Decoding the 8% Growth Target

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Abstract

The Planning Commission has announced an average GDP growth target of 8% for the Twelfth Five Year Plan period which runs from 2012/13 to 2016/17. While it is not as high as the 9% envisioned over a year back, it has not been dragged down to the sub-7% levels which some allude to as the 'new potential' of the economy. With the 8% target, the Commission seems to strike a balance between the current and the aspirational. In this paper, we disaggregate the 8% growth target into what could be achieved through a business-as-usual approach and what would need added effort. We outline a simple Cobb-Douglas production function model which decodes India's growth over the last two decades and helps us outline alternate paths to the 8% target. We discuss a variety of 'extreme' paths of growth which depend heavily on one particular input at a time. We then go on to outline a more plausible and balanced path, and discuss the key challenges surrounding it. We conclude that 8% growth will neither come automatically nor easily, but what needs to be set right to achieve it over the next five years is clearly known.

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I. Growth Experience in the Past

It is well recognized that high growth not only needs rapid growth in inputs such as physical and human capital, but also a high growth rate of Total Factor Productivity (TFP). TFP is not only driven by technological change, but includes the impact of policy environment, institutional infrastructure, transaction costs, level of financial intermediation, terms-of-trade shocks, etc. Anything that is not associated with the two inputs of production is captured by TFP. Put simply, growth in TFP is a combination of pure technical progress and the ability to utilise inputs more efficiently, the latter often being made possible by productivity enhancing economic and institutional reforms. In fact, much of the impact of the reform agenda pursued since 1991 has manifested itself through an increase in TFP.

In accounting for the sources of growth, we calibrate the Cobb-Douglas production function to fit the economy's growth path[2]. GDP is assumed to be produced by combining physical capital, human capital and labor, operated at the economy's overall level of productivity. The measure of productivity is the total factor productivity, measured as the "residual" not accounted for by the accumulation of physical or human capital.

$$Y = AK^{a} (HL)^{(1-a)} \qquad (1)$$

Where

Y: Real Gross Domestic Product at Factor Cost [Data source: CSO]

A: Total factor productivity [Data source: Calculated as residual]

K: Real Net Fixed Capital Stock[3] [Data source: CSO]

L: Labor employment [Data source: NSSO, Current Daily Status]

H: Labor quality proxied by average years of education of the population aged 15 years and above [Data source: Barro & Lee]

α: Factor share of capital; **(1- α):** Factor share of labor

[2] While we outline our preferred production function specification in the main text of the paper, we also try a slightly different specification in the appendix. Our main conclusions remain unchanged across the two specifications.

[3] Estimated using a perpetual inventory model. *Net Fixed Capital Stock (Y) = Net Fixed Capital Stock (Y-1) + Gross Fixed Capital Formation (Y) – Consumption of Fixed Capital (Y)*

By taking the difference in natural logarithms of Equation (1), we can derive the contributions of various inputs to output growth.

$$\mathbf{A' = Y' - \alpha K' - (1-\alpha)H' - (1-\alpha)L'} \qquad (2)$$

where a dash above a variable denotes its time derivative

For the last two decades until 2011/12, we insert values for GDP, capital stock, labour and human capital to derive the TFP (A) as the residual. For the next five years (2012/13 to 2016/17), we insert different forecasts for TFP, capital stock, labour and human capital which give us an average GDP growth rate of 8%.

We assume competition in markets so that factor earnings are proportionate to the respective factor productivities. The shares of income paid to the factors are then used to measure their importance in the production process. Consistent measures of factor income are not available for individual countries, and we follow the generally accepted view that once statistical anomalies are corrected, the weights are similar across a broad range of countries[4]. Factor shares are assumed to be 0.33 for capital and 0.67 for labour, in line with the literature.

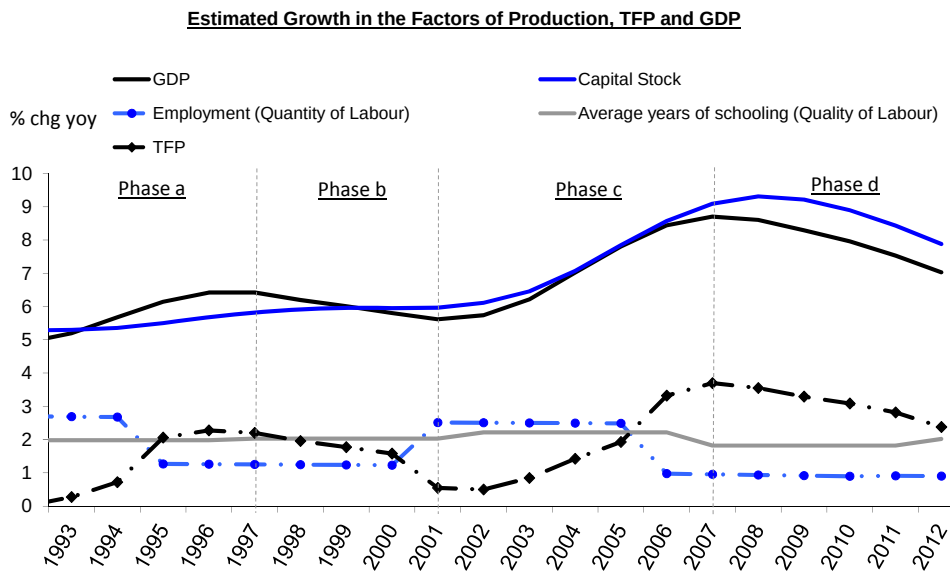
Data on GDP and capital stock are available on a yearly basis. We pass both these series through the Hodrick-Prescott filter to iron out cyclical variations and get a handle on the trend[5]. Data on labour employed and average years of schooling are only available for every five years and have been an impediment for a production function type analysis for India. To fill in these gaps, we extrapolate between the years using a constant growth rate. Another shortcoming of labour data is that the last available is 2009/10 for labour employed and 2010/11 for average years of schooling. To extend these two series till 2011/12, we use the same average annual growth rate as in the last five years for which the data is available.

Data on capital stock needs a special mention. We have time-series data on the net fixed capital stock, and by taking a first difference, we can calculate net fixed capital formation. We find that growth in net fixed capital formation correlates strongly with growth in gross fixed capital formation. This allows us to express our forecasts of net fixed capital stock as gross fixed capital formation.

[4] See Gollin (2002)

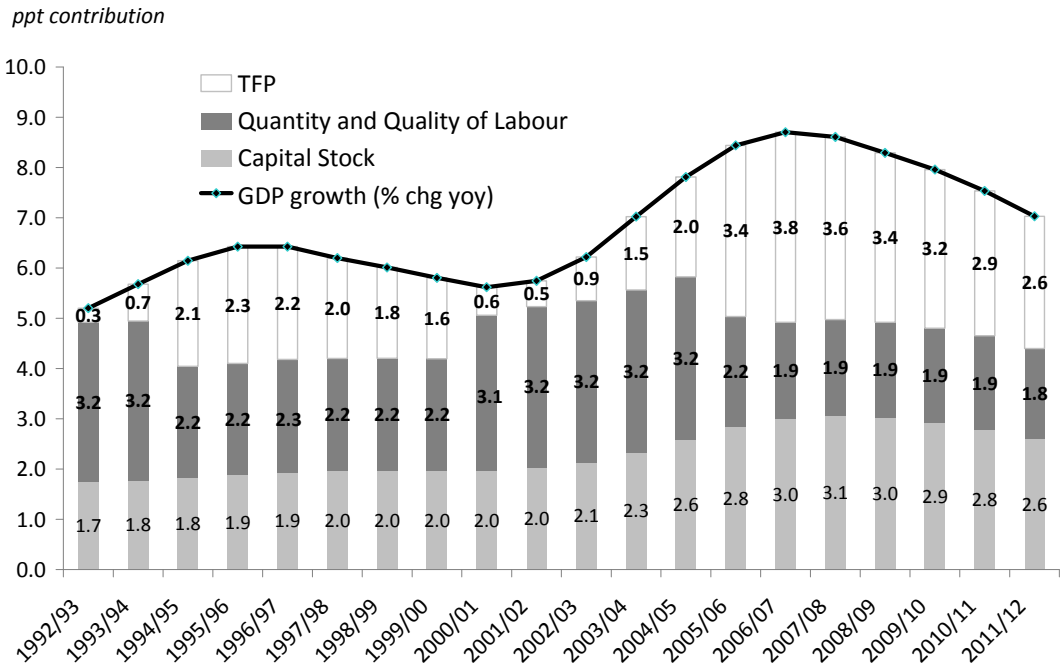
[5] We pass the annual GDP and capital formation series through a HP filter (of power 4) and then calculate growth rates.

Figure 1: Growth in TFP, labour and capital in different phases of GDP growth



Source: CEIC, CSO, NSSO, Barro&Lee database

Figure 2: Contribution of inputs to GDP growth over the last two decades



Source: CEIC, CSO, NSSO, Barro&Lee database

Figure 1 and 2 outline India's growth experience over the last two decades. Gradually rising GDP growth in the first six odd years of the 1990s was led mainly by a spurt in total factor productivity growth following the 1991

reforms **(phase a)**. As the effects started tapering off, growth moderated between the late 1990s and early 2000s **(phase b)**.

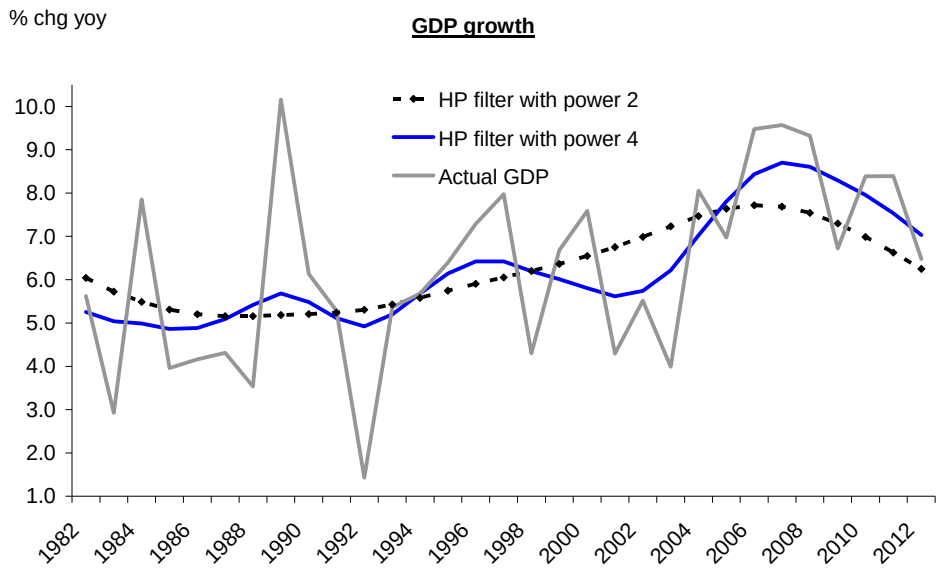
Thereafter came the big spurt in GDP growth led by an unparalleled growth in TFP and capital stock. Even the slow to change growth in labour employed showed an increase. With TFP and capital stock being the primary growth drivers, growth was driven by not just input accumulation but also efficiency gains and organizational changes **(phase c)**.

However, the 2008 crisis bought with it four years of slowing growth **(phase d)**. From a high of 8.7% in 2006/07, *trend* growth fell to about 7% in 2011/12. While the first two years of slowing was marked by the 2008 financial crisis, the next two years were marked by the Euro debt crisis and domestic issues. Over these four years, each contributor to growth slowed.

The strong correlation between capital stock and TFP was evident through the slowdown. The two series are tightly interconnected – India being a relatively capital-scarce economy, there is little incentive to innovate, adopt new technology and increase productivity at low levels of capital accumulation. Further, a slowdown in reform momentum and increased uncertainties discourages innovation and investments. Weaker trade flows and a higher base for technology is also likely to have slowed TFP growth.

We assess the trend GDP growth since 2000/01 which combines the lower growth years of early 2000s and the last few years of slowdown, as well as the (part global liquidity induced) boom period of mid-2000s. In order to extract the trend, we pass the real GDP at factor cost series through the Hodrick-Prescott filter applying the original power of 2 (λ =100). We also pass the GDP series through the HP filter using an alternate power of 4 (λ =6.25) which Ravn and Uhlig (2002) suggested as more appropriate for annual series. We find that since 2000/01, trend GDP growth rate is at 7.2% for the power 2 specification and 7.4% for the power 4 specifications. Actual GDP growth over this period lies in the middle, at 7.3%.

Figure 3: Trend growth since 2000/01 lies between 7.2% and 7.4%



Source: CEIC, CSO

With every major determinant of growth slowing over the last few years, reaching the target of average 8% GDP growth over the next five years becomes a challenge. In the next section we discuss the magnitude of the challenge.

II. What Will Business-As-Usual Get Us?

We label the *trend* increase in each of the determinants of growth (capital, labour and TFP) as the **business-as-usual** scenario. Under this scenario we assume that the capital stock grows by **8.0% per year** which is the average trend rate of growth recently as well as the average trend rate of growth over the last 10 odd years. We assume adding about **3.6 mln** people per year (on a CDS basis) to the workforce as has been the case between the last two NSS survey rounds (i.e. between 2004/05 and 2009/10); increasing mean years of schooling at its latest available five year trend rate (of 0.09 pts per year between 2005 and 2010) to **5.66** by the end of the Twelfth Plan and increasing TFP at an annual rate of **2.6% yoy** as has been estimated over the last year as well as the last ten odd years. **Our model estimates that this business-as-usual scenario will give us an average growth rate of 7.0% over the Twelfth Five Year Plan, lower than our target of 8.0%.**

Note here that the **business-as-usual scenario outlined does not imply stagnation** in the determinants of growth. Rather it assumes a growth in each

input at trend levels/rates, which would be a challenging task in itself, especially in the wake of the current slowdown.

Figure 4: Business-as-usual will not get us to 8% growth

	Average trend GDP growth per year % chg yoy	Average growth in trend capital stock per year % chg yoy	Addition to labour force per year, CDS mln	Average years of schooling, end of period years	Total Factor Productivity growth % chg yoy
1998/99-2003/04	**6.1**	6.3	7.2	4.5	1.1
2004/05-2007/08	**8.4**	8.7	5.1	4.9	3.1
2008/09-2009/10	**8.1**	9.1	3.6	5.0	3.2
2010/11-2011/12	**7.3**	8.2	3.6	5.2	2.7
2012/13-2016/17 Forecast: Business as usual scenario*	**7.0**	**8.0**	**3.6**	**5.66**	**2.6**

Source: CEIC, CSO, NSSO, Barro&Lee database

III. Three "Extreme" Paths to 8% Growth

As a business-as-usual approach will only get us limited growth, in order to reach the 8% target, substantial efforts will have to be made to augment the various determinants of growth. We reflect upon three 'extreme' paths – capital intensive growth, human capital intensive growth and productivity intensive growth, followed by a 'balanced' path growth.

In the table below we outline four different paths to 8% growth. In the first three scenarios, we maximize the growth of one particular determinant, while keeping the growth of the other determinants at 'business-as-usual' level. This may not be realistic, especially as several determinants of growth are interconnected and rise or fall together, but it does give a flavour of the challenge at hand.

While there is a large supply of labour in India, it is an advantage only if there is sufficient investment in the country to absorb the labour productively, and if the labour is suitably skilled and educated to be employable. With this in mind, we focus on physical capital investments and the human capital aspect of labour rather than its raw supply.

Figure 5: We outline three 'extreme' paths and one balanced path to 8% growth

2012/13-2016/17:	Average trend GDP growth per year	Average growth in trend capital stock per year	Addition to labour force per year, CDS	Average years of schooling, end of period	Total Factor Productivity growth
	% chg yoy	% chg yoy	mln	years	% chg yoy
1. Business as usual scenario	**7.0**	8.0	3.6	5.66	2.6
2. 8.2% growth scenarios:					
a. Physical capital intensive growth	8.0	**11.3**	3.6	5.66	2.6
b. Quality of labour intensive growth	8.0	8.0	3.6	**6.20**	2.6
c. Productivity intensive growth	8.0	8.0	3.6	5.66	**3.8**
d. Balanced growth	**8.0**	**8.8**	**4.2**	**5.75**	**3.0**

Source: CEIC, CSO, NSSO, Barro&Lee database

If we embark on a **physical capital intensive growth trajectory (scenario a)**, keeping other determinants of growth constant at today's levels, we will have to increase the growth in capital stock by a record 11.3% per year, which translates to an investment rate of 42.6% of GDP over the next five years, from 32% in 2011/12.

If we embark on a **productivity intensive growth trajectory (scenario b)**, we will have to get an annual average growth of 3.8% yoy in TFP, from 2.6% over the last two years. The highest we have clocked in the past for a period of five years (according to our model), has been an average 3.4% in mid-2000s.

A quality of labour (human capital) intensive growth trajectory (scenario c) would involve raising the mean years of schooling to 6.2 in five years from about 5.2 in 2011/12. Just to put this in context, mean years of schooling is a slow moving variable. To make a similar increase, from 5.2 to 6.2 years of schooling, China took ten years. To make a similar magnitude of increase, India took 12 years, while moving from 4.1 in 1998 to 5.1 in 2010.

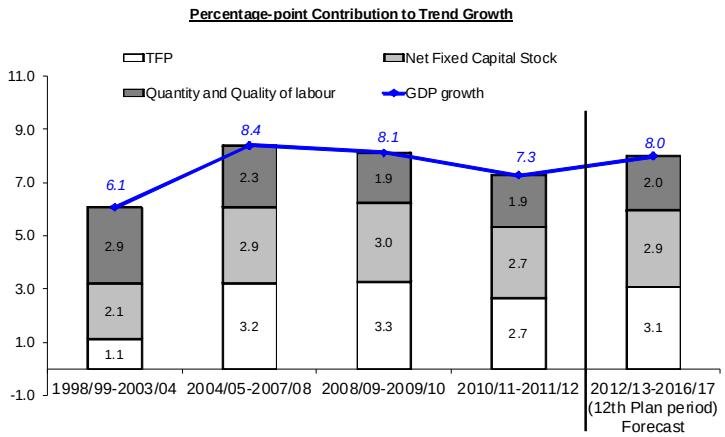
Each of the 'extreme' cases outlined above are rather too ambitious for a five year timeframe. A more realistic path would be a balanced trajectory (scenario d) where each determinant of growth contributes more than it is contributing now to achieve 8% growth over five years. While several combinations are possible, we highlight one plausible combination and discuss the challenges around it.

IV. A Balanced Path to 8% Growth

Scenario d in figure 5 outlines a **plausible and balanced path to 8% growth.** It is more plausible than the 'extreme' paths, because it demands a contribution from each factor of production of a magnitude that has been achieved in the recent past (during the mid-2000s). It is more balanced that the 'extreme' paths because all inputs have to take up the mantle of growth. This may be desirable not only because balanced growth tends to be more sustainable, but also because there are strong interconnections between the factors of production and productivity, and several of them rise and fall together.

However, this would not mean that working on one input will automatically augment another. This scenario will involve concerted efforts in identifying constraints and roadblocks across each input and chalking out a feasible route to overcome them in a relatively short period of time. Below, we will discuss the magnitude of the challenge faced by each of the input as it takes up the mantle of growth. We also discuss some areas which will need special focus. While it is not a comprehensive list, it gives a flavour of the kinds of challenges faced.

Figure 6: A plausible and balanced path to 8% growth



Source: CEIC, CSO, NSSO, Barro&Lee database

TFP – Our calculation of TFP shows a fall in its growth from 3.7% yoy in 2006/07 to 2.6% in the last two years. Our baseline scenario for the next five years is that **TFP will rise by an average 3% yoy** per year, contributing 3.1ppt to the 8% growth.

It is worth noting that high TFP growth rates in the early stages of economic reform reflect both the pure productivity growth and also the fact that the economy is moving from a position inside the production possibility frontier to a position closer to it. The contribution of the latter is large in the beginning but moderates over time. India is still at an early stage of this transition, and there is substantial scope for exploiting total factor productivity gains in the future.

In its easiest form, some TFP is created when excess labour moves from lower productivity sectors to higher productivity ones, leading to a more productive redistribution of resources. As such, growth of jobs itself produces some TFP growth. A key part of the growth agenda could therefore be to enable excess labourers to move out of agriculture into other jobs (even in rural areas), even while making efforts on increasing agricultural productivity. In light of this, while our balanced growth trajectory suggests efforts on all fronts, some key interventions such as building out the road and rail network to connect rural markets to towns and increasing educational and skill attainments in rural areas could have a relatively big impact on GDP growth.

India is particularly lagging with respect to ease of doing business. The World Bank's latest Ease of Doing Business ranking puts India at 132 out of 185 countries. It takes an average of 12 procedures, 27 days, and a paid in capital of 140 percent of per capita GDP to start a business legitimately. By contrast, it takes only 7 procedures, 19 days, and 18 percent of per capita GDP on average in South Asia. We could improve our performance on some of the indicators in the short run by implementing small changes such as reviewing the utility of various entry and licensing restrictions and removing those which prove irrelevant, and creating electronic interface allowing users to submit documentation required for various licenses only once. In addition, we need an easier process of exit where the claims of financiers and workers are quickly resolved. There are instances of industrial parks with defunct firms whose assets are locked up because they cannot expire. Improving the business environment for enterprises could not only make the economy more productive but also lead to higher investments and provide more employment opportunities.

Much of the spurt in productivity in the mid-2000s came from restructuring of manufacturing and the rise in telecommunication and IT services. A second generation of structural reforms is critical for raising TFP growth. Some new reforms which are either being debated or are in early stages of implementation such as the Goods and Services Tax, FDI in retail, increasing FDI in Insurance, and several more would be necessary for exploiting potential TFP gains.

Capital Formation – Gross fixed capital formation has fallen from a high of 33.7% of GDP in 2007/08 to 32% of GDP in 2011/12 implying that it has been growing slower than GDP. In the balanced scenario, the **investment rate has to go up to an average 34.5% of GDP** over the next five years.

To achieve this, the reasons why investments are getting stalled and new investments are drying up have to be understood and reversed. Figure 6 outlines some of the main reasons behind stalled investments, which have to be addressed at the policy-making level. The Land Acquisition and Resettlement & Rehabilitation Bill, which is currently being finalized could help in bringing greater clarity, reduce uncertainty and thereby aid investments.

Recent efforts by the Government on setting up the Cabinet Committee on Infrastructure (CCI) which will fast-track big infrastructure projects, is a big step in the right direction. The key will be to see if the acceleration in government rhetoric can be transformed into action.

Figure 7: Land acquisition and coal linkages issues have been some of the reasons for stalling investments

CMIE database shows that about Rs. 5 trillion worth of investments (in 500 projects) were shelved in 2011-12.

Of these, 20 projects account for 68% of the total cost of shelved projects. The reason for shelving these 20 projects are as follows –

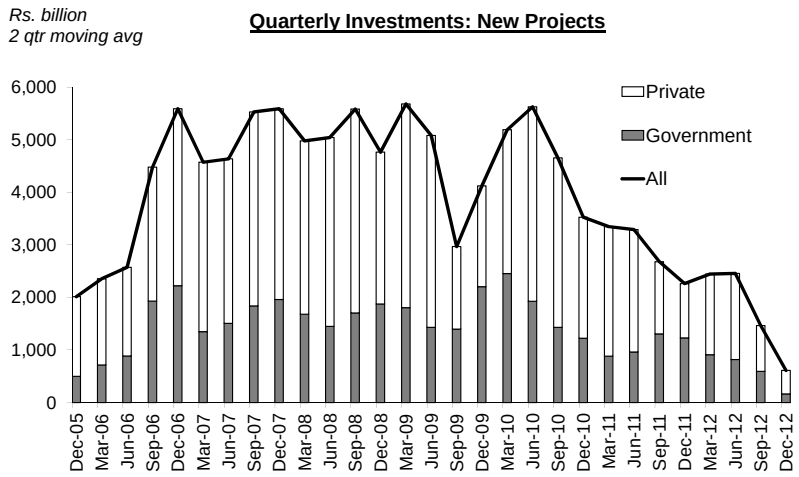
Land acquisition – 10 of the 20 projects could not procure land
Coal linkages – 3 of the 20 projects did not get coal linkages
Mining ban – 1 of the 20 was shelved due to a mining ban
Tax policy – 1 of the 20 was shelved as an available tax holiday ended

(Source: CMIE, May 2012)

Figure 8 shows that government investment peaked in Mar 2010 while private investment peaked in Sep 2010. It seems that since 2010, private investment is

lagging state investment by about six months. An upswing in public investments may be needed to crowd-in the private sector. To that end, the recent move to encourage cash surplus Central Public Sector Enterprises to invest their surplus cash (for their own benefit and also to increase the investment rate of the country)[6] could help revive the investment climate.

Figure 8: Private investment slowdown is following state investment slowdown by about six months



Source: CMIE

Quantity and Quality of Labour – NSSO surveys shows that additional employment per year has fallen between the 1999/00-2004/05 and 2004/05-2009/10 survey periods. Our baseline scenario for the next five years is for employment to go up to **4.2 mln additional workers employed every year** from 3.6 mln workers employed per year between the latest available 2004/05-2009/10 period.

As excess labourers in the less productive agriculture start to move out, opportunities need to be created across industry and services. The one sector which needs to start hiring more is manufacturing. Across urban/rural and males/females, workforce per 1000 has been falling for manufacturing between the 2004/05 and 2009/10 NSSO rounds. Much consideration has to be given to the long-standing issue of rationalising labour laws to give employers more

[6] http://pmindia.nic.in/press-details.php?nodeid=1526

flexibility to shed labour when faced with a downturn. While this is politically sensitive, efforts to build consensus with labour representatives must be continued.

It is well recognised that demographic structure of the economy will give dividends only if it is suitably skilled to do so. The mean years of schooling measure works as a proxy for human capital. In 2010 the mean years of schooling for India was 5.13. Over the last five years the variable has been growing at an average pace of 0.088 ppt per year. Our balanced path assumes that this pace is increased to 0.1 ppt year, taking **mean years of schooling to 5.75 by the end of the Twelfth Plan**.

The variable is slow moving and the increase becomes harder, the higher it is. Therefore an increase to 5.75 may not come easily. While the last five years have seen a near universalization of primary school enrolment rate, the next five years have to focus on the quality of education in order to retain students in school. Focussing on teacher training and enforcing accountability amongst them will be key.

There is also a need to involve private sector partners in the management and running of industrial training Institutes (ITIs) in order to make training curriculums and skills imparted more relevant for the job market. There are a handful of government sponsored training programmes, such as the Himayat programme in Jammu and Kashmir run by the Ministry of Rural Development, that involve private sector companies. Such programmes need to be replicated and scaled up.

Learning while Earning and Learning by Doing are powerful vehicles for Skill Development but India only has 0.35 million (mln) apprentices (Germany & Japan have 4 mln and 10 mln respectively). If India had the same proportion of its labour force in apprenticeships, we would be skilling 16 mln people at any given point of time. For this to happen, the lesser known Apprenticeship Act needs to be amended and companies need to be given timely approvals for starting off their apprenticeship programmes. We need to think out of the box and encourage new programme designs in order to accomplish ambitious targets.

V. Conclusion

Our growth model makes it clear that achieving 8% growth over the next 5 years will not be easy. Policy options where we only augment one determinant of growth at a time will not be enough, because the quantum of increase needed will be very high and at times unreasonable. Only a balanced growth path will be plausible and sustainable. Here too, policies which caused the growth spurt of mid-2000s may have already had its impact and the global situation will also not be as benign over the next few years. Therefore innovative thinking, greater efforts and new policies which can be implemented in a time-bound manner will be needed to augment each determinant of growth, in order to achieve the Twelfth Plan target over the next five years.

Biliography

Ahluwalia, Montek. S, 2011, "Prospects and Policy Challenges in the Twelfth Plan", Economic and Political Weekly

Aziz, Jahangir and Sajjid Z Chinoy, September 2012, "India's falling potential growth, North America Emerging Markets Research", J. P. Morgan

Barro, Robert J. and Jong-Wha Lee, September 2011, Educational Attainment Dataset

Bosworth, Barry, Susan Collins and Arvind Virmani, February 2007, "Sources of Growth in the Indian Economy", Working Paper 12901, NBER

Gollin, Douglas, 2002, "Getting Income Shares Right", *Journal of Political Economy* 110(2): 458-74.

National Sample Survey Organization of India, "Employment and Unemployment Situation in India 2004-05".

Planning Commission, 2011, "Approach Paper for the Twelfth Five Year Plan 2012-17"

Poddar, Tushar and Eva Yi, January 2007, "India's Rising Growth Potential", Global Economics Paper No: 152, Goldman Sachs Economics Research

Psacharopoulos, George, and Harry Patrinos, August 2004, "Returns to Investment in Education: A Further Update", Education Economics, Vol. 12, No. 2, pp. 111-134,

Ravn, M.O and H. Uhlig, 2002, "On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations", The Review of Economics and Statistics, MIT Press, vol. 84(2), pages 371-375.

Appendix

In accounting for the skill content of labour a few different specifications have been used in the literature. For our note we have tried a second specification as well, which has been used by Bosworth Collins and Virmani (2007) –

$$Y = AK^{a} \left(e^{rs}L\right)^{(1-a)}$$

Where –

s: Labor quality proxied by average years of schooling of the population aged 15 years and above [Data source: Barro & Lee]

r: Return to each additional year of schooling, assumed to be 10% in our calculation, in line with findings from Psacharapoulus and Patrinos (2004) and Bosworth, Collins and Virmani (2007).

While the specification used in the main paper gives the same weight to the quantity and quality of labour (both in natural logs), in the specification used above, mean years of schooling is included only to the extent it raises worker productivity.

Figure 9: In the new specification, TFP plays a slightly more important role

	Average trend GDP growth per year % chg yoy	Average growth in trend capital stock per year % chg yoy	Addition to labour force per year, CDS mln	Average years of schooling, end of period years	Total Factor Productivity growth % chg yoy
1998/99-2003/04	6.1	6.3	7.2	4.5	1.9
2004/05-2007/08	8.4	8.7	5.1	4.9	3.9
2008/09-2009/10	8.1	9.1	3.6	5.0	3.8
2010/11-2011/12	7.2	8.2	3.6	5.2	3.2
2012/13-2016/17 Forecast: Business as usual scenario*	**7.2**	**8.2**	**3.6**	**5.66**	**3.2**

In this specification, we find that as expected the importance of the skills indicator (mean years of schooling) is reduced and shifted to the residual TFP. However the magnitude of change in results between the two specifications is not very big, and most importantly our main conclusion - that the extreme paths to 8% growth will be very ambitious and even unrealistic and therefore a balanced path is needed - still holds.