Has India's Growth Story Withered?

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Prachi Mishra[1]

Ministry of Finance, Government of India

Abstract

This paper analyzes the growth performance in India over the past two decades. We use 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 percent. 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 percent 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 output gap continues to be positive, suggesting caution in further loosening 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] Dr. Prachi Mishra is a Senior Economist in the Office of the Chief Economic Advisor in the Ministry of Finance, Government of India. Email. pmishra0513@gmail.com. The views expressed are those of the author and do not necessarily represent those of the institutions to which the author belongs. I would like to thank Laura Papi and participants at an IMF seminar for helpful comments.

I. 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 Organization (CSO), India's annual growth rate of real GDP (measured at market prices) has fallen to 7.0 percent in the calendar year 2011 from 10.5 percent in 2010: a sharp decline of 3.5 percentage points within one year (Figure 1a). The first quarter of 2012 was further marked by a decline in growth to 5.6 percent. This decline in growth has been accompanied by a slowdown in investment (both gross fixed capital formation and infrastructure investment, Figures 1b and 1c). In addition, India's ranking in the overall global competitiveness index by the World Economic Forum slipped five positions in 2011-2012. In April 2012, Standard and Poor 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 RBI to boost investment is limited due to high and persistent inflationary pressures, way beyond RBI's comfort zone of 3.5-4 percent (Figure 1d). 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 favorable 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 analyzed data up to 2004) and for India in Rodrik and Subramanian (2005) (data up to 1999) using the most recent data till 2011.

II. 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 policy makers who wish to stabilize 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) uni-variate statistical procedures, (ii) production function approach, and (iii) a simple macroeconomic model based approach. While both uni-variate 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 the 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 labor. Assuming a Cobb-Douglas production function with constant returns to scale,

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

where *Y* is real GDP, *A* is total factor productivity (TFP), *K* is the stock of physical capital, *H* is total hours worked, α 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 labor 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,

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

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

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

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:

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

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

$$\bar{y} = \bar{a} + \propto \bar{k} + (1 - \propto)\bar{h} \qquad (5)$$

"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 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 utilization in manufacturing. The model is estimated by Bayesian methodology (Regularized Maximum Likelihood) (Ljung, 1999). One disadvantage of this approach, however, is that unlike the statistical filters, this approach is specific to the model we lay out.

III. Data

We use quarterly real GDP (2004 prices) at market prices for the statistical filters from September 2011 World Economic Outlook (WEO) (1996 Q2-2011 Q4); the series are seasonally adjusted by X12 Arima procedure. The production function approach is implemented using annual data from Haver Analytics for 1980-2011. In order to avoid the end-point bias in most statistical filters, we project the data forward using IMF forecasts (of 7-7.5 percent annual growth rate during 2012-2014). For the HP filter we assume standard smoothing parameters (1600 for quarterly data; 100 for annual). We also do sensitivity analysis using more optimistic and pessimistic growth projections, as well as other assumptions on the smoothing parameters.

IV. 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 percent in 2002 to 9.0 percent in 2007 (Figure 2a). Comparing across sub-samples, the average between 1997 and 2001 is 5.5 percent. It increased by more than 2 percentage points during the period between 2002 and 2007 to 7.8 percent. Simple structural break tests (based on Clemente, Montañés 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 is structural (we find on average across all methods a decline of 0.8 percentage points of GDP in 2011). All the methods indicate a positive output gap in 2011, with an average of 0.4% of GDP (Figure 2d). Note that although the economy is growing below potential, the output gap (which is the difference in levels of actual and potential) is still positive, suggesting demand pressures in the economy.

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.

Robustness

We conduct a variety of robustness checks for the main findings. First, we allow for alternative smoothing parameter for the HP filter (16,000 instead of 1,600). The results are shown in Figure 3a. Our main finding of a boost in potential between 2002 and 2007 remains robust. Post-2007, potential growth remains flat around 8% of GDP, and we do not find any evidence for a deceleration in 2011. Further, we use Bai-Perron structural break tests to perform the linear de-trending methodology. The tests support the case for a structural break in real GDP series in

2002.[2] Once again, there is evidence that potential growth increased between 2002 and 2007; since then that it has decelerated (based on the Bai-Perron test with two breaks) or it remained flat (based on allowing for one break) (Figure 3b).

All the findings presented above are based on data for GDP at market prices. However, there is a substantial difference between GDP measured at market prices and that at factor costs – the reason being the existence of significant mark-ups. For example, GDP growth based on market prices fell much more sharply during the global financial crisis than that based on factor costs (Figure 4a). We redo the calculations for potential growth based on GDP at factor costs (Figure 4b). Again, the main conclusions remain unchanged; an increase in potential between 2002 and 2007; since then stagnation or even a decline.

Next, we analyze if agriculture sector is special? Do our findings change if we exclude agriculture from total GDP? As shown in Figure 5a, growth in agriculture has been consistently below that in the non-agriculture sector (the difference being as large as 9 percentage points of GDP in 2002). Within non-agriculture, through most of the decade of 2000s, the growth in services has outpaced that of manufacturing. In 2011, the difference was particularly high; services grew at 9% while manufacturing grew only at 4%. Excluding agriculture from GDP, the findings remain qualitatively similar, though we find stronger evidence for a decline in potential growth in the post-2007 era (Figure 5b).[3]

Next, note that our baseline estimates of potential are based on assumptions of 7-7.5 percent growth rate during 2012-2014. Since most statistical filters are subject to end-point biases, I also run the estimates under alternative optimistic and pessimistic assumptions on the growth rate of 8-8.5 percent, and 6-6.5 percent respectively. The results are shown in Figure 6. Similar to the baseline, in both the optimistic and pessimistic scenarios, the potential growth rate increased

[2] The Bai-Perron tests allowing for two breaks and one break respectively are depicted in Figures 3c and 3d.
[3] The decline in potential growth post 2007 is 0.2 percentage points smaller when we exclude both agriculture and manufacturing, perhaps capturing the more robust growth in services.

sharply from 6.0 to 8.5 percent between 2002 and 2007; since then, under the pessimistic assumptions, the decline in potential has been the sharpest to about 7.5% of GDP in 2011.

Findings from the production function approach

Next, 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, labor and capital, and a fixed labor share of 0.7 percent of GDP). The results are shown in Table 1. We divide the sample from 1982-2011 into sub-periods of 4-5 years. 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 percent, lower than that between 1986 and 1990 (5.8 percent). Since 1997, growth picked up with an annual average of 5.7, 6.8 and 7.7 during 1997-2001, 2002-2007 and 2008-2011 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 2008-2011 from 4.7 to 8.9 percent. TFP growth has also exhibited some increase over the same period from 2.4 to 3.6 percent. In contrast, the growth in hours has been more or less stagnant.

Next, we apply the production function approach discussed above, and estimate potential output. The rate of growth of potential output is estimated at 7.7 percent of GDP in 2011, with no evidence for a recent decline. Looking at 5-year sub-periods, we find a distinct jump in potential growth between 1991-1996 and 1997-2001 (from 5.3 to 6.1 percent) and an even bigger increase during 2002-2007 (to 7 percent) (Table 2). A decomposition of trend GDP growth suggests that the boost in potential is explained partly by a growth in TFP, but primarily by growth in the capital stock (Figure 7a). Between 1982-85 and 2008-2011, the average annual growth in capital stock increased from 4.8 to 8.5 percent, with an increase from 6.0 to 7.6 percent between 1997-2001 and 2002-2007. The growth in capital stock is reflected in a steady rise in the capital-labor ratio (Figure 7b). 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 (Figure 7d). Although annual growth rates have been volatile, there has been a steady upward long-term trend since mid 1970s. In order to answer what the increase in per capita incomes have meant in terms of catch-up, 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 summarized in Figures 8a and 8b. 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 percent confidence interval ranging between 6 and 10 percent. Looking at sub-samples, similar to the findings from other techniques, we find that the average annual potential growth increased sharply from 5.6 percent during 1997-2001 to 7.4 percent during 2002-2007, reaching up to 7.6 percent during 2008-2011. The output gap is positive and is estimated at 0.8% of GDP. The 95 percent 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 percent 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 GDP from 5.6 to 7.6% of GDP between 1997-2001 and 2002-2007. 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.

V. Conclusions

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.

VI. References

Basu, S. and John G. Fernald (2009), "What do we know (and not know) about potential output", Federal Reserve Bank of St. Louis Review, July/August 2009, 91(4), pp. 187-213.

Borensztein, E., & Ostry, J. D. (1996). Accounting for China's growth performance. American Economic Review Papers and Proceedings, 86, 224–228.

Benes, J., K. Clinton, R. Garcia-Saltos, M. Johnson, D. Laxton, P. Manchev, and T. Matheson (2010). Estimating potential output with a multivariate _lter. Working paper 10/285, IMF.

Bosworth, Barry, and Susan M. Collins. 2008. "Accounting for Growth: Comparing China and India." Journal of Economic Perspectives, 22(1): 45–66.

Gerlach, S. and W. Peng (2010), "Output Gap and Inflation in Mainland China", China Economic Review 17 (2006) 210–225 225.

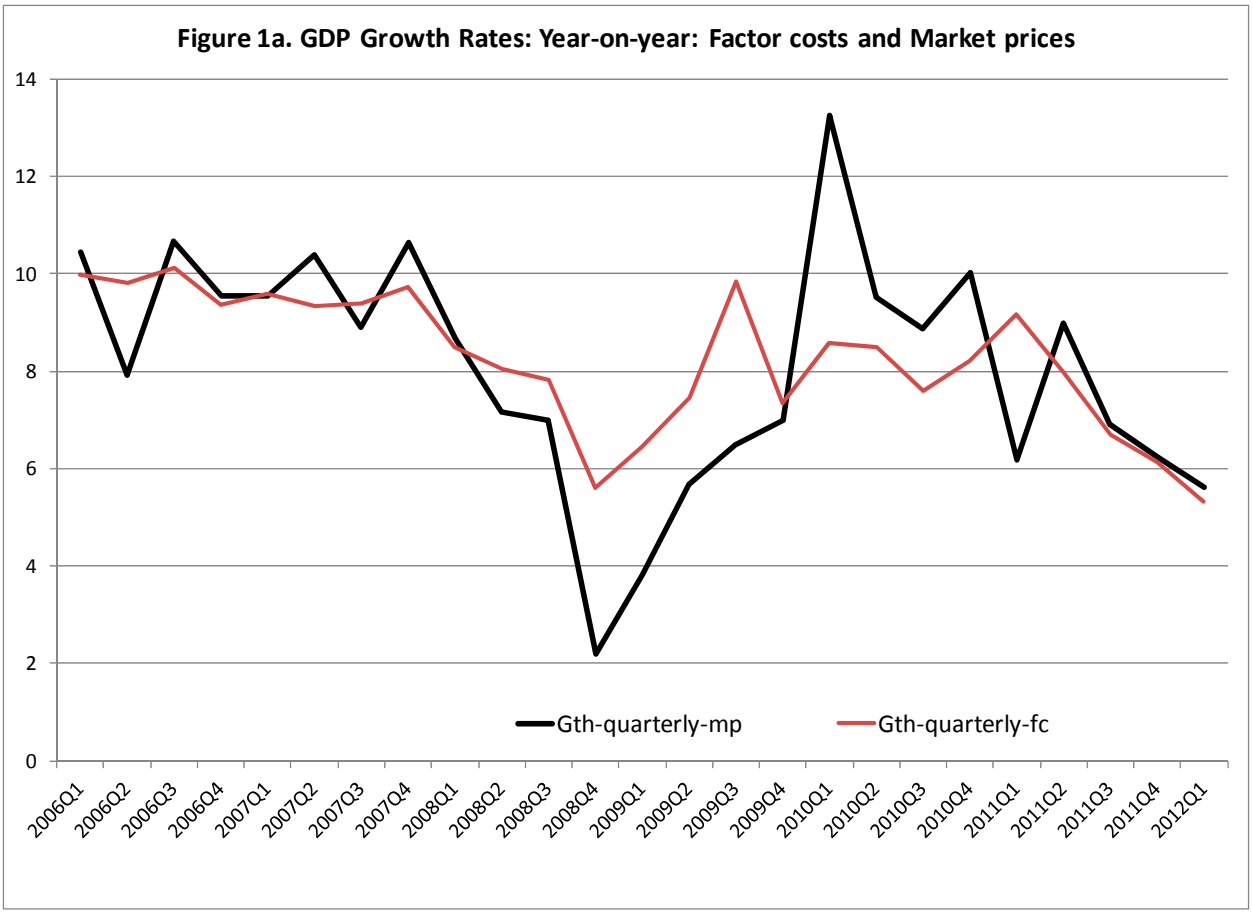
Goyal, Rishi (2010), "Potential Growth and Output Gaps in Brazil", Selected Issues Paper, Article IV Consultation, Brazil.

Ljung, L. (1999), "System Identification: Theory for the User," Prentice-Hall: New Jersey

Okun, Arthur, M. The Political Economy of Prosperity.Washington, DC: Brookings Institution, 1970.

Rodrik, Dani & Arvind Subramanian (2005). "From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition," IMF Staff Papers, Palgrave Macmillan Journals, vol. 52(2), pages 193-228, September.

FIGURES AND TABLES



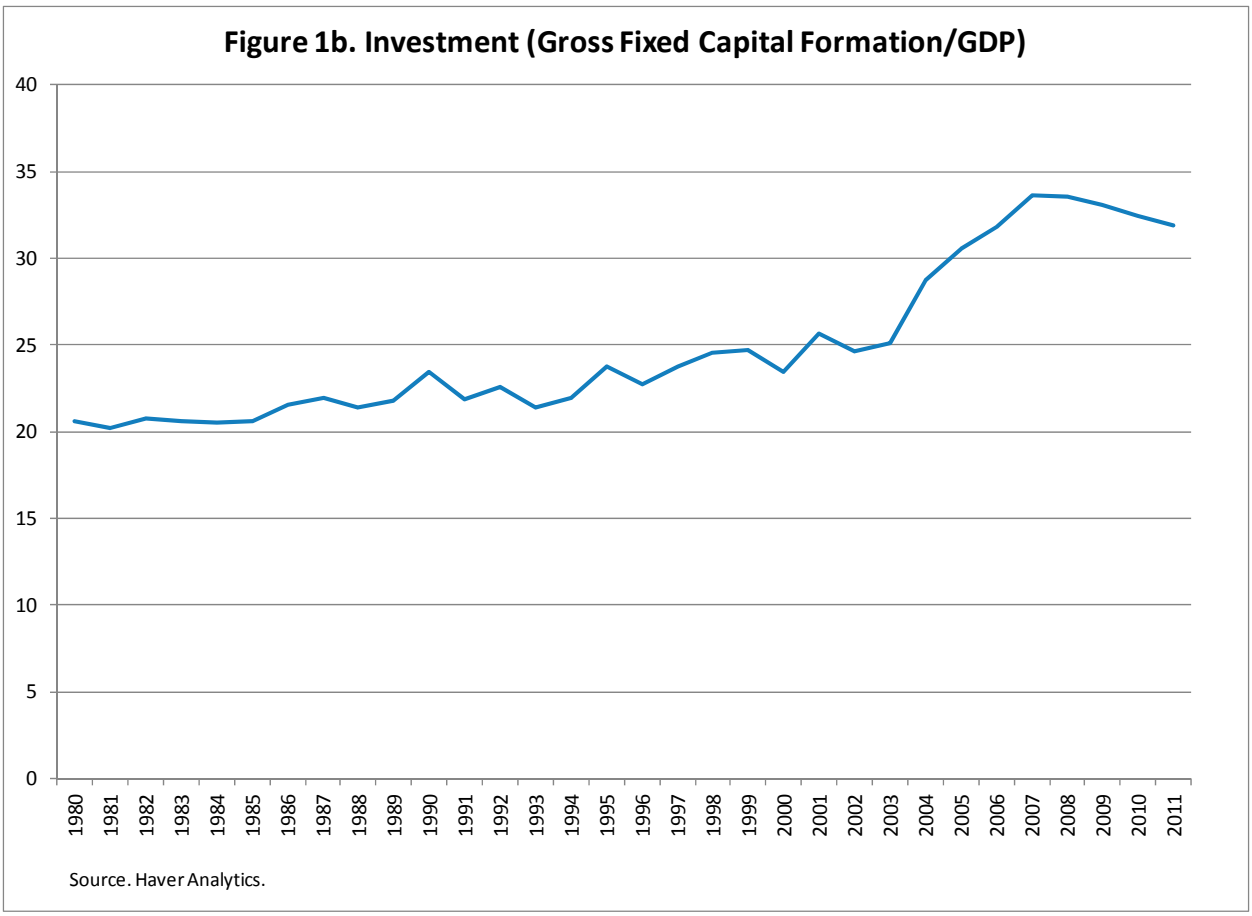
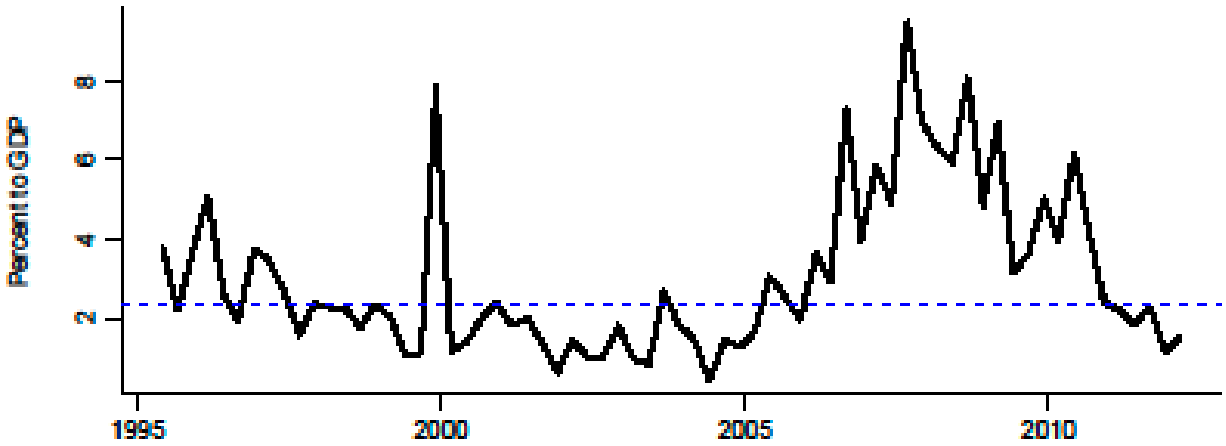


Figure 1c. New Infrastructure Projects (in % of GDP)



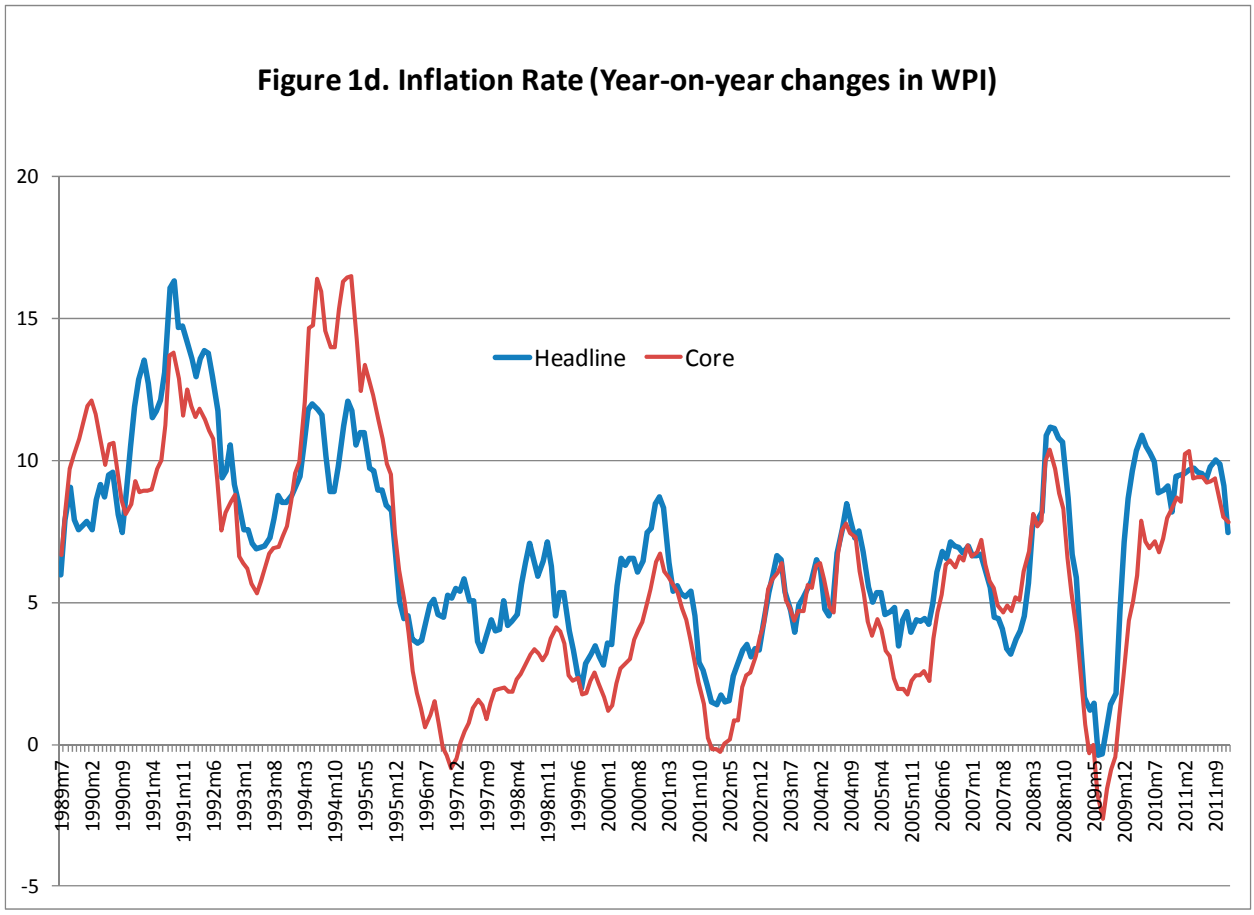
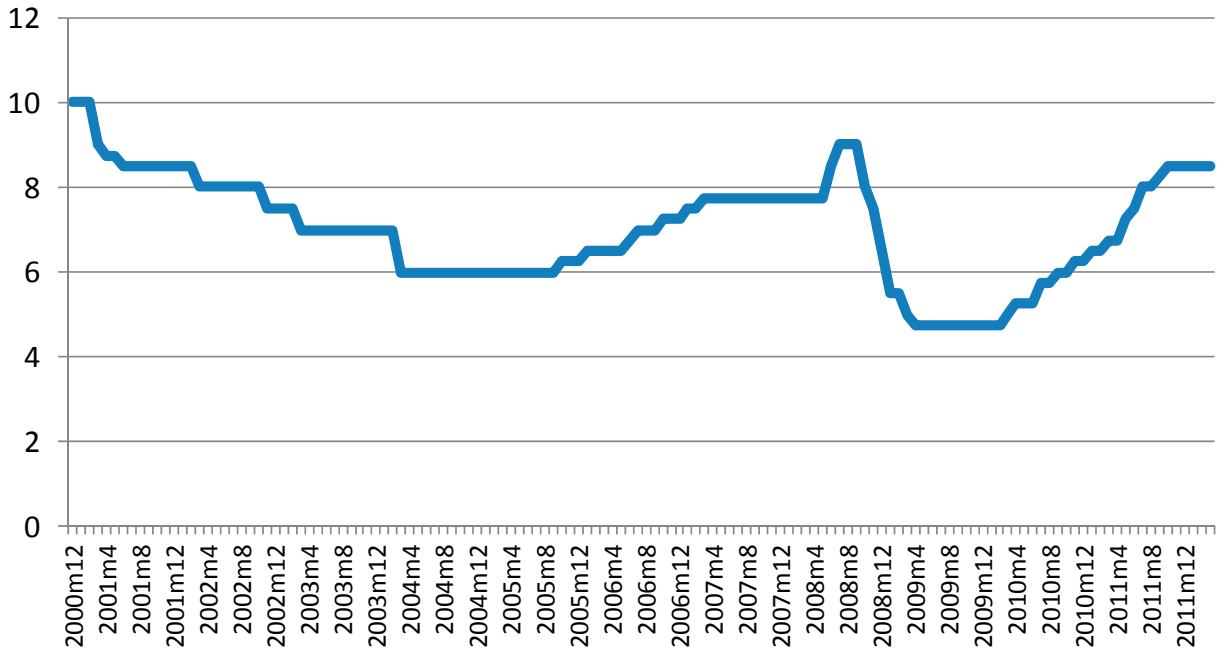


Figure 1d. Inflation Rate (Year-on-year changes in WPI)
20
15
10
5
0
-5
Headline
Core
1989m7
1990m2
1990m9
1991m4
1991m11
1992m6
1993m1
1993m8
1994m3
1994m10
1995m5
1995m12
1996m7
1997m2
1997m9
1998m4
1998m11
1999m6
2000m1
2000m8
2001m3
2001m10
2002m5
2002m12
2003m7
2004m2
2004m9
2005m4
2005m11
2006m6
2007m1
2007m8
2008m3
2008m10
2009m5
2009m12
2010m7
2011m2
2011m9

Figure 1e: Monetary Policy Stance in India



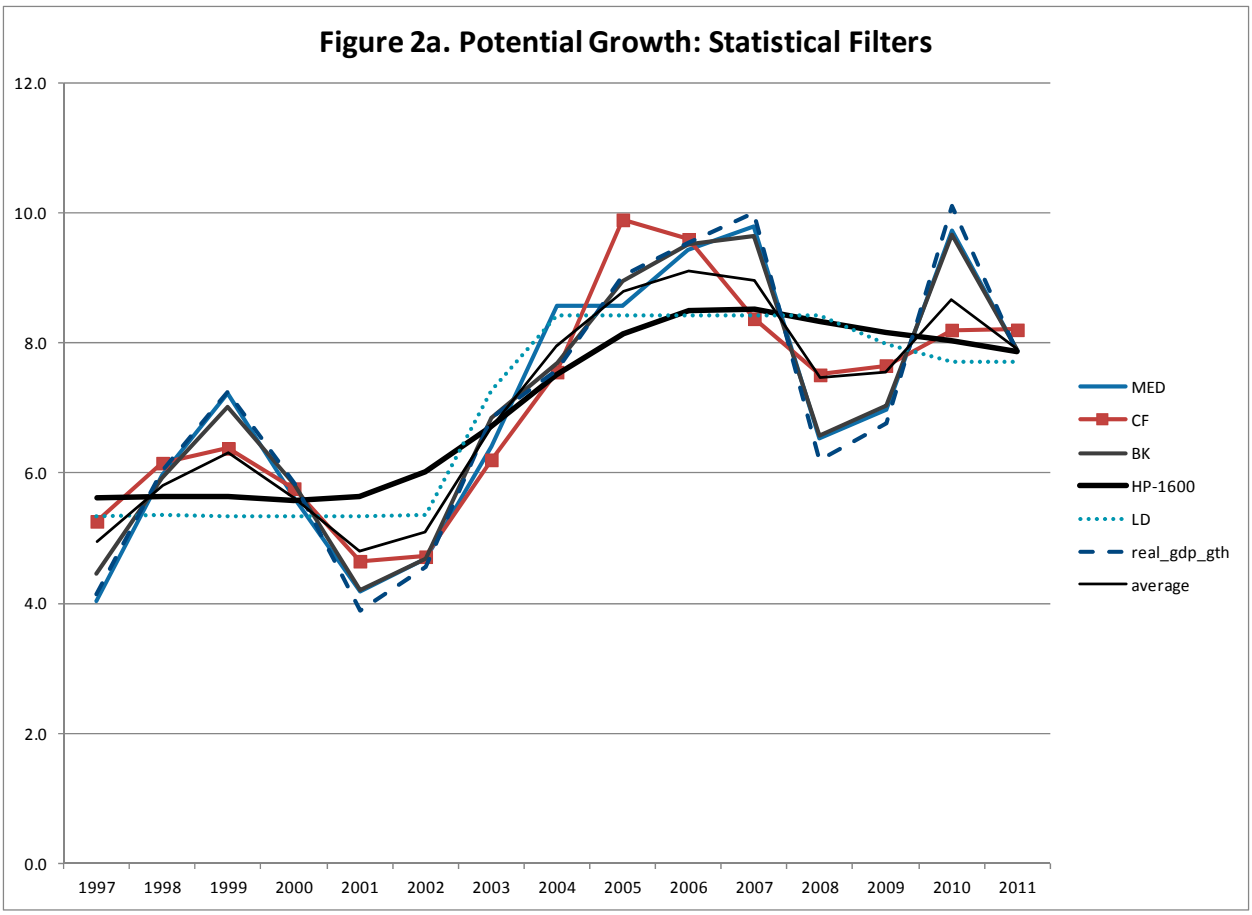


Figure 2a. Potential Growth: Statistical Filters
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
MED
CF
BK
HP-1600
LD
real_gdp_gth
average

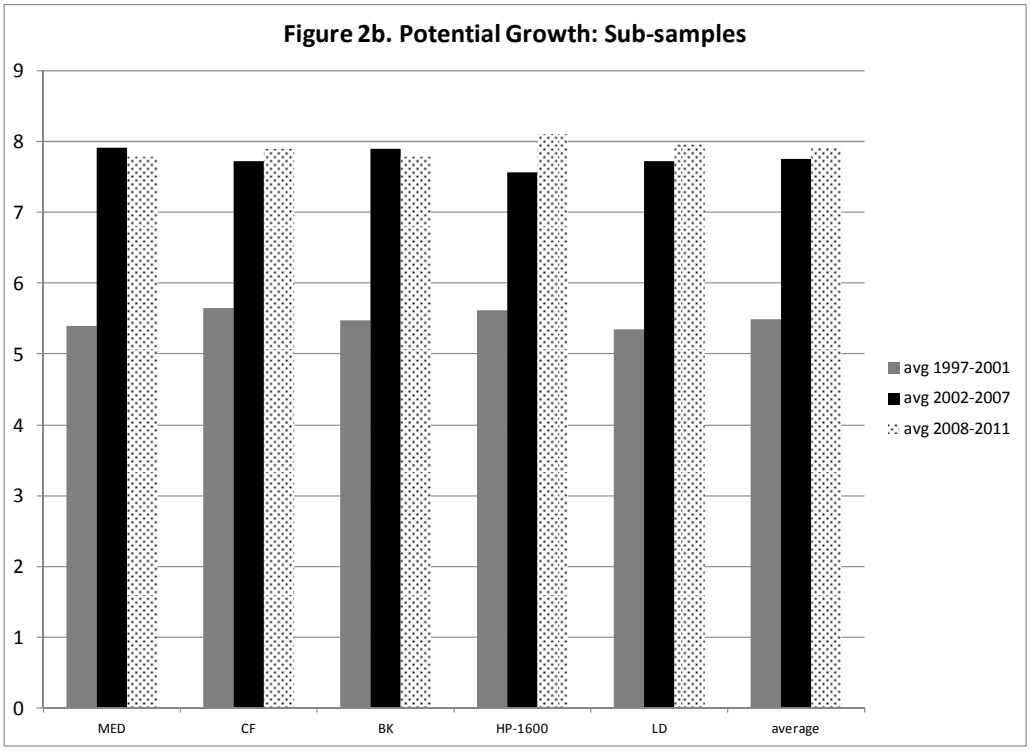
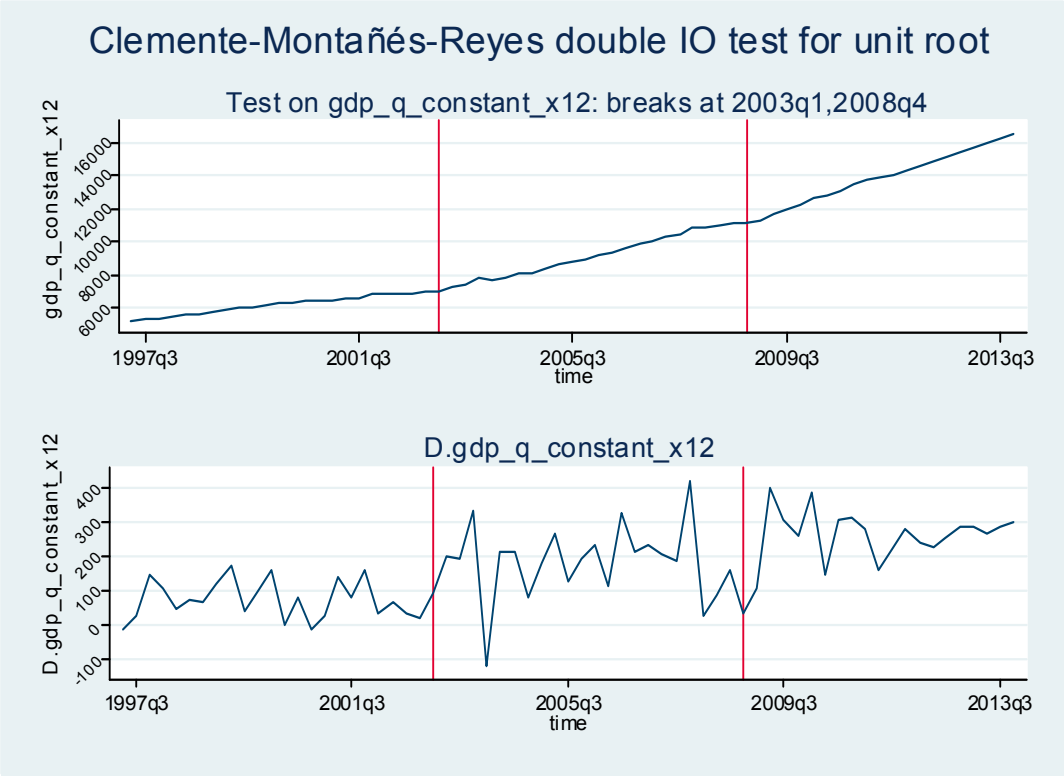


Figure 2b. Potential Growth: Sub-samples
9
8
7
6
5
4
3
2
1
0
MED
CF
BK
HP-1600
LD
average
avg 1997-2001
avg 2002-2007
avg 2008-2011

Figure 2c: Test for Structural Break in Real GDP



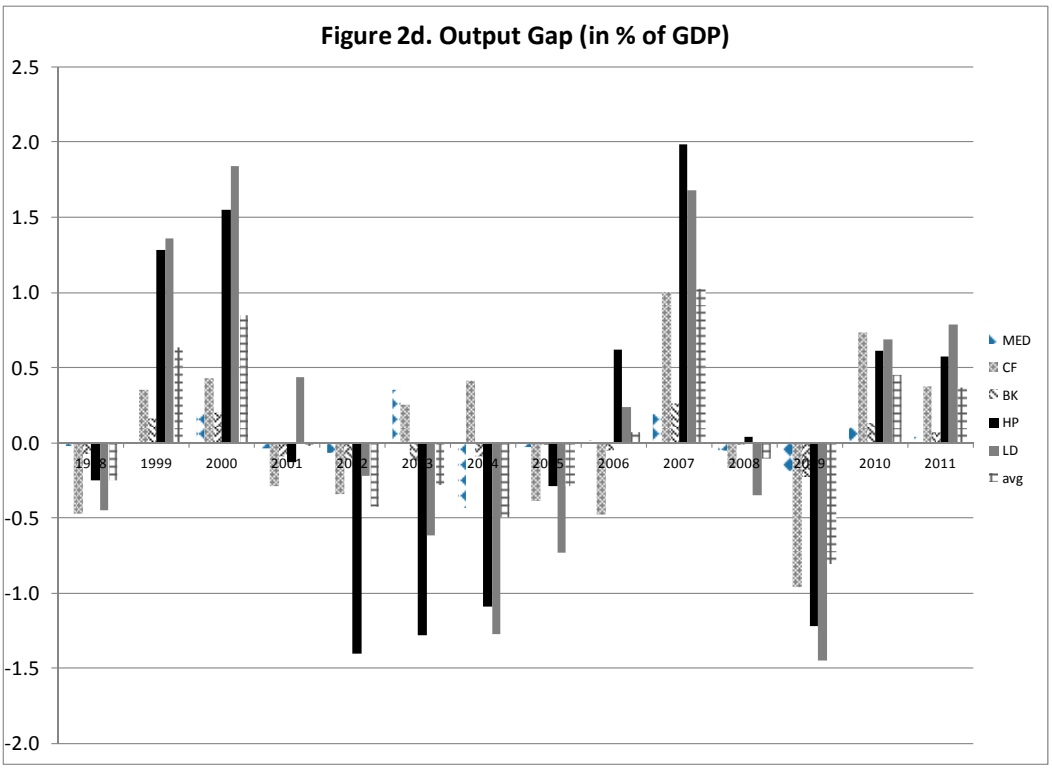


Figure 2d. Output Gap (in % of GDP)
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
1999
2000
2001
2010
2011
MED
CF
BK
HP
LD
avg

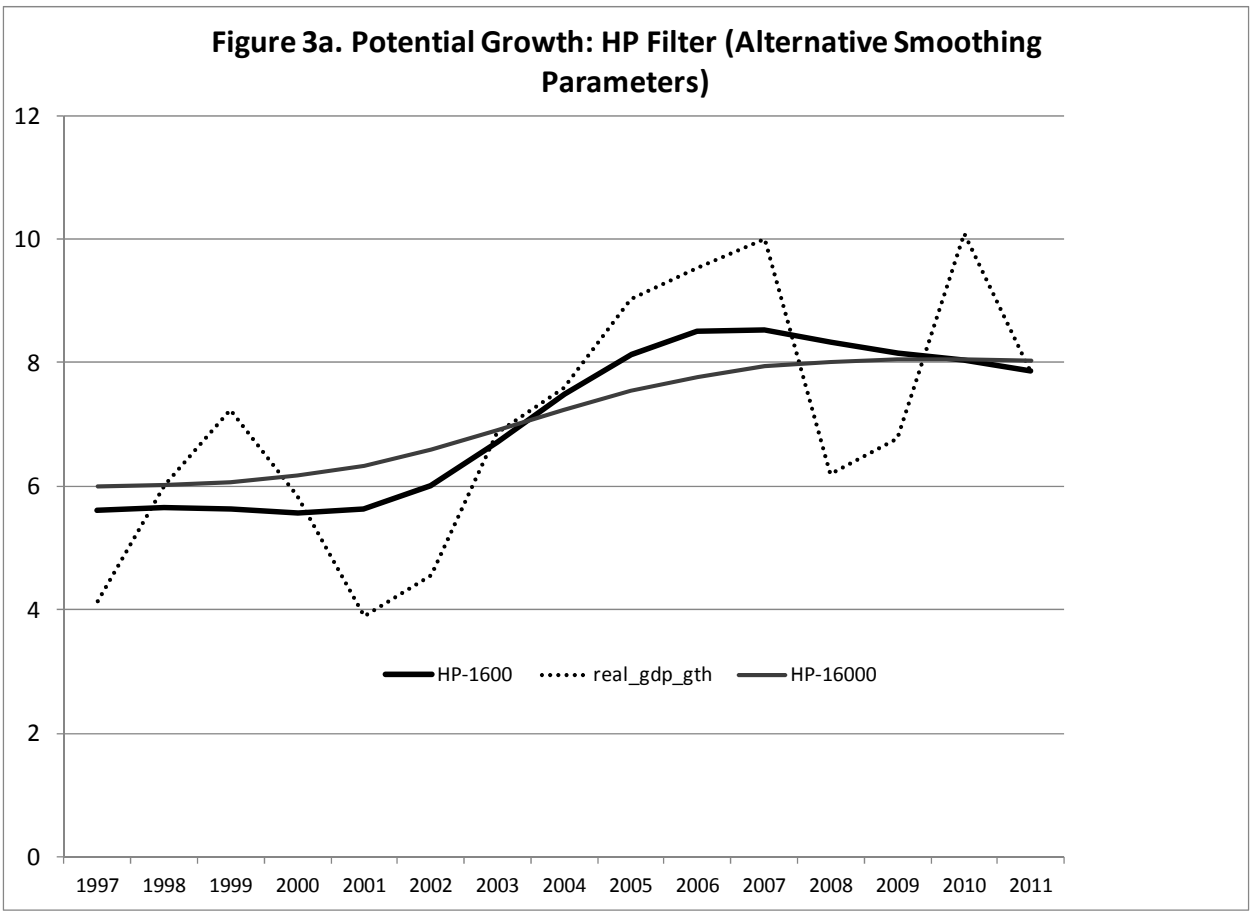


Figure 3a. Potential Growth: HP Filter (Alternative Smoothing Parameters)
12
10
8
6
4
2
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
HP-1600
real_gdp_gth
HP-16000

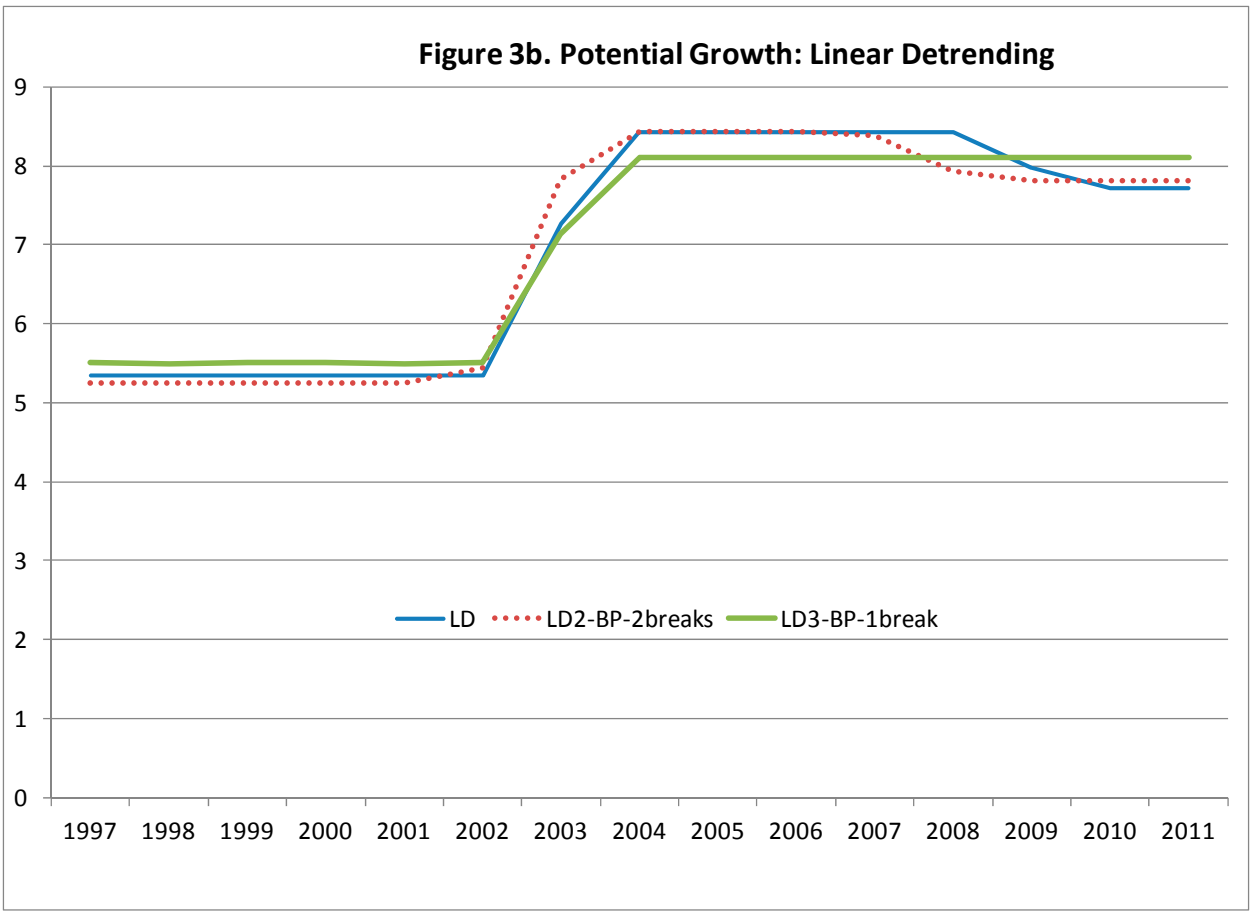
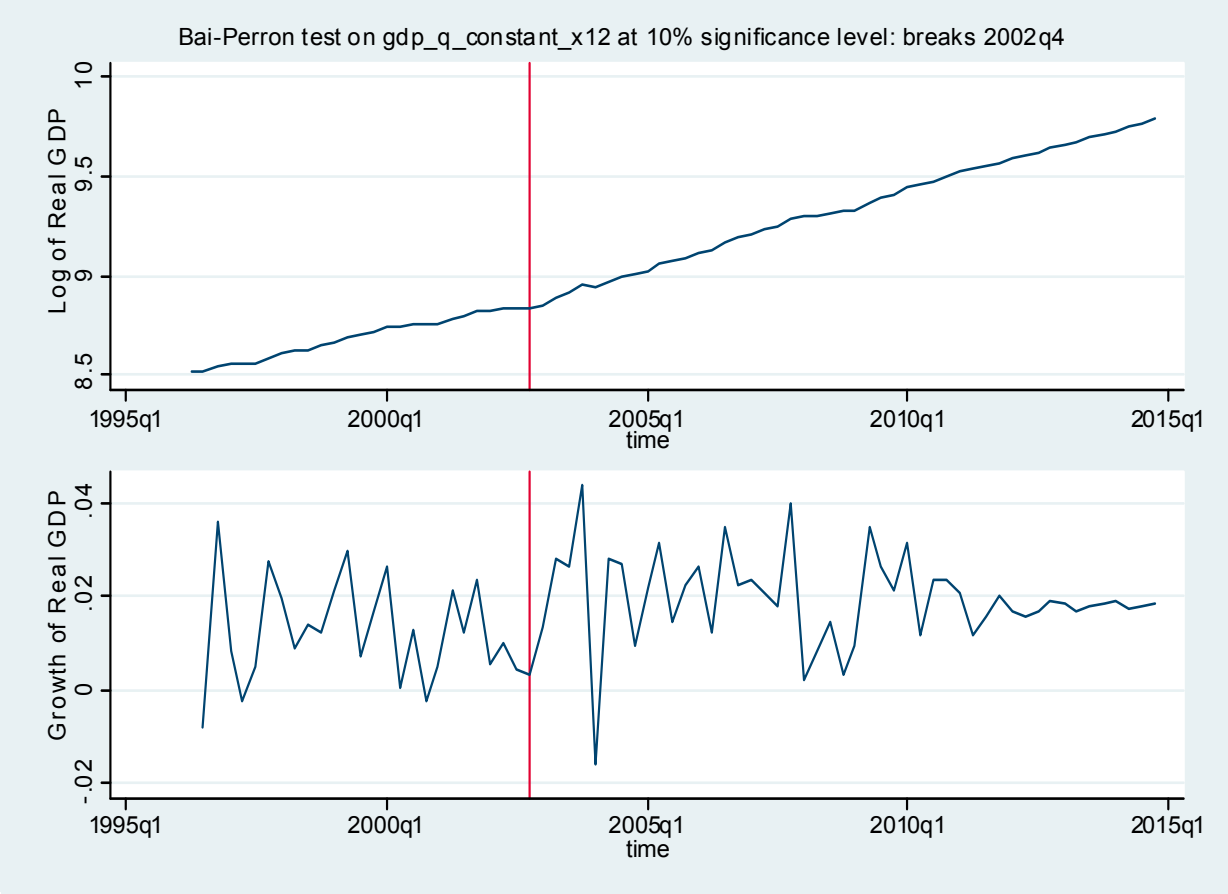


Figure 3b. Potential Growth: Linear Detrending
9
8
7
6
5
4
3
2
1
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
LD
LD2-BP-2breaks
LD3-BP-1break

Figure 3c: Bai-Perron Tests: Two Breaks in Real GDP

Figure 3d. Bai-Perron Tests: Two Breaks in Real GDP



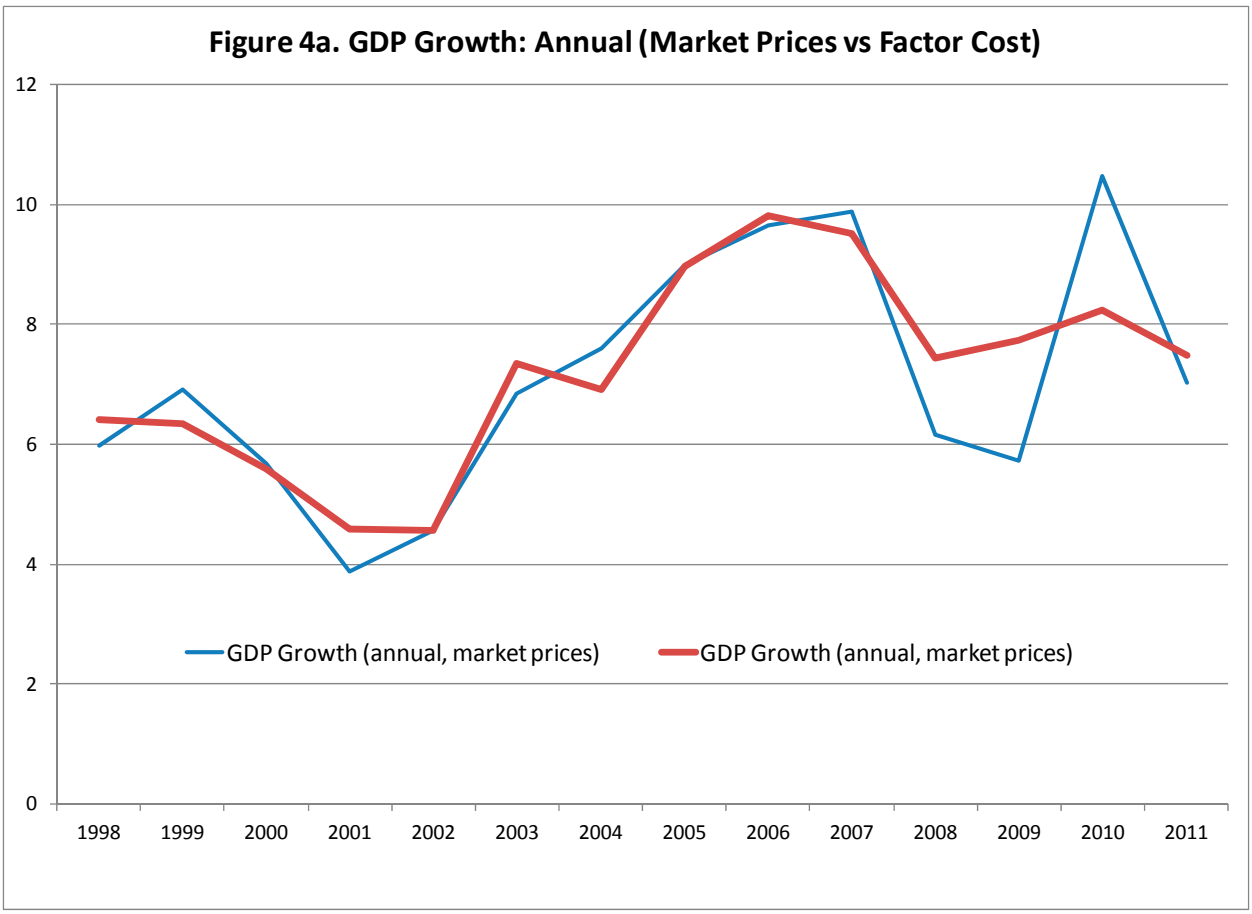


Figure 4a. GDP Growth: Annual (Market Prices vs Factor Cost)
12
10
8
6
4
2
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
GDP Growth (annual, market prices)
GDP Growth (annual, market prices)

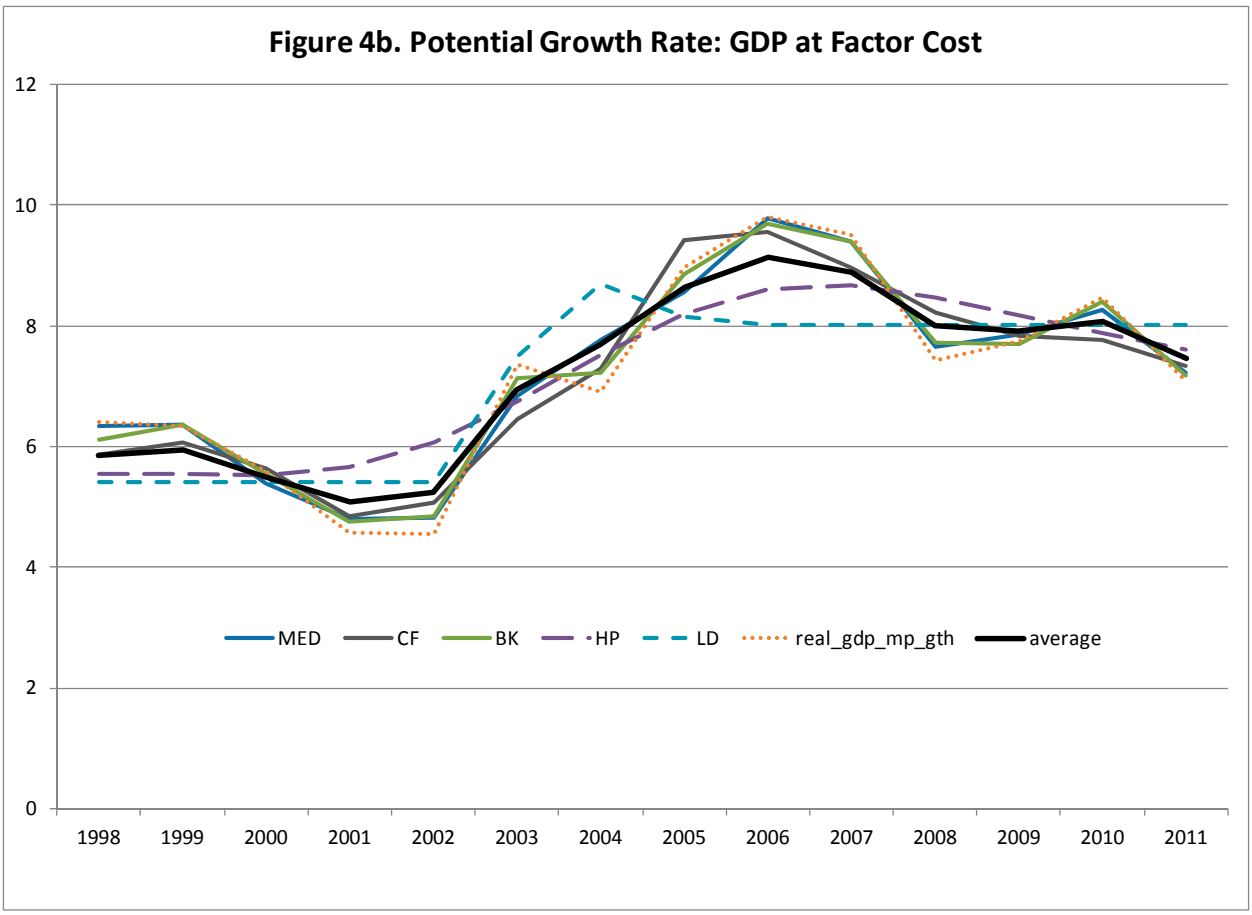


Figure 4b. Potential Growth Rate: GDP at Factor Cost
12
10
8
6
4
2
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
MED
CF
BK
HP
LD
real_gdp_mp_gth
average

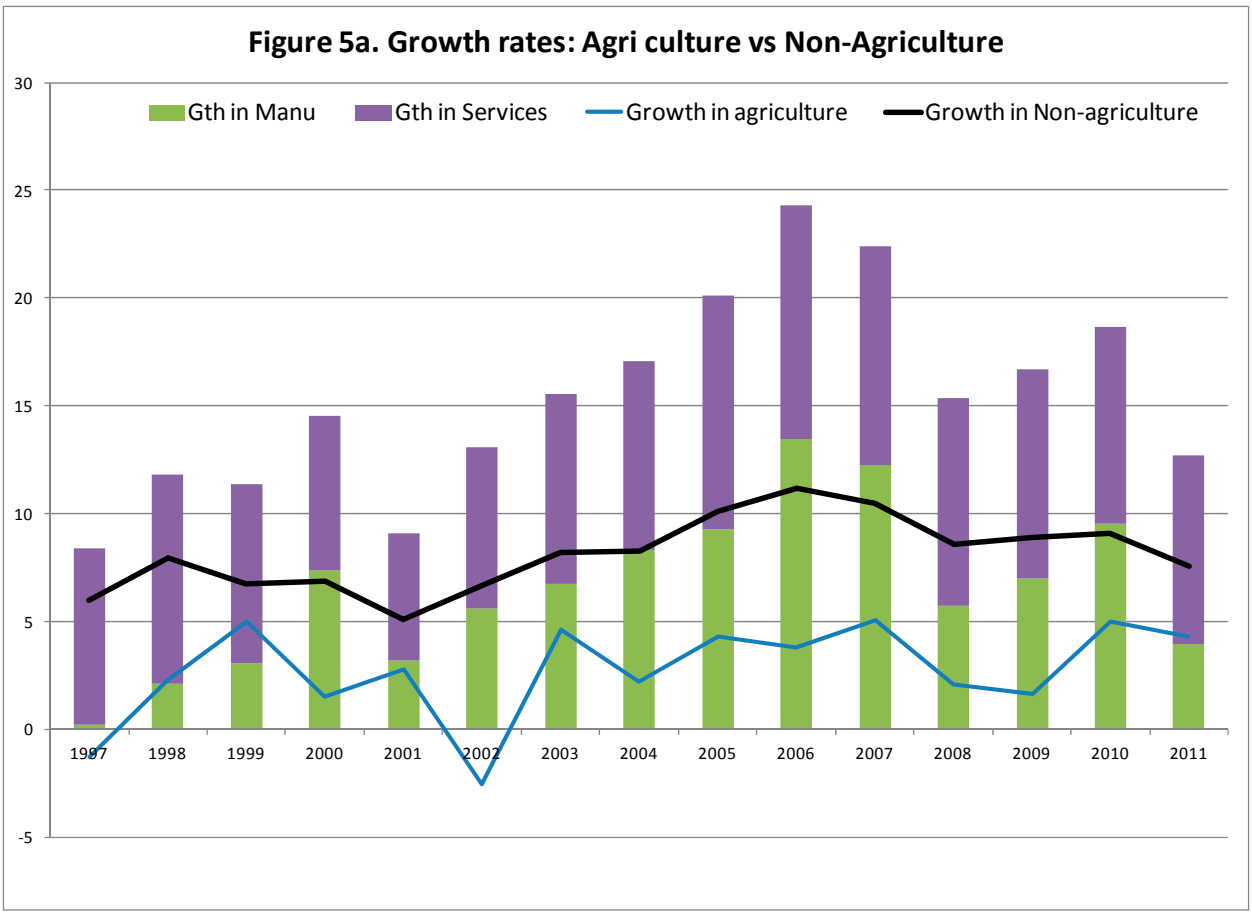


Figure 5a. Growth rates: Agri culture vs Non-Agriculture
Gth in Manu
Gth in Services
Growth in agriculture
Growth in Non-agriculture
30
25
20
15
10
5
0
-5
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

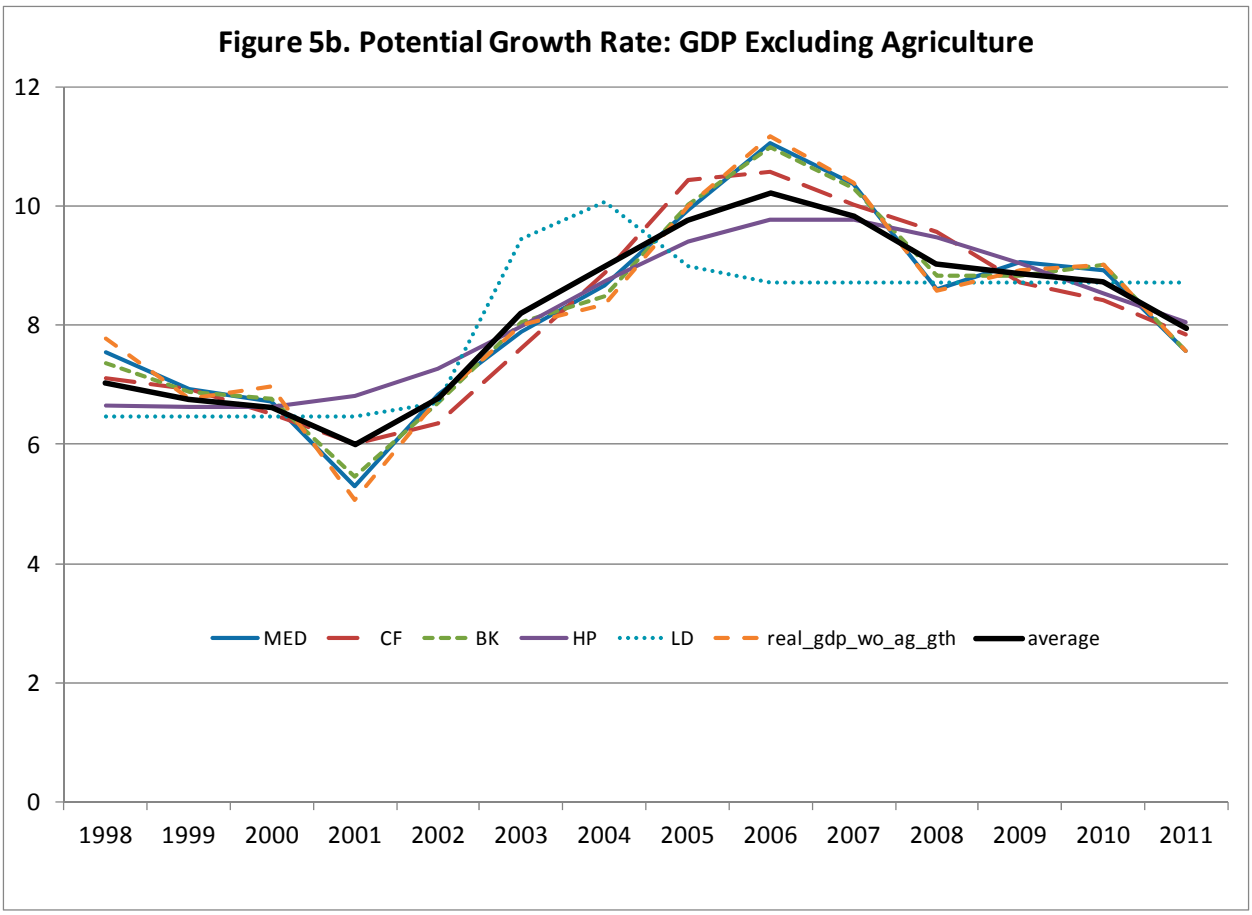


Figure 5b. Potential Growth Rate: GDP Excluding Agriculture
12
10
8
6
4
2
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
MED
CF
BK
HP
LD
real_gdp_wo_ag_gth
average

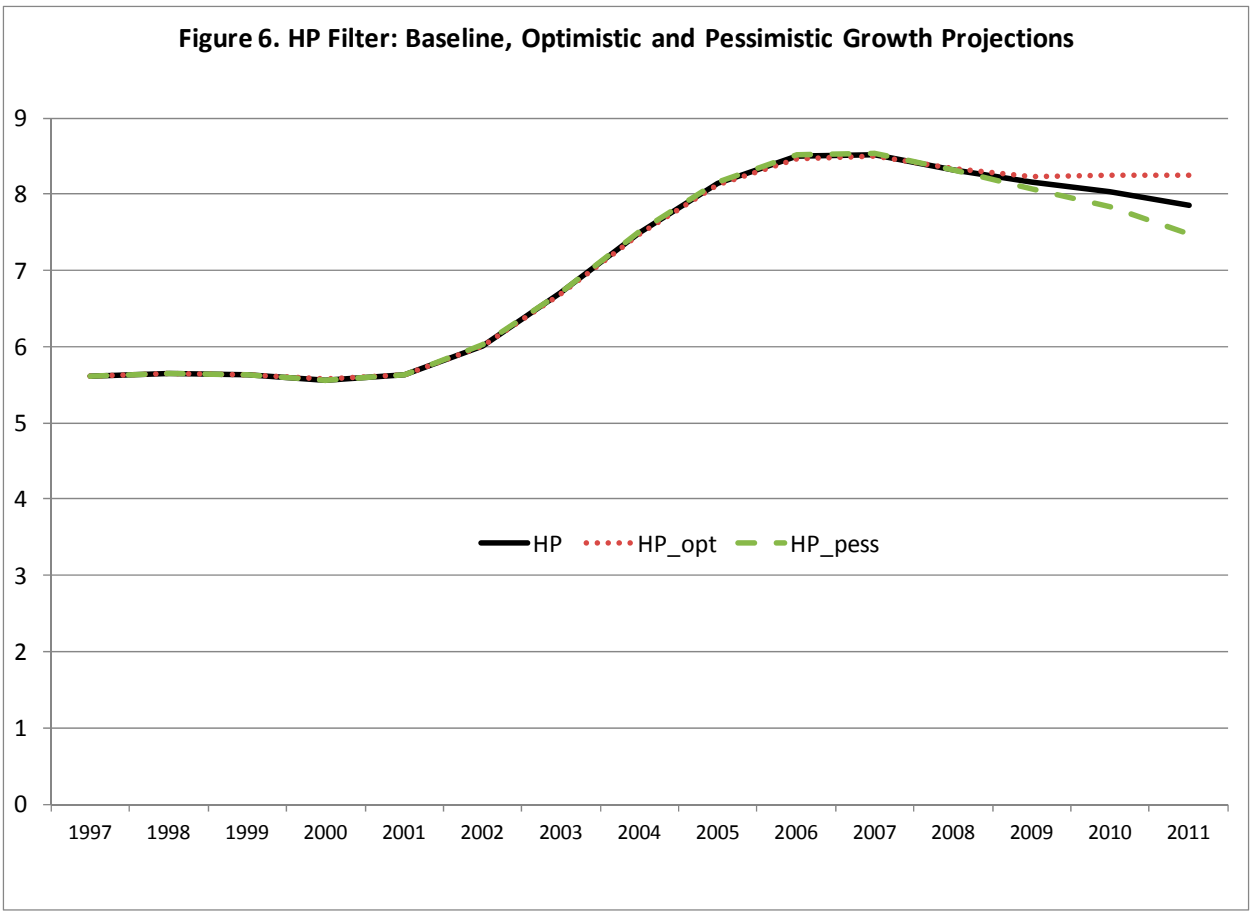
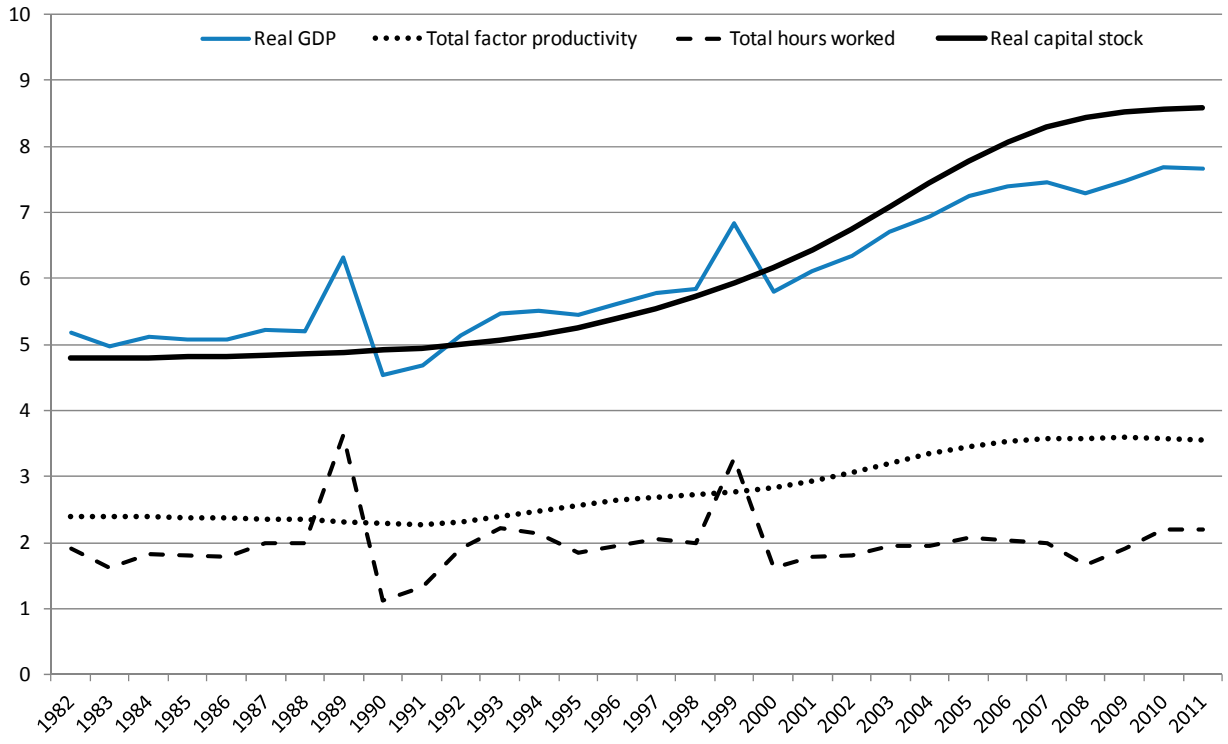


Figure 6. HP Filter: Baseline, Optimistic and Pessimistic Growth Projections
9
8
7
6
5
4
3
2
1
0
HP
HP_opt
HP_pess
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

Figure 7a. India: Average trend growth in GDP and its components: 1991-2011



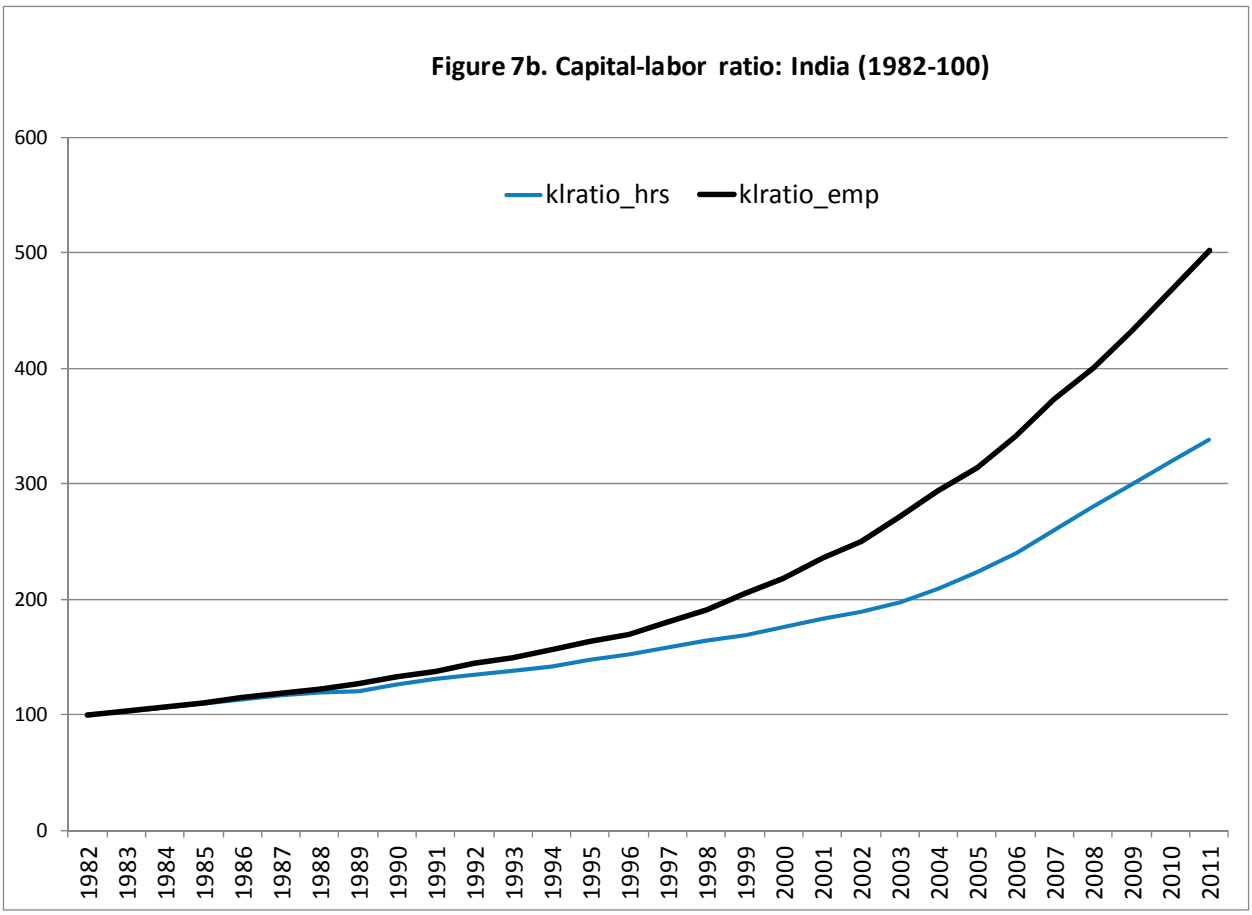


Figure 7b. Capital-labor ratio: India (1982-100)
klratio_hrs
klratio_emp
600
500
400
300
200
100
0
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

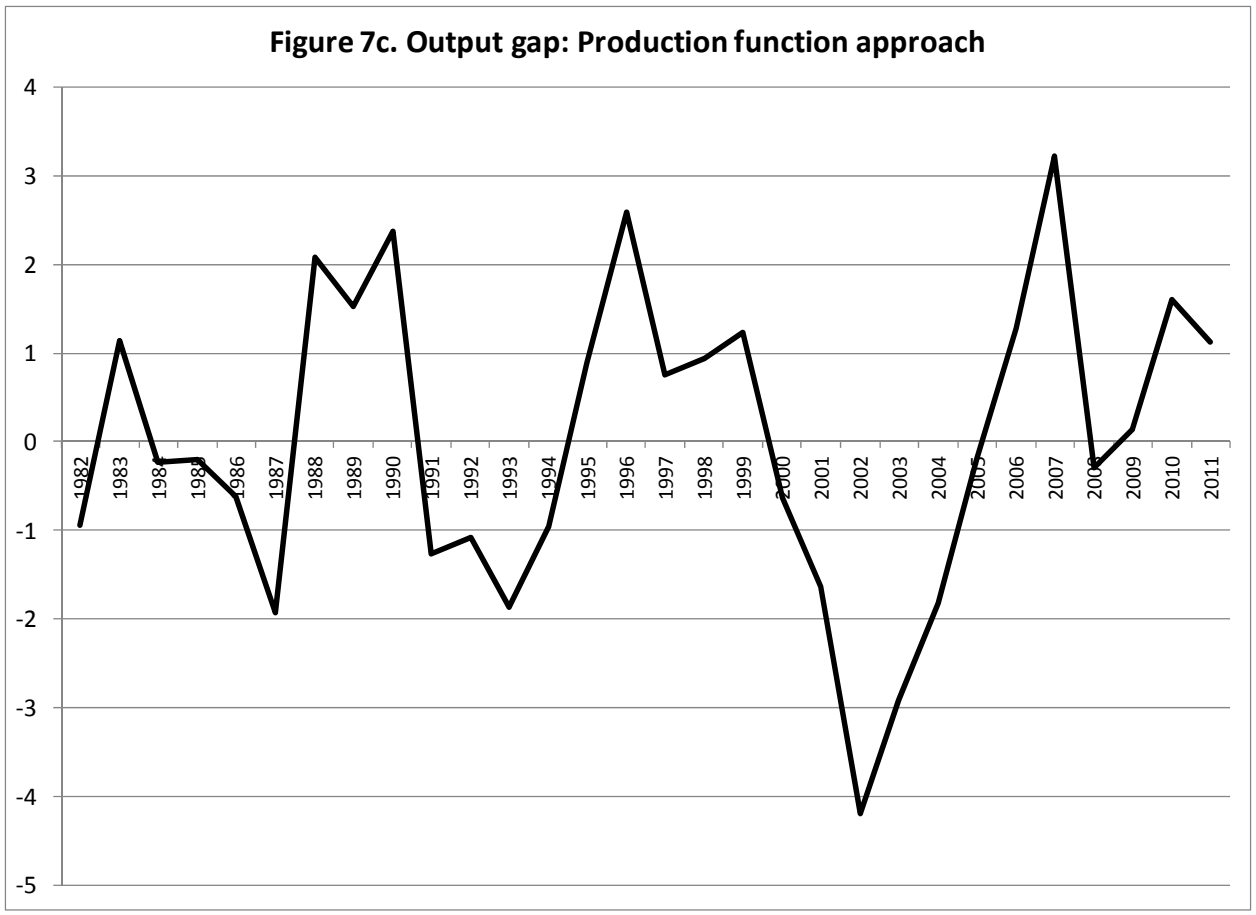


Figure 7c. Output gap: Production function approach
4
3
2
1
0
-1
-2
-3
-4
-5
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

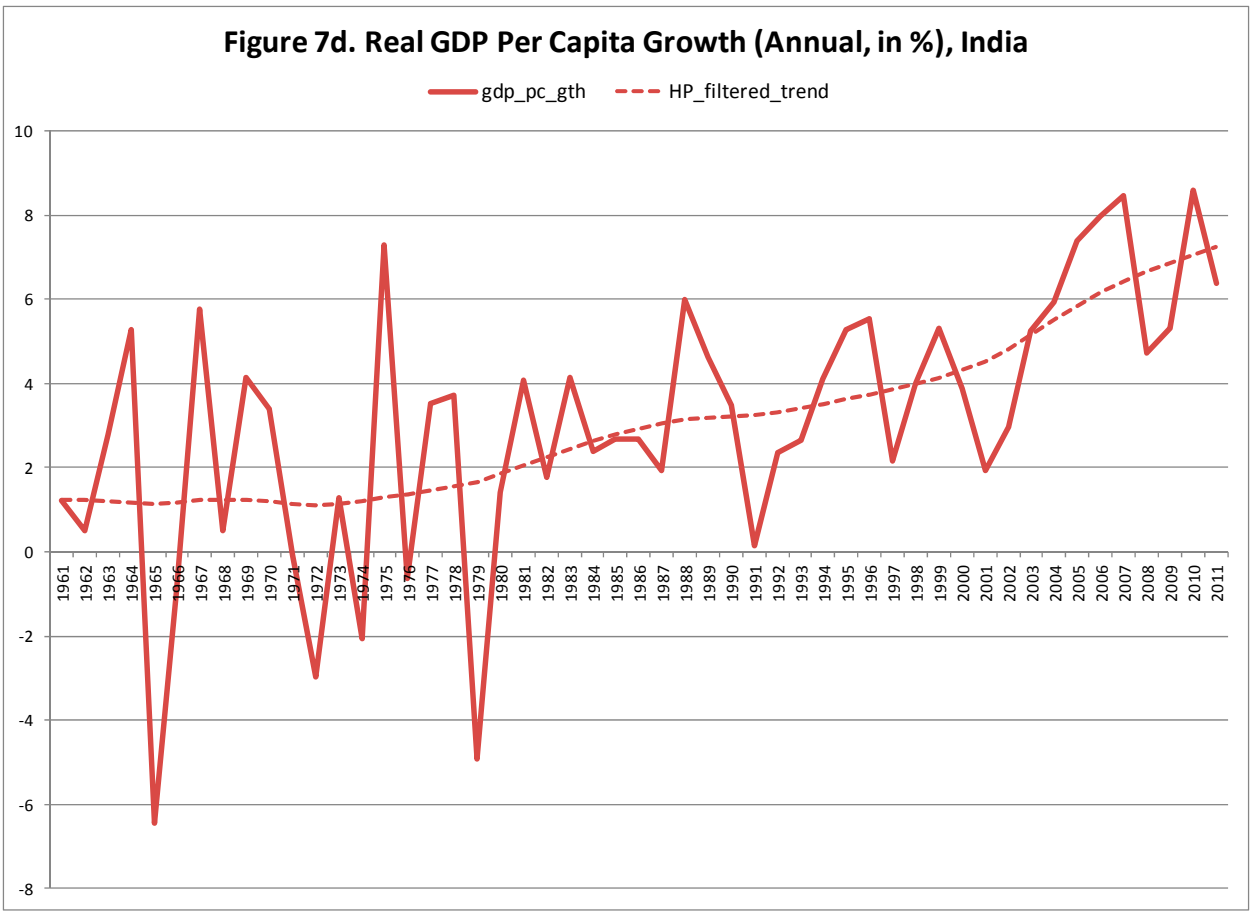


Figure 7d. Real GDP Per Capita Growth (Annual, in %), India
gdp_pc_gth
HP_filtered_trend
10
8
6
4
2
0
-2
-4
-6
-8
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
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2000
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2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

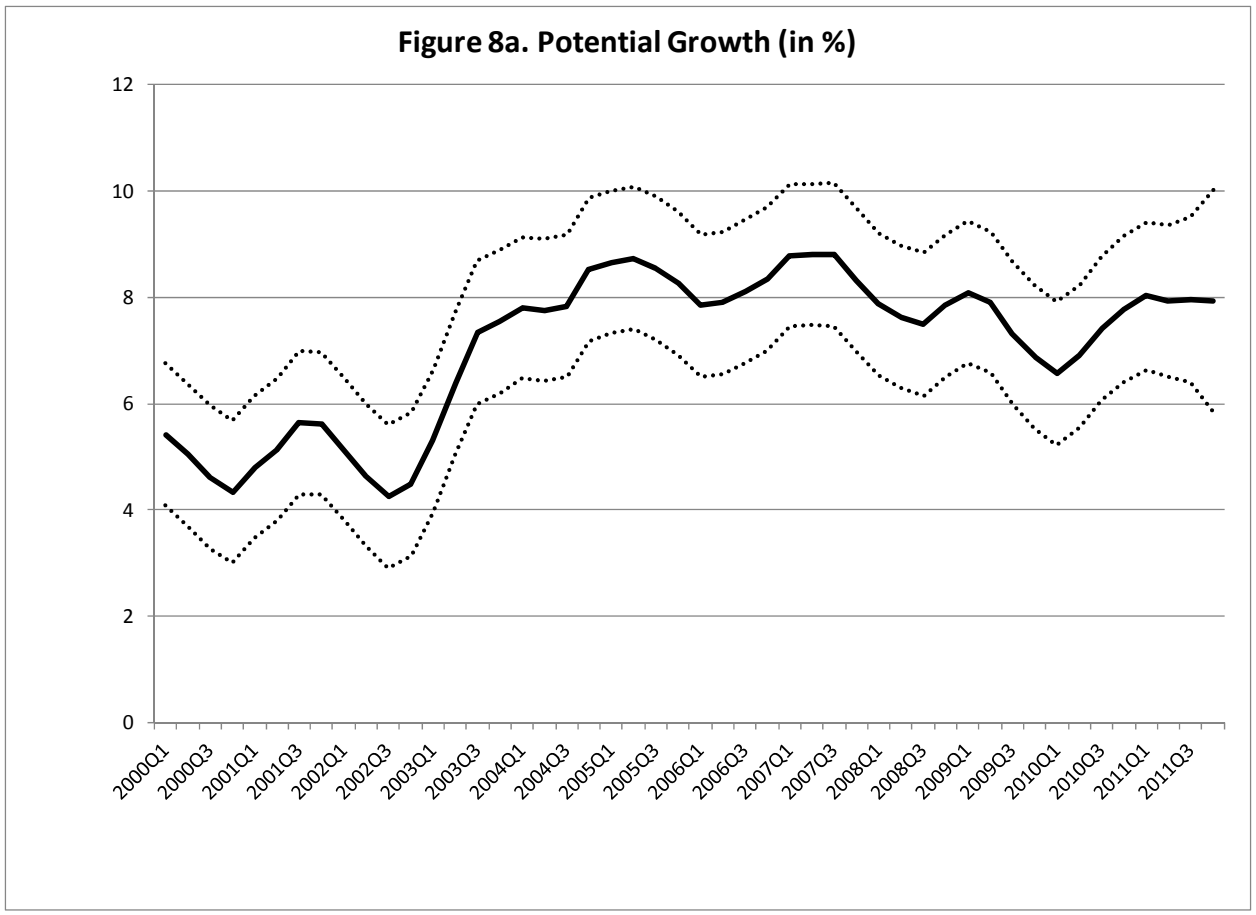


Figure 8a. Potential Growth (in %)
12
10
8
6
4
2
0
2000Q1
2000Q3
2001Q1
2001Q3
2002Q1
2002Q3
2003Q1
2003Q3
2004Q1
2004Q3
2005Q1
2005Q3
2006Q1
2006Q3
2007Q1
2007Q3
2008Q1
2008Q3
2009Q1
2009Q3
2010Q1
2010Q3
2011Q1
2011Q3

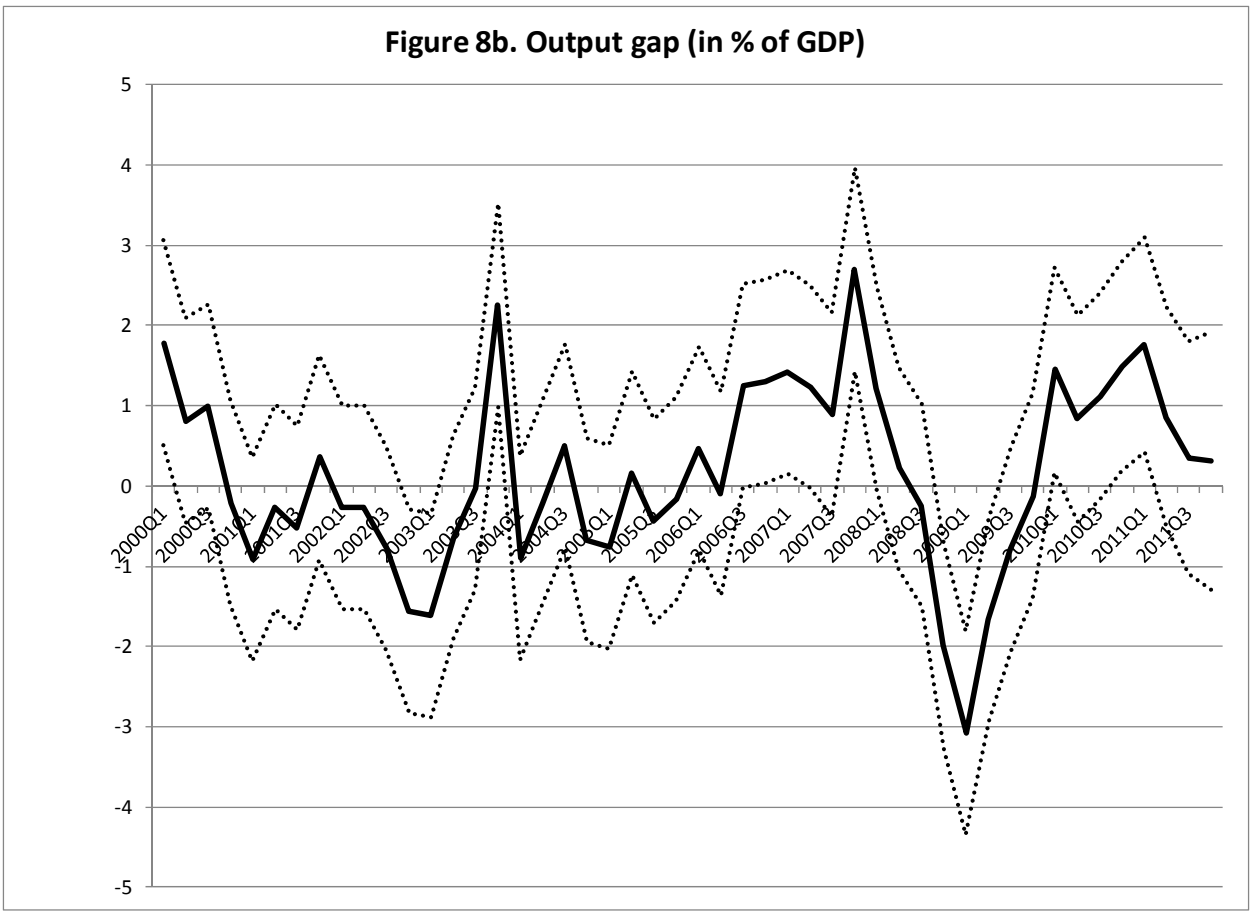
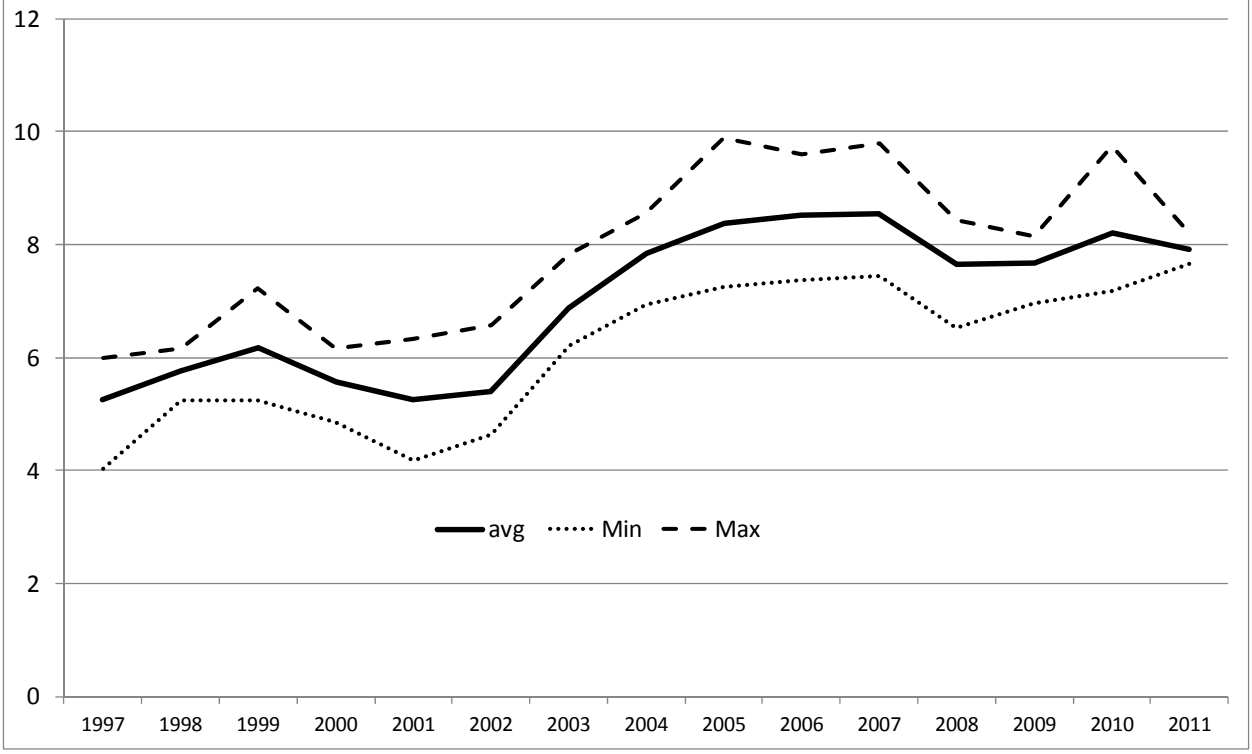


Figure 8b. Output gap (in % of GDP)
5
4
3
2
1
0
-1
-2
-3
-4
-5
2000Q1
2000Q3
2001Q1
2001Q3
2002Q1
2002Q3
2003Q1
2003Q3
2004Q1
2004Q3
2005Q1
2005Q3
2006Q1
2006Q3
2007Q1
2007Q3
2008Q1
2008Q3
2009Q1
2009Q3
2010Q1
2010Q3
2011Q1
2011Q3

Figure 9a.
Potential Growth: Range of Estimates (in %)



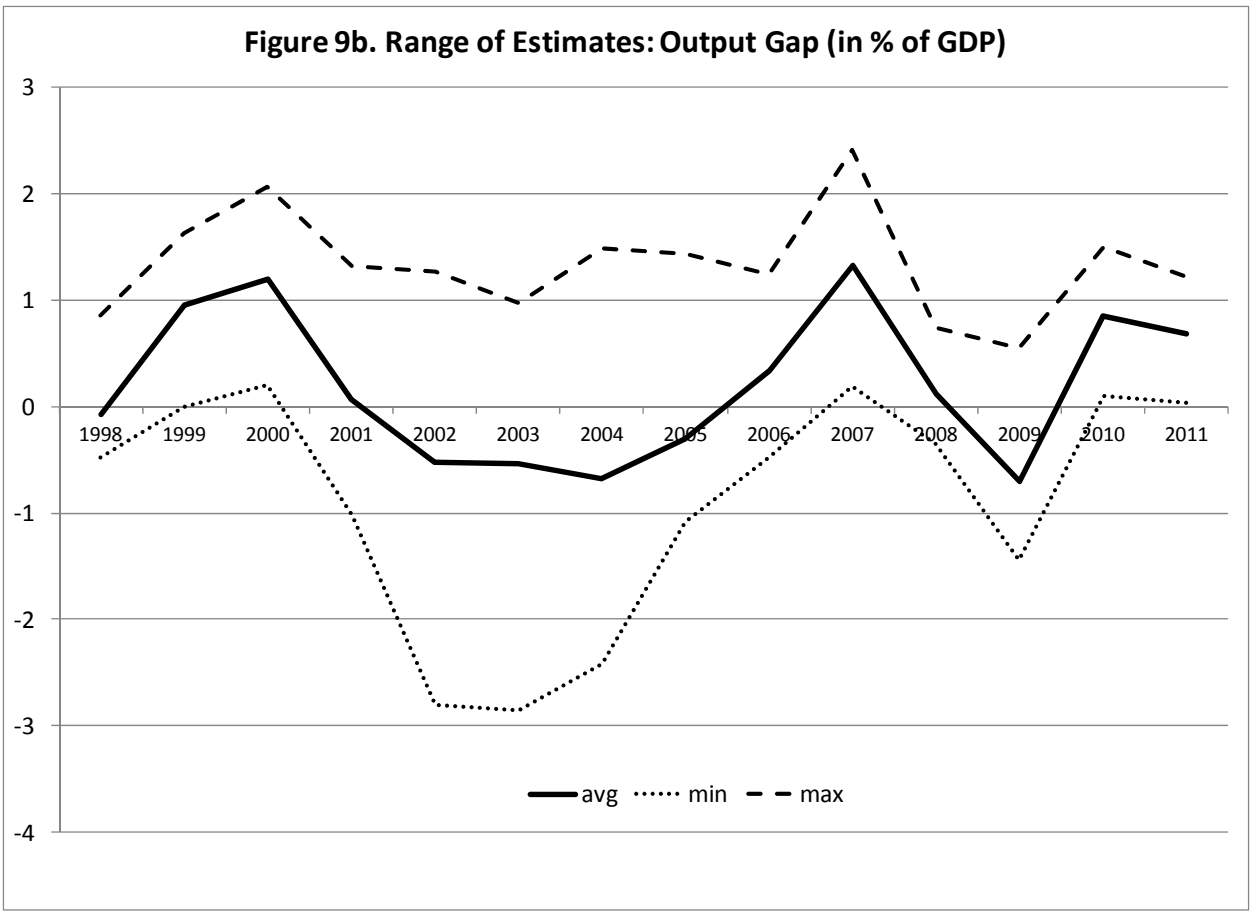


Figure 9b. Range of Estimates: Output Gap (in % of GDP)
3
2
1
0
-1
-2
-3
-4
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
avg
min
max

Table 1. India: GDP Growth and its Components, 1982-2011

	Real GDP	TFP	Total hours	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
1997-01	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

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
1997-01	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