimate the potential growth to be 7.9% in 2011, with a range between a minimum of 7.7% of GDP and a maximum of 8.2% of GDP. The main finding of a sharp increase in potential in the early 2000s seems to be corroborated by the averages, with an increase in potential growth of about 2 percentage points of cop from 5.6% to 7.6% of GDP between 1997-2001 and 2002-07. On average, the output gap is positive in 2011, and about 0.7% of GDP; however, the magnitude of the output gap has declined on average by 0.2 percentage points between 2010 and 2011.

### Conclusion

The results in this paper have three important policy implications. First, the key message of the paper is that despite the recent slowdown, potential growth in India continues to be high. However, even under optimistic scenario whereby India continues to grow at its peak growth rate of close to 10% in 2007, it would take India 23 years to become an upper middle-income country.



In order to boost the potential to close to double-digits and regain the momentum as in early 2000s, structural reforms must be hastened. Second, in the shorter term, given that the economy still faces a positive output gap, the RBI should exercise caution in further loosening the monetary policy stance. Given the limited scope for lowering interest rates, there is no substitute to structural reforms for lifting growth rates in the Indian economy.

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