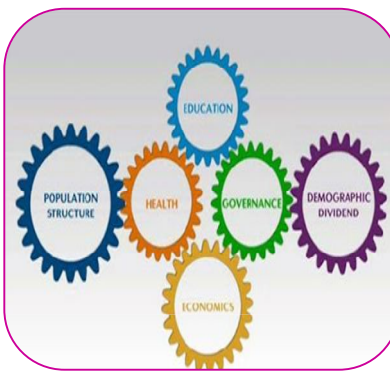_____

DEMOGRAPHIC DIVIDEND: AN EMPIRICAL ANALYSIS

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ABSTRACT—
Demographic dividend is the buzzword of the day. But, the real question to ask is, 'Is number everything? Is there really that strong a correlation between the quantity of labor force and economic growth? What about the quality, skill and ability of labor force? This paper attempts to empirically understand the contribution of quality, skill and ability of labor force in driving economic growth.

KEYWORDS: *Demographic Dividend, economic growth*

INTRODUCTION:

Demographic dividend is the most talked about phrase in economic growth literature in recent times, especially in the context of India's economic growth. No discussion and argument can be expected to complete without a mention to this concept. Why is this concept of demographic dividend so important? If number is the game, India has it. India has the numbers to its favor. But, the real question to ask is, 'Is number everything? Is there really that strong a correlation between the quantity of labor force and economic growth? What about the quality, skill and ability of labor force? To what extent does the quality, skill and ability of labor force, apart from the sheer number, contributes to the economic growth? This paper attempts to empirically understand the contribution of quality, skill and ability of labor force in driving economic growth. Such a study will not only help us in understanding the under currents of economic growth but will also be of great help in analyzing the current economic policy in right perspective.

Economic literature is rich enough with various tools and techniques to analyze the qualitative contribution of labor force to economic growth. One such analytical tool is, 'Total Factor Productivity (TFP)[1]'. Total Factor Productivity accounts for those aspects of economic growth which remains unexplained by the traditional factors of production namely, labor and capital.

The objective of this paper is twofold:
- ✓ *Firstly it highlights the importance of 'Total Factor Productivity (TFP)', along with labor and capital, in explaining economic growth in recent past, and*
- ✓ *Secondly, the paper tries to emphasize the significance of Human capital development policies as a prelude to sustainable economic growth.*

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[1]Robert J. Barro, "Notes on Growth Accounting". Journal of Economic Growth, June 1999

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Arrangement of the paper:

− The basic idea is to calculate TFP for post – reform period and the differences thereof between the explained and unexplained components of economic growth. This analysis will help us in understanding the basic source of India's economic growth in recent past.

− Firstly, we explain the methodology adopted to measure Total Factor Productivity.

− Making use of the technique developed for measuring TFP, we calculate an empirical estimation of TFP for the post reform period.

− Later, we make an attempt to bifurcate the contribution of capital share and labor share in explaining out TFP.

− If TFP is substantial enough in explaining economic growth and net capital formation has a larger share in explaining out TFP, it will signify that the technical progress is embedded in capital.On the other hand, if labor force has a substantial share in explaining out TFP it will mean labor force is basically able and skilled and vice - versa.

− We will use these findings to emphasize the significance of Human capital development policies, apart from FDI and other investment policies, as a prelude to India's economic growth.

Methodology:

Traditionally, production function is used to study the sources of growth. Output grows through increases in inputs and through increases in productivity due to improved technology and a more able workforce[2]. Taking labor (N) and capital (K) as the only important inputs, a typical production function looks like the one depicted in equation (I):

$$Y = Af(K, N) \quad \text{(I)}$$

Where 'A' represent the level of technology, the higher the 'A' is, the more output is produced for a given level of inputs. Therefore, 'A' is also called as "productivity". A slight manipulation of equation (I) will lead us to the following equation (II):

$$\Delta Y/Y = [(1 - \alpha)\,\Delta N/N] + [(\alpha)\,\Delta K/K] + \Delta A/A \quad \text{(II)}$$

Where, (1-α) and α are weights equal to labor's share and capital's share to the output (Y). $\Delta A/A$ factors for the rate of improvement in the technology, called *technical progress*, or the growth of Total Factor Productivity.

TFP cannot be measured directly; instead we will make use of 'Solow Residual[3]'. The technical progress $\Delta A/A$ is measured by turning equation (II) inside out.

$$\Delta A/A = \Delta Y/Y - [(1 - \alpha)\,\Delta N/N] - [(\alpha)\,\Delta K/K] \quad \text{(III)}$$

Measured this way changes in TFP i.e., $\Delta A/A$ is called, 'Solow Residual'.

Empirical Estimation[4]:

The growth rate of capital stock series for 1992 to 2012 is constructed using data available for capital formation at constant 2004 – 05 price series. Whereas the labor force growth rate series for the same period were constructed using employment data available for organized sector of both private and public sector. Capital share value (α) is derived from

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[2] Robert J. Barro, "Notes on Growth Accounting". Journal of Economic Growth, June 1999.

[3] R. Solow, "Technical Change and the Aggregate Production Function". Review of Economic and Statistics, August 1957.

[4] Central Statistical Organization, MOSPI, GOI, "New Series of National Accounts Statistics (Base Year 2004-05)"

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Brahamanand (1982)[5], who estimated the share of wages in totalincome for the economy as 75% from 1950 to 1970 and 71% for 1980. This suggests acapital share of 25% in the fifties and sixties, rising to 29%between 1970 and 1980 andperhaps even higher in the nineties. As per another research[6], "The TFP estimates are not sensitive to different fixed weights for capital and labor. There may be minor differences among the estimates but they do not change their nature significantly". Our estimate of 0.25 for capital share and 0.75 for labor share (1-α) therefore appears quite reasonable and justified.

Figure1: Total Factor Productivity Growth Rate Graph for the Post – Reform Period (1991 to 2012)
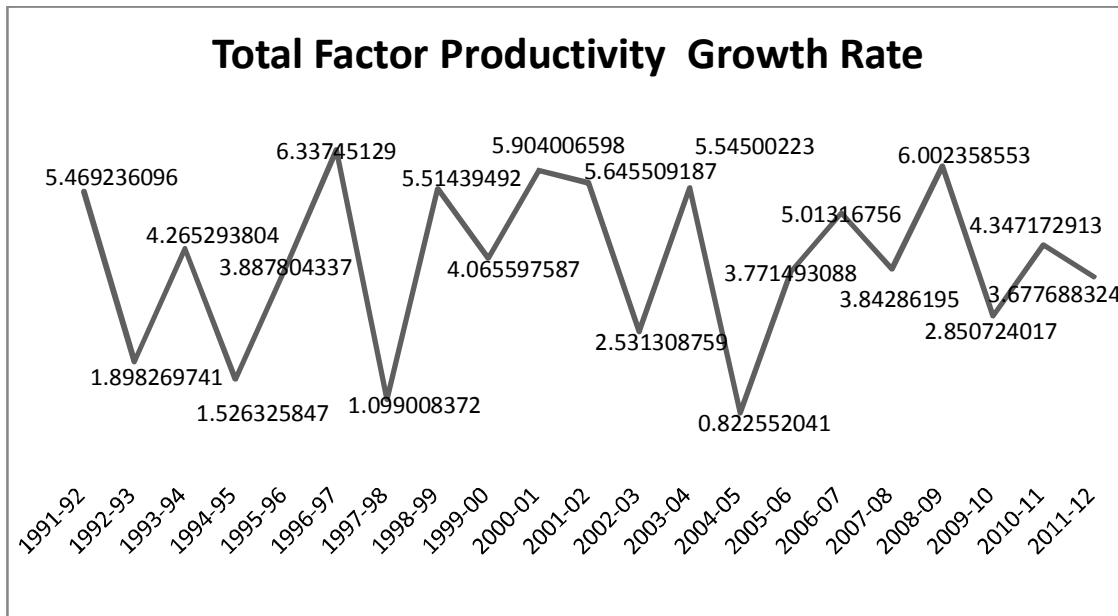

Figure1 clearly brings out the significance of TFP in explaining growth. The annual average TFP growth rate for the post reform period (1991 – 2012) was approximately 3.927399 which is almost fourfold higher than that of the pre – reform period i.e. 1.27879(1976 – 1991). This estimate underscores the importance of TFP as the major driving force behind the post – economic reform growth rate.

Having established the importance of TFP in explaining growth, it would be an interesting analysis to bifurcate and explain the contribution of labor and capital, in explaining out TFP. In other words the TFP, which is the unexplained component of GDP growth, is influenced by which of the two factors, capital or labor?

[5]Brahmananda, P. R. (1982), Productivity in the Indian Economy: Rising Inputs for Falling Outputs, Himalaya Publishing House, 1982.
[6]Sanjoy Saha (2014), "Total Factor Productivity Trends in India: A Conventional Approach", The NEHU Journal, Vol XII, No. 1, January - June 2014, pp. 95-106. ISSN: 0972 - 8406 95

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Total Factor Productivity v/s Capital Growth Rate

$y = 5.3054 - 0.6185x$
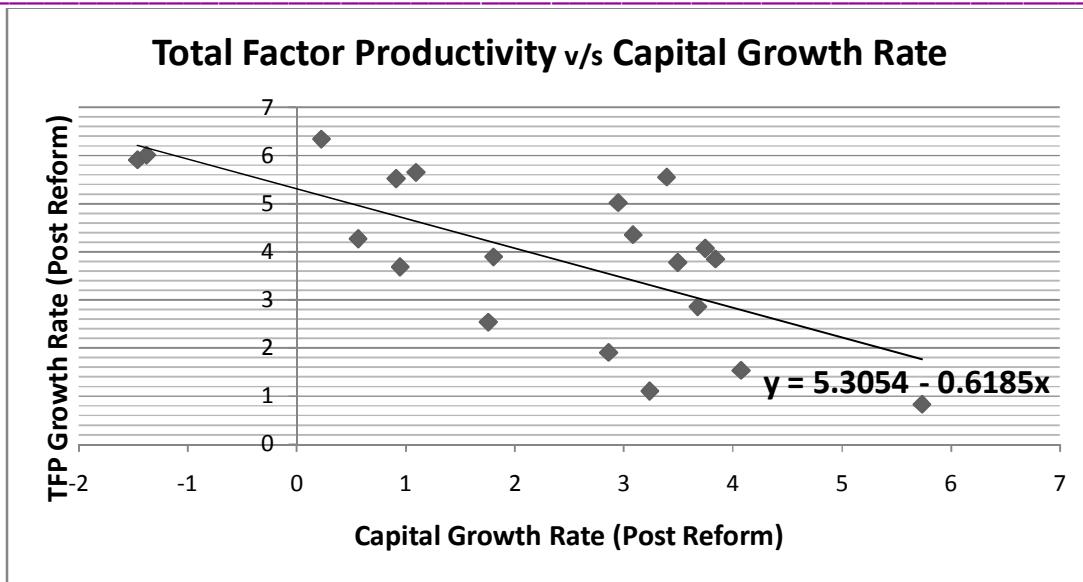
SUMMARY OUTPUT

Regression Statistics[7]

Multiple R	0.686087
R Square	0.470716
Adjusted R Square	0.441311
Standard Error	1.263855
Observations	20

ANOVA

	df	SS	MS	F	Significance F
Regression	1	25.57037	25.57037	16.00819	0.000838
Residual	18	28.75195	1.59733		
Total	19	54.32232			

|	Coefficients	Standard Error	t Stat	P-value[8]
Intercept	5.305412	0.44552	11.90836	5.71E-10
X Variable 1	-0.61851	0.154588	-4.00102	0.000838

Regression equation:

$$TFP_{GrowthRate} = 5.3054 - 0.6185 C_{GrowthRate} \qquad (IV)$$

With the P-value of 0.000838 it can be said with the 95% level of confidence interval that coefficient of capital growth rate, i.e. – 0.6185, is statistically significant in explaining out TFP growth rate. In other words, a one point increase in capital growth rate will lead to 0.6185 point reduction in TFP growth rate, the unexplained component. This means a major part of Technical progress which is responsible for GDP growth is in fact embedded in capital.

What is relevant from the perspective of this paper is the contribution of labor force growth rate in explaining out TFP. What is the statistical significance of labor force as a factor in explaining out TFP?

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[7]Minitab® 17.1.0

[8]The smaller the p-value, the smaller the probability that rejecting the null hypothesis is a mistake

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Total Factor Productivity v/s Labor Force Growth Rate

y = 4.0322 - 0.0867x
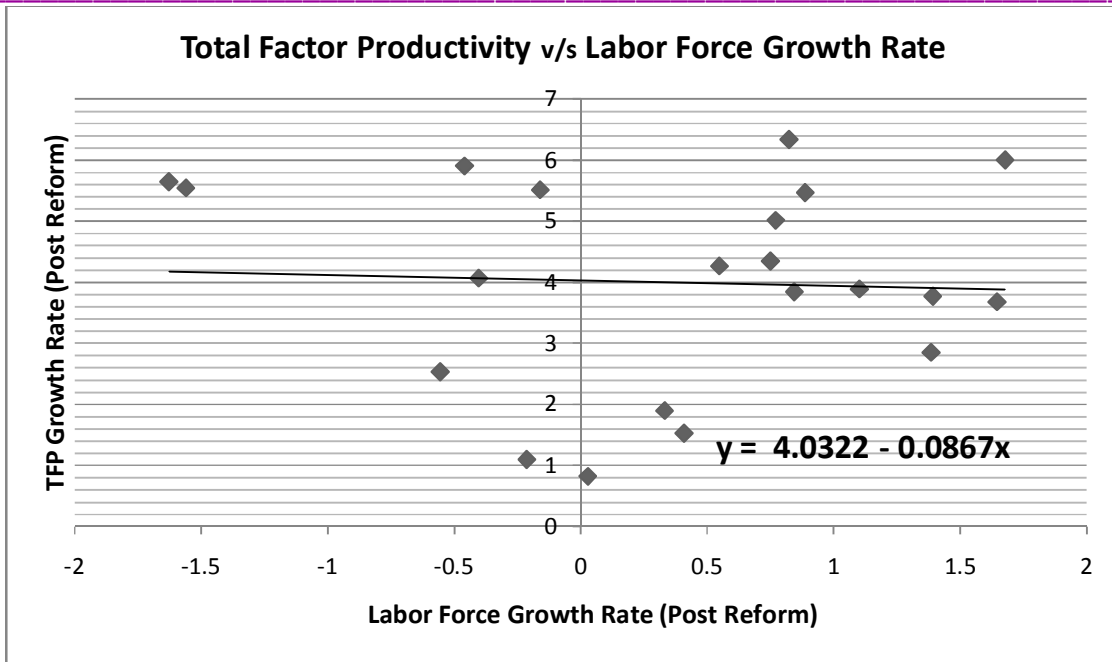
SUMMARY OUTPUT

Regression Statistics[9]

Multiple R	0.048289
R Square	0.002332
Adjusted R Square	-0.05018
Standard Error	1.723742
Observations	21

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.131949	0.131949	0.044408	0.83534
Residual	19	56.45443	2.971286		
Total	20	56.58638			

	Coefficients	Standard Error	t-Stat	P-value
Intercept	4.032239	0.404622	9.965455	5.56E-09
X Variable	-0.08668	0.411346	-0.21073	0.83534

Regression Equation:

$$TFP_{GrowthRate} = 4.0322 - 0.0867 L_{GrowthRate}$$

With a greater p-value of 0.83534, the regression coefficient of labor force growth rate (– 0.0867) is statistically insignificant. It means that the explanatory power of labor force growth rate in explaining out TFP is equivalent to zero.

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[9]Minitab® 17.1.0

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Concluding remarks:

This paper reveals three important observations; *firstly*, TFP is the major dirving force behind GDP growth rate in recent past, mainly the post – reform period. *Secondly*, capital as a factor of production is largely the driver of TFP. This means technical progress embedded in capital is largely responsible for explaining out TFP growth rate. *Lastly*, the significance of labor force growth rate in explaining out TFP is next to zero. This also means, the contribution of labor force in the recent surge of GDP growth rate is highly negligible if not insignificant.

Given this low contribution of labor force growth rate in explaining out TFP, which is the main driver of GDP growth rate in recent past, how justified we are in calling our large pool of young labor force a '*Demographic Dividend*'? It is not the absolute number, but a well-trained, skilled and able labor force that can make the difference.

Economic growth rate in the post reform period is mainly driven by technical progress embedded in the capital factor. It is a high time that we give a relook at out human resource development policies and programs. Are they labor enabling? *Demographic dividend does not exist, it has to be created.*

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6. Reserve Bank of India, (2012), "Handbook of Statistics on the Indian Economy"
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