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# **Towards a sustainable Growth story: A critical analysis of the fundamentals**

Saraswat, Deepak

Kirorimal College, University of Delhi

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# **Towards a Sustainable Growth Story<sup>1</sup>**

## **A Critical Analysis of the Fundamentals**

December, 2008

**Deepak Saraswat**

B.A. (Hons.) Economics, Part 3

Kirorimal College

University of Delhi

### **Abstract**

In this paper, I will develop an insight into the growth process of Indian Economy and will find that increased inequality due to unconventional transitions have its negative implications for future growth prospects and the overall issue of sustainability. The objective of this paper is to throw light on theoretical concepts of growth process and to suggest some policies which are in line with the conventions and at the same time are well integrated with the contemporary Indian Economy. Issues like that of consumption inequality, labor mobility etc. have been identified as inhibiting factors for a smooth flow of transitions and with a sector specific analysis, have been dealt with, so as to remove them and make the transition process free flowing, which will bring about a sustainable long-run growth strategy.

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<sup>1</sup> I would like to express my sincere gratitude towards Ms. Vineeta Sharma (Kirorimal College) for her guidance, which has been one of the most important sources of my success in drafting this paper. I would like to thank Mr. Saumyajit Bhattacharya (Kirorimal College) and Mr. Pavan Kumar (Ramjas College) for their valuable comments and suggestions regarding the work. I would also like to thank the Library staff of the Institute of Economic Growth for allowing me to access their academic resources. I am solely responsible for all remaining errors.

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## 1. Introduction

Indian GDP growth in 2006-07 was 9.6 and looking at past few years, it has consistently been on a surge compared to first few years of the decade. On a superficial note, it points towards sustainability of a high growth in long-run. It is argued that this high rate of growth is accrued to stimulus from external markets and due to increased savings rate, which have induced a sudden step up in investment potential, hence, it has caused multiple rounds of investment and has stimulated growth.

But it has to be analyzed carefully. Talking about external demand, the high rate of growth in dollar value of exports is not a sufficient indicator, indeed the net exports, which actually contribute to the growth, have been consistently negative and the gap between exports and imports has risen throughout the decade. Now, for growth, it is essentially the autonomous investment which acts as a generator, bringing in the induced investment, which drives the growth. But in India, Public Investment, which is generally called the Autonomous investment, has seen a decline in its share in Total Capital Formation, from 29% in 2001-02 to 22.5% in 2005-06, whereas that of Private corporate sector (Induced Investment) has risen from 22.5% to 40% during the same period.<sup>2</sup> So, it can be inferred that Domestic consumption demand has stimulated pvt. Corporate investment, which has brought a surge in overall Investment, and hence, in growth.

At the same time it has been seen that domestic savings rate have increased, which is due to the increased savings of those who can save. This points towards the fact that growth has been accompanied with Increase in inequalities in Income which would have an impact on consumption patterns and hence, on consumption led growth itself.

The objective of this paper is to bring out the Income and consumption inequalities, which can prove to be detrimental for long run sustainable growth and suggest some measures in form of specific sector analysis to mitigate this inequality and hence bring out a long run high rate of growth which is sustainable.

The rest of the paper is organized as follows: In section 2 a brief explanation of some empirical evidences in favor of Productive consumption by masses have been cited which are followed by 2 theoretical models emphasizing on enhancing labor productivity and bringing endogenous growth process through Productive consumption. In section 3, we will analyze the consumption inequalities in Indian Economy, which will make the fragile structure of the growth

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<sup>2</sup> Data source: Handbook of statistics, RBI

process, overt. Section 4 deals with the discussion of Indian Sectoral Transition which has been a major cause of this fragility and Inequality, and will discuss a specific case of Indian Manufacturing Sector, which is identified as a crucial juncture of the new growth strategy. Section 5 will bring the theoretical conventions of models discussed in section 2 and the findings of section 3 & 4 together to show, how it will enhance the growth process and I will also show an IS-LM analysis to simulate the same. Section 6 will summarize the findings and conclude the paper, followed by appendix and references.

## **2. Empirical and Theoretical overview**

In this section we will see the role of Productive Consumption and its growth stimulus. Productive consumption is defined broadly as the Consumption expenditure on food, nutrients, good health facilities and on some basic and intermediate necessities, which are directly linked with improving the standard of living for Low Income groups.

### **2.1 Empirical Evidences**

A positive relation between labor productivity as well as output growth on one hand and Productive consumption on the other hand has been identified by many empirical studies on Micro and Macro levels by several Economists on various national and international arenas. Here are a few of them:

On the basis of microeconomic cross-sectional data for small-scale farming enterprises in Sierra Leone (1974/75), Strauss (1986) estimates the coefficients of an agricultural Cobb-Douglas production function<sup>3</sup>. The production function is specified to account for a dependence of the agricultural workers' efficiency upon daily nutrient intake per worker. The approach takes into account the simultaneity of household choices, the levels of variable farm inputs and it considers the possible influence of other variables on agricultural output, e.g. land quality. The coefficients of nutrient intake show the expected positive sign and are highly significant. The positive impact of nutrient intake on labour productivity is especially marked at low levels and decreases with an increasing level of calorie intake.

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<sup>3</sup> Strauss, John (1986), Does Better Nutrition Raise Farm Productivity?, *Journal of Political Economy*, Vol. 94, No. 2, 297-320

Ram and Schultz (1979) analyse the relation between the health status and labour productivity in agriculture on the basis of data for different Indian states<sup>4</sup>. The rate of mortality is employed as an indicator of the health status in such a way that a decrease in the rate of mortality is interpreted as an improvement in the health status. Ram and Schultz regress the percentage change in rural labour productivity on the percentage change in the rate of mortality for the period from 1958 to 1967. This single regression explains 28 percent of the interstate variation in agricultural productivity.

On a macroeconomic level, Wheeler (1980) examines for 54 DCs (Developing Countries) the relation between the growth rate of output on the one hand and the growth rate of different indicators for the nutritional status (calorie availability per day), the health status (life expectancy at birth), and education (adult literacy rate), on the other hand, for the period from 1960 to 1970<sup>5</sup>. For this purpose, Wheeler formulates a simultaneous four-equation model, consisting of a macroeconomic production function and one equation for nutrition, health, and education, respectively (which are called "welfare equations"). The production function includes capital in addition to labour in efficiency units as inputs, with the latter again depending on the level of nutrition, health, and education. The three "welfare equations" represent the level of nutrition, health, and education as a function of per capita income as well as some exogenous variables. By this formulation, a mutual causality between the growth rate of output on the one hand and the change in nutrition, health, and education on the other hand can be taken into consideration. Wheeler finds a strong labour augmenting effect of the nutrition and health variables in the determination of the change in output for "poor countries".

The above-mentioned results are confirmed by Hicks (1979)<sup>6</sup> insofar as he finds within the framework of different multiple regressions on the basis of cross-sectional data for 69 non-oil exporting DCs (1960-73), without exception, a strong and significant influence of different "basic-needs" indicators (life expectancy at birth, adult literacy rate, primary school enrolment rates) on the growth rate of real per capita income.

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<sup>4</sup> Ram, Rati and Theodore W. Schultz (1979), Life Span, Health, Savings and Productivity, *Economic Development and Cultural Change* 27, 399-421.

<sup>5</sup> Wheeler, David (1980), Basic Needs Fulfillment and Economic Growth: A Simultaneous Model, *Journal of Development Economics* 7, 435-451

<sup>6</sup> Hicks, Norman (1979), Growth vs. Basic Needs: Is there a Trade-off?, *World Development*, Vol. 7, Nov./Dec., 985-994

## 2.2 Theoretical Models

### 2.2.1 Consumption and Labor Productivity

Gersovitz (1983) analyzes the effects of Productive Consumption on the Labor Productivity<sup>7</sup> and he concluded from the resultant model that, “*Greater current consumption adds to utility directly and indirectly by increasing income, thereby creating a bias against savings*”.

The crucial hypothesis of consumption ( $c_1$ ) enhancing the efficiency of labour ( $h$ ) is represented by a concave and twice continuously differentiable "effort-function". Thus, it is supposed in accordance with efficiency wage literature, that consumption increases the efficiency of labour without any delay.

$$h = h(c_1) , \text{ with } h' \geq 0 . \quad \dots\dots\dots(1)$$

The individual considered exists for two periods, the entire income is received exclusively during the first period. Current and future consumption are chosen in order to maximise total utility,

$$V = u(c_1) + u(c_2) , \quad \dots\dots\dots(2)$$

subject to the constraints,

$$R \cdot s = c_2, \quad \dots\dots\dots(3)$$

$$c_1 + s = y = w \cdot h(c_1) + \alpha \quad \dots\dots\dots(4)$$

In this case  $w$  denotes the wage rate per efficiency unit of labour [i.e. the wage rate per man-hour in relation to one unit of efficient labour ( $w_0/h$ )],  $h(c_1)$  the efficiency of labour, so that  $w \cdot h(c_1)$  represents the wage income and  $\alpha$  all components of non wage income. The first-order condition for an interior solution reads:

$$u'(c_1) = -R \cdot u'(c_2) \cdot (w \cdot h' - 1) . \quad \dots\dots\dots(5)$$

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<sup>7</sup> Gersovitz, Mark (1983), Savings and Nutrition at Low Incomes, Journal of Political Economy Vol. 91, No. 5, 841-855

Taking into consideration the presumed positive marginal utility, condition (5) can only be fulfilled if the following inequality holds:

$$(w \cdot h' - 1) < 0 \text{ or } w \cdot h' < 1. \quad \dots\dots\dots(6)$$

The interpretation of condition (6) is as follows: Saving necessarily means a reduction in current consumption. Consequently, the efficiency of labour and, therefore, the wage income decreases in accordance with the effort-function. The condition  $wh' < 1$  means that further saving (renunciation of current consumption) by one unit can only be reasonable if the induced fall in income turns out to be smaller. The bias toward current consumption in the case of low incomes becomes clear if (5) is transformed to:

$$u'(c_1) = R \cdot u'(c_2) - R \cdot u'(c_2) \cdot w \cdot h'. \quad \dots\dots\dots(7)$$

For comparably low incomes and, consequently, ceteris paribus low consumption levels,  $h'$  is relatively high, and the value of the right-hand side of (7) is relatively small. Hence, a low marginal utility of consumption in the first period (left-hand side) and, taking into account the concavity of the utility function, a comparably high level of current consumption results. This effect disappears with a rise in income and for  $h' = 0$  (7) turns into the usual optimum condition. The average saving rate rises with income provided that the following condition Holds:

$$(1 + \lambda) \cdot (\varepsilon - 1) + wh' - \mu \varepsilon > 0, \quad \dots\dots\dots(8)$$

**With,  $\varepsilon \equiv (-h''/h')$ ,  $c_1$ ,  $\mu \equiv \alpha/c_1$  and as before  $\lambda \equiv c_2/c_1$ .  $\dots\dots\dots(9)$**

Provided that the individual has no non-wage income ( $\alpha = 0$ ),  $\varepsilon > 1$  is a sufficient condition for the saving rate to increase with income. Accordingly, the marginal attractiveness of current consumption as a result of the efficiency and wage increasing effect must fall sufficiently fast.

### 2.2.2 Human Capital Enhancement Function<sup>8</sup>

To analyse the implications of productive consumption in the context of growth, the productive consumption effect is interpreted as enhancing the stock of human capital. This central

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<sup>8</sup> Steger, Thomas (1997), Productive Consumption and Growth in Developing Countries, University of Siegen, Germany, Pg 13-15

hypothesis is specified in the form of a *human-capital-enhancement function*. In its intensive form, this concave and twice continuously differentiable function reads:

$$h(t)=\phi[c(t)] - (n+\delta)\cdot h(t), \quad \text{with } \phi'(c) > 0 \text{ and } \phi''(c) < 0. \quad \dots\dots\dots(1)$$

In this case  $h(t)$  denotes the stock of human capital per capita at time  $t$ ,  $c(t)$  consumption per capita,  $\delta$  the depreciation rate of human capital, and  $n$  the population growth rate, respectively. Equation (1) represents the equation of motion for the average stock of human capital. As a result of productive consumption activities, the stock of human capital per capita increases according to the function  $\phi[c(t)]$ , while it decreases due to depreciation and population growth. Consequently,  $\phi[c(t)]$  can be designated as the gross human-capital-enhancement-function. The positive, but decreasing marginal human-capital-enhancement-effect of consumption [ $\phi'(c) > 0, \phi''(c) < 0$ ] appears justified by the empirical evidence. The "smooth" shape may not be reasonable at an individual level. However, this assumption hardly appears problematic at an aggregate level that is if (1) is interpreted in the sense of an average human-capital-enhancement-function. On account of its static character, the traditional efficiency wage theory was forced to assume that consumption increases the efficiency of labour without any delay.

This version of enhancement of Human capital is related very closely to the Endogenous growth models, wherein, Enhancement of human capital contributes to the enhancement of the overall capital stock and hence contributes towards achieving a higher rate of growth.

### 3. Indian Scenario

#### 3.1 Growth Story

As seen in the first section of the paper, the growth has been consumption led and has also been accompanied by a sharp increase in savings rate, which point towards the fact that this growth has been accompanied by increase in Income inequalities, which will have implications on consumption patterns and then on the consumption led growth itself.

Also, there has been a shift in commodity baskets in favor of luxury and credit fuelled consumption goods, which have thrived on easy availability of credit due to financial liberalization.

Apart from that, when I analyzed the contribution of Sectoral growth to the total GDP, some strange facts came into limelight. Service sector has accounted for as much as 60% of the increment in GDP during the high growth period between 2002-03 and 2006-07. Further, the contribution of agriculture (10.75%) and registered Manufacturing sector (11%), the real commodity producing sectors, to the increment in GDP during this period has not been very much higher than that of construction (11%), communication (10.46%), banking and insurance (8.03%) and real estate (7.71%). That is, the individual sectors in Services have been growing as fast as the leading commodity producing sectors.

So, we can see that growth has been Consumption-led, Service dominated and credit fuelled which has implications for its sustainability. In this case, a Global Economic shock (like the current financial crisis) will have a shift away from the current financial regime, and growth in credit fuelled consumption will slow down, resulting in decelerating of Income growth and overall GDP growth.

With this background, in the next sub-section I will analyze the consumption baskets and their growth overtime with a fall in MPC. Followed by it will be an analysis of the welfare contribution of different consumption baskets, classified by luxury and necessities, using the sen's welfare index and I will use it to show the inherent inequalities in the consumption patterns arising out of the service dominated and consumption led growth, which have a negative implications for the growth process in long run.

### **3.2 Analysis**

Looking at the consumption trajectories in Indian Economy, I get the following data results: The share of private final consumption in GDP has declined from over 70% in the early 1990's to 65% a decade later and to below 59% in 2006-07.<sup>9</sup>

As we have seen in the section 2.2, as argued by the analysis of Models, that at higher levels of Income, the marginal utility out of the additional consumption starts declining and there is an overall savings bias in the Economy. So, theory says that MPC declined as income rises. Thus, the trajectories shown above may not seem to be surprising, but this inverse relationship does not hold for Income growth from low levels; precisely in the case of a developing economy like India. This is because, in the case of India, where more than one fourth of the total population is facing severe poverty situations, an increase in Income must meet unmet needs for masses which turn to increased effective demand and hence the overall bias towards current consumption.

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<sup>9</sup> Source: Handbook of Statistics, RBI

This paradox has arisen in India due to the presence of Inequalities which has resulted in the increased savings from the class which has surpluses to save. Nearly, one fourth of Indian population is below the poverty line and a significant number still dwell just close to it. So in the case of Indian Economy, increasing MPS with increasing Income does not represent an equitable picture of the society.

To establish this more convincingly let us analyze the Compound Average Growth Rate (CAGR) of some consumption commodities<sup>10</sup> and we will find that: during 1999-00 to 2006-07 CAGR of real pvt consumption expenditure in India has been 5.5 percent. But the CAGR of food among its components has been just 2% and that for rent, fuel and power has been close to 3.6%. On the other hand, during the same period CAGR of private consumption on transport and communication stood at 10.8% and for recreation, luxury and culture goods and services it was 11%. Private consumption on Basic goods (food, fuel, power etc) has been growing far slower than that for other luxury commodities.

So I found that:

1. Food and other necessities has grown at a very lower rate, in spite of a larger lower section of society, for which, increase in Income leads to fulfillment of unmet needs and hence an increase in MPC.
2. Luxury commodities have grown at a very high rate, which has fuelled growth but represent only a small section of service dominated economy.
3. Despite this scenario, basic goods still own a heavy weight in private consumption expenditure. For ex. Food alone accounts for 40% of the total private consumption over the years.

To analyze and evaluate my hypothesis of Increasing consumption inequalities and its implications on Growth process, I have measured inequality within 2 classes of consumption commodities viz. Class 1 of food and basic necessity goods and Class 2 of non food luxury items and durable goods and have calculated their individual welfare contribution by using Sen's welfare Index:  $W = \mu(1-G)^{11}$ , where,  $\mu$  = Mean expenditure,  $G$  = Gini's Coefficient (See Appendix 1 for details ). This index is efficient in the sense that it takes into account both the average expenditure and the inequality extent.

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<sup>10</sup> Hajra, Sujan (2008), Re-crowning the Indian Consumer, Hindu: Business Line

<sup>11</sup> Sen, A. K. (1974) Information Base of Alternative Welfare Approach: Aggregation and Income Distribution, Journal of Public Economics 3: 219-231

For the purpose of calculating the gini's coefficient I have used the National Sample survey data on Monthly per capital expenditure by different income classes (in ascending order), on different consumption baskets<sup>12</sup>. For the consumption baskets I have made two classes: Class 1 (including food, pan, tobacco, intoxicants, fuel and light) and Class 2 (including non food luxury commodities like services, durable goods and commodities used by high income groups).

The results have been summarized as follows:

<b><u>For Rural Areas:</u></b>	<b>Gini's Coeff .</b>	<b>Avg. Consumption Exp. (Rs.)</b>	<b>Welfare</b>
Class 1	0.1739	447.19	369.424
Class 2	0.2541	199.03	148.459
<b><u>For Urban Areas:</u></b>	<b>Gini's Coeff</b>	<b>Avg. Consumption Exp. (Rs.)</b>	<b>Welfare</b>
Class 1	0.1457	653.27	558.076
Class 2	0.3683	575.91	363.789

### **3.3 Results: Identification of Problem Areas**

The results from the analysis of sub-section 3.1 and 3.2 are summarized as follows:

1. A much higher Inequality in Class 2 commodities has been observed in both Rural and Urban areas, compared with Class 1 commodities. (Consumption which has stimulated the current high growth has been distributed very unequally)
2. Welfare contribution of Class 1 goods on other hand is far greater than welfare contribution of Class 2 goods in both, Rural and Urban areas. (Basic goods have more welfare enhancement effects than the luxury and credit fuelled consumption goods, in the Indian Economy)
3. Gaps of Inequality and Welfare contribution between both classes of goods become even in more wider when one looks at Urban areas in comparison with Rural areas. (Service dominated regions have greater presence of Inequality).

<sup>12</sup> Table: A-14 to A-17, Appendix A, NSS Report No. 527, Household Consumption Expenditure in India, 63<sup>rd</sup> Round, 2006-07

So I found that, the Consumption expenditure on certain goods, which has fuelled the current high economic growth, has been very unequally distributed and also is contributing less to the welfare than basic goods and necessities. This is due to the fact discussed before that in a low income country like India, increasing income translates into current consumption of basic goods and necessities and hence increases the utility of people (Models in section 2.2).

So comparing the results to the earlier analysis of CAGR of different consumption baskets I find that this widening inequality and depressing consumption of necessities and basic goods (which have contributed more to the welfare) point towards some problem with the income earning opportunities in some marginalized and *not so well off* sections on the Indian society. These results confirm the hypothesis that increased income inequality has an implication on consumption patterns and hence will inhibit a sustained growth process in Indian Economy.

Once the problem area has been identified, it can be asserted that a more even distribution of benefits of high growth and income earning opportunities is likely to stimulate demand for the Basic and Necessity commodities (Class 1) and which will prop up overall consumption Base and also the MPC, and hence will contribute to a more sustained growth of GDP in Indian Economy.

## **4. Solution to Problem: Sectoral Case Study**

### **4.1 Transition Story: Issue of Labor Mobility**

This problem of Income Earning Opportunities for deprived and not so well off sections of society has been dealt with in the “Growth Report” published by the Growth Commission.<sup>13</sup>

According to which, the solution starts by:

1. Creating gainful employment for people who are otherwise marginalized and all bound to get restricted to the low productive and hence low remunerative sectors of the society
2. Next, creating better jobs for people who are educated, more skillful workers, so that they can climb the ladder of income and hence of their standards of living.

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<sup>13</sup> The Growth Report, Commission on Growth and Development, part-2 The policy Ingredients of Growth Strategies, Pg 45

These suggestions are confirmed by the Rationale of Economic History that, in an economy, there must be a step by step transition from Agriculture to Manufacturing to Services sector. This step by step transition makes the process above mentioned more lucid and if we look closely to this process, it represents the result of the same step by step transition. That is, in an economy a step by step transition from a low productive sector to high productive sector ensures that people are brought out of low productive sectors into sectors of comparatively high productivity and then with adequate skill formation, they enter into sectors with very high productivity, and in this way they climb the ladder of income and standard of living.<sup>14</sup>

Now, these two objectives (suggestions by growth report and Transition), can be attained only when labor is mobile between sectors and hence makes migration overtime from a low productive to high productive sector.

But India has defied the conventions of the Economic History by trying to transit directly to Services from Agriculture, leaving a lackluster manufacturing sector. Labor mobility in India has suffered due to this leap frogging, which has been both the cause and effect of a clumsy step by step transition and hence, is the prime reason of Inequalities shown in the first section.

In Indian case, labor mobility has been in a dismal state. To prove it, I have performed a decomposing exercise<sup>15</sup>, in which I have decomposed the aggregate labor productivity of Agriculture and Manufacturing, into 3 parts, one of which (called as Denison Effect), will show the changes in agg. Labor productivity due to movement of workers overtime, from a low productive sector (agriculture) to a higher productive one (manufacturing), and hence will help in judging the situation posed by state of labor mobility in India (See Appendix 2 for details).

Due to data constraint, I have used Average output per worker (Average Productivity), as a proxy for the Labor productivity in both agriculture and manufacturing sector<sup>16</sup>. The increase in aggregate average productivity comes out to be 92.98% for the time period between 1994-95 to 2004-05. The decomposing results are as follows:

$$\begin{array}{ccccccc}
 \mathbf{0.9298} & = & \mathbf{1.363} & + & \mathbf{(-0.315)} & + & \mathbf{(-0.1183)} \\
 \text{(change in prod.)} & & \text{(Pure Productivity effect)} & & \text{(Boumul effect)} & & \text{(Denison effect)}
 \end{array}$$

<sup>14</sup> The Cambridge Economic History of India, vol. 2, Edited by Dharma Kumar, orient longman in association with Cambridge university press, pg- 533-549

<sup>15</sup> William D Nordhaus (2000), Alternative Methods for Measuring Productivity Growth, University of Yale, Pg 4-6

<sup>16</sup> Source: Handbook of Statistics, RBI

These results show that due to constrained labor mobility, there has been close to 12% decline in aggregate avg. productivity over the time period, which proves the Dismal state of Labor mobility in the case of Indian Economy.

Possible reasons for this constrained labor mobility have been identified by the “Growth report” as follows: (Improving upon which will facilitate the labor mobility):

1. Lackluster situation of Literacy and Education
2. Zero Sum Game

I will expand upon each of them one by one.

Taking the first point of Literacy and Education, we will see it from the point of view of Sen’s capability approach and then will comment on its role in facilitating the labor mobility.

**Sen’s Capability Approach<sup>17</sup>:** Basic objective of development as expansion of human capabilities has been widely prevalent but, with and without a prime emphasis on generation of Economic Growth. “Capability” refers to alternative combination of functioning from which a person can choose. So, this notion consequently turns out to be that of freedom- the range of options a person has in choosing what kind of life to lead. Sen then talks about some factors or variables which enable these freedoms in a person; called as enabling factors. Social variables that of Health and Education can perfectly take the position of these enabling factors. He proves them to be valuable because they have Intrinsic Importance, Instrumental personal roles, social roles, process roles and empowerment & distributive roles. Apart from that they all generate significant positive externalities, which along with all other roles, help in fostering freedom of choice, which develops capabilities and hence induce overall development in a society.

In the light of these arguments we see that prerequisites for enhancing the quantum and quality of employment in developing countries is adequate skill formation. Skills<sup>18</sup> here are defined as an acquired practiced ability or a qualification needed to perform a job or a certain task. Adequate provisions for creating and developing marketable skills, in process of skilling, up-skilling and re-skilling workers contributes directly to the role of increasing their adaptabilities to various situations and work conditions. Hence, increased adaptability facilitates better labor mobility from a low

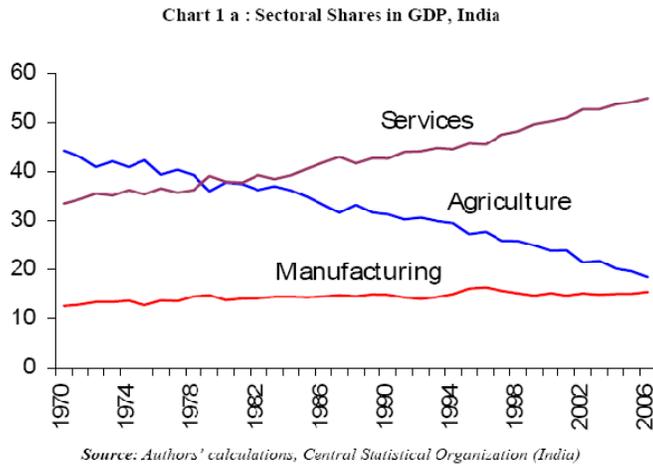
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<sup>17</sup> Dreze and Sen (2002), India: Development and participation, Oxford University Press, Chapter-2, Pg 36-43

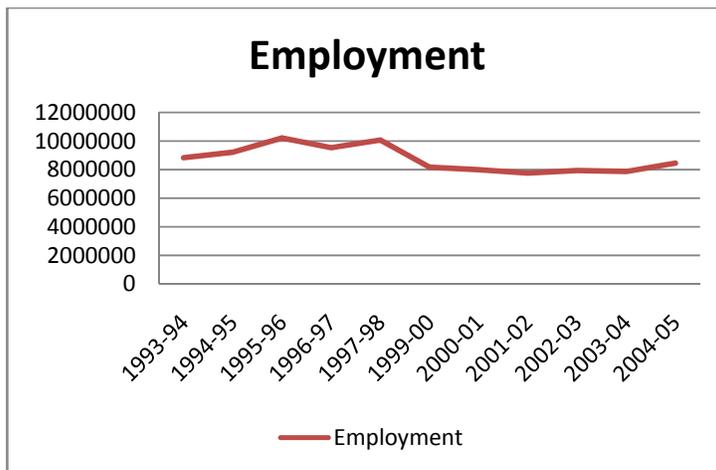
<sup>18</sup> Skill formation and Employment assurance, NCEUS, August 2008, Pg 5-9

productive sector to a high productive one, overtime. There is a crucial role of public policy in this regard which will be dealt with, later in this section of the paper.

Moving on to **Zero Sum Game**, we will see a case study of **Indian Manufacturing Sector**. First, let us glance at the relative GDP contribution of the Manufacturing sector in India.



The graph shows a lackluster trend in the Manufacturing contribution to the total GDP, while the share of agriculture is falling and that of services is surging rapidly. Also, below we can see the employment creating capacity of the sector:



Source: ASI, RBI database

We can conclude from these two graphs that even after the industrial reforms, manufacturing sector has not been enhanced in terms of increasing growth and hence have not been able to create jobs which are central goal of our analysis. India has missed out on a crucial sector of manufacturing which has led to inhibiting the labor mobility from a low productive sector to a higher one.

In this case, the ZERO SUM GAME, comes about. : This is the characteristic of most developing countries marked by large labor supply. In a highly populated country like India there is large labor supply. But due to absence of a job creating ability of one crucial juncture in transition process i.e the Manufacturing sector, labor demand falls short of the supply. These shortages create inevitable entering barriers on entering in labor force and securing an employment. This is because at one hand, manufacturing sector is unable to provide job and on the other hand, services sector does not create a large scale job due to its capital intensity, apart from that in services sector, entry is restricted due to inevitable entry barriers like High educational and skill requirements<sup>19</sup>. In this case, increased skills of one worker are very likely to pose a threat to the job of another comparatively less skilled worker. In this case gain of employment by one might retrench another and cause a zero addition to the net value added in the output produced. These tendencies inhibit free labor movement from a lower sector to an upper one and pose a threat to the above said solution for declining Inequality and promoting Inclusion.

So, the solution is to enhance the crucial sector of Manufacturing so that it can provide employment to masses, removing the constraints on labor mobility and bringing out a lucid transition from low productive agriculture to comparatively high productive manufacturing sector, which will contribute towards easing barriers on Income earning opportunities and hence removing consumption inequalities in Indian Economy.

To enhance the manufacturing sector the strategies should be designed for Investment which can enhance the sector and create the Employment through the route of increased demand due to enhanced operations.

In a resource constraint country like India, policies cannot be designed to invest simultaneously in all sectors, so something else has to be proposed. Here comes the role of “**UNBALANCED GROWTH THESIS**” by Albert O Hirschman<sup>20</sup>, he proposed that in a developing nation it is not possible to invest simultaneously in all sectors of the economy, so strategy has to be made to invest in sector which is most favorable and will pull other sector into growth process.

But here when it comes to choosing the sector one must look that Investing in one sector at the cost of other might inhibit the growth of other sector. This tendency will eventually result in a growth pattern where one sector enhances at the cost of other, then other sector follows the same pattern and they move towards high growth rate inhibiting each other. This process brings about a

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<sup>19</sup> There might be other reasons also like existence of Labor Unions. In this paper I have not analyzed them, so they remain as a future avenue for research in this regards. In future I would like to analyze them too.

<sup>20</sup> Albert O Hirschman, Rival Views of market society and other essays, chapter-1: “A Dissenter’s Confession: The strategy of Economic Development revisited and chapter-3: “Linkages in Economic Development”.

clumsy and prolonged journey to the desired target of higher growth of all sectors. This is known as “**Antagonistic pattern of Growth**”, wherein due to inhabitation of growth of one sector at the cost of other causes a decline in growth of that sector and this continues as they proceed clumsily to long run growth story.

The solution of this problem is that the sector chosen for investment must be the sector which has **Maximum Backward and Forward Linkages**. This is possible for a sector which has maximum backward and forward linkages to impart benefits to other sectors in the economy without gaining at their cost and hence can induce other linked sectors into the growth process. This happens because the sector with backward and forward linkages, has significant positive externalities for the linked sectors and its enhancement acts as a stimulus of other linked sectors, which are then pulled into the growth process through their enhancement.

One answer to this question is **Investment in “Infrastructure”** because it acts as a diverging series of investment. The virtue of infrastructure is that unlike other sectors, it does not constraint the growth of other sector and will pull a number of sectors into growth process and enhance their expansion, which will turn into increased employment opportunities and eventually, in higher income and higher consumption expenditure to boost and sustain the economic growth. Public expenditure on infrastructure- roads, ports, airports, power, irrigation etc, crowds private investment in, because it gives the producers a chance to enhance their operations due to lower costs concerning infrastructure needs and hence their desire to operate on large scale to reap maximum benefits out of it.

Now, looking at the theoretical background of the role on Infrastructure, we see that either Infrastructure can enter the production function Directly, as any other factor of production or it can enter the production function through enhancing the Total Productivity and hence, having an Indirect effect<sup>21</sup>. I have analyzed manufacturing sector and the role of Infrastructure in it from the point of view of both Direct and Indirect effects (See Appendix 3 for details).

Direct Effects: To analyze direct effects I have regressed the Index of Manufacturing output as a dependant variable over the Composite Index of Infrastructure Industries as an independent variable for the time period 1993-94 to 2007-08. The summarized results are as follows<sup>22</sup>:

The regression equation is:  **$Y = - 44.9 + 1.37 X$**

**$S = 5.32359$      $R-Sq = 99.1\%$      $R-Sq(adj) = 99.0\%$**

<sup>21</sup> Straub, Stephane (2007), Infrastructure and Development: A critical Appraisal of Macro level Literature, University of Edinburgh, pg 7-10. This paper has defined how Infrastructure enters production function directly and also Indirectly, enhancing the aggregate productivity.

<sup>22</sup> Regression Report: MINITAB statistical software (Appendix 3.2)

These results point towards the significance of the regression. The R-sq is close to 0.99, which is very significant. Also, the p values for T test and for overall regression are 0.00 which show that regression is very significant. Durbin-Watson index is 0.4259 which shows some positive auto-correlation, but this might be largely due to the crucial Base effect underlying the Manufacturing output.<sup>23</sup>

**These results show that Infrastructure has played a crucial role in determining the output of manufacturing sector and hence DIRECT effects are very significant.**

Indirect Effects: Aggregate productivity in manufacturing sector has been falling over the same time period of 14 years, which shows that there are no significant Indirect effects of infrastructure on the aggregate productivity of manufacturing sector. But this has to be looked into closely. Overtime, it has been seen in manufacturing sector that Labor productivity has increased but this is accompanied by 2 most important things: 1. Capital substituting labor and 2. Declining efficiency of capital, shown by an increase in capital-output ratio.<sup>24</sup>

So there is one important qualification over this result that, labor productivity has increased, which might help in reversing the trend of declining aggregate productivity in manufacturing sector. One crucial aspect of increase in labor productivity is that of SOCIAL INFRASTRUCTURE (health and education), which have been discussed earlier as well. So enhancing social infrastructure will have positive externalities too and can have significant Indirect effects in future, as it enhances the aggregate productivity.<sup>25</sup>

**In all, I have found that there are significant DIRECT effects of Infrastructure over the performance of Manufacturing sector and at the same time enhancing the social infrastructure might bring about crucial INDIRECT effects too in future.**

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<sup>23</sup> At this point of time due to exposure to the Introductory Econometrics for the first time, I am unable to analyze the autocorrelation and the base effect in detail. In future I would like to analyze them more closely.

<sup>24</sup> Source: Handbook of Statistics, RBI. Also, this situation has been significantly due to labor unions and low skill level of workers, which has forced owners to substitute capital for labor. Following the suggestions in this paper, there are fairly good chances that these trends will reverse. This is also a further avenue of research for me

<sup>25</sup> Some Works on this topic suggest that there may be some sizable Indirect effects on productivity also, other than that of Social Infrastructure. I would like to work on them in future.

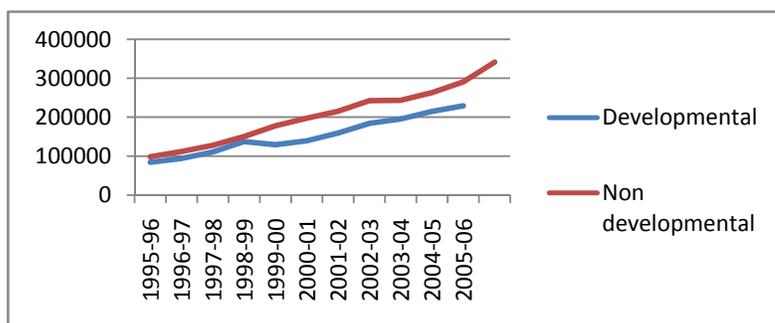
### **Case Study: Delicensing and Manufacturing sector**<sup>26</sup>

This is a study done by Indian council for Research on International Economic Relations, which has studied the performance of manufacturing sector after the delicensing in India. They have analyzed the trends in manufacturing sector, taking into account 3 factors: Infrastructural dependence, Dependence on external finance and Labor intensity. I will talk about the first factor i.e Infrastructural Dependence. They have analyzed that after delicensing, the manufacturing industries with Above median Infrastructural dependence have seen a 15% decline in their performance due to infrastructural deficiencies in India with comparison to a 33% increment in performance for industries with Below median infrastructure dependence. This study shows that, how crucial infrastructure has been for determining the performance of Manufacturing sector in India, which confirms my analysis of its direct and indirect effects.

## **4.2 Public Policy**

In an economy a clear distinction must be made in public spending in current outlays and capital expenditure which will facilitate growth and development. More spending in the former at the cost of latter will inhibit latter and take away resources which are crucial for longer term. This can crowd out private investment possibilities in future too because these expenses will be financed out of taxes, fees or inflation which will deprive private sector of resources it might otherwise have invested for expanding their operations and hence creating more employment opportunities.

Following graphs show somewhat this situation only and points towards possibilities of gaining room

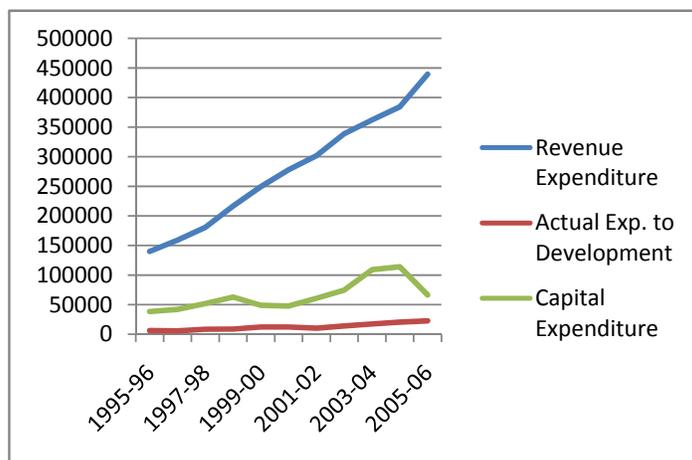


for investment for developing activities (like Infrastructure):

Source: ASI, RBI database

Figure 1: Developmental and Non Developmental Expenditures

<sup>26</sup> Working Paper No. 211 “ What constraints Indian Manufacturing?”, Poonam Gupta, Rana hasan, Utsav Kumar, March 2008, ICRIER



Source: ASI, RBI database

Figure 2: Different heads of Public expenditure in India

In the first figure one can see the disparity between expenditure for Developmental and Non Developmental purposes. Second figure points towards the parts of govt expenditure in India and shows the lackluster trend of Expenditure which accrues to Actual Growth (This head is derived by making capital expenditure net of interest payments and defense expenses).

Both of these graphs show that there exists a room of improvement and channelizing funds for Developmental purposes like that for Infrastructural Development (Social and Physical) in India. It can be argued that rather than allocating funds for satisfying some political needs and for benefits to privileged classes for some non productive causes, they can be channelized for development of a good Infrastructural base and providing funds for Educational and Health services in India.

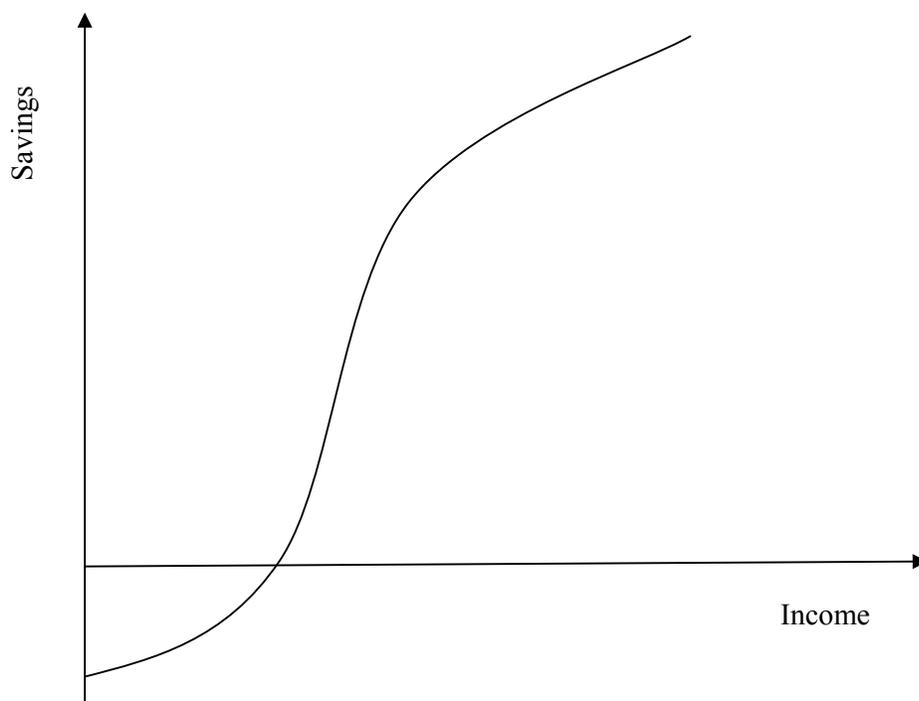
In this section we have seen the crucial role of Labor Mobility in easing the consumption inequalities amongst the masses and to facilitate it, we have seen that enhancing the Literacy level of people and providing them income earning opportunity by stimulating a crucial missing juncture like that of manufacturing sector are crucial steps to be taken.

## 5. Simulation

### 5.1 Increase in MPC and strengthening the growth prospects

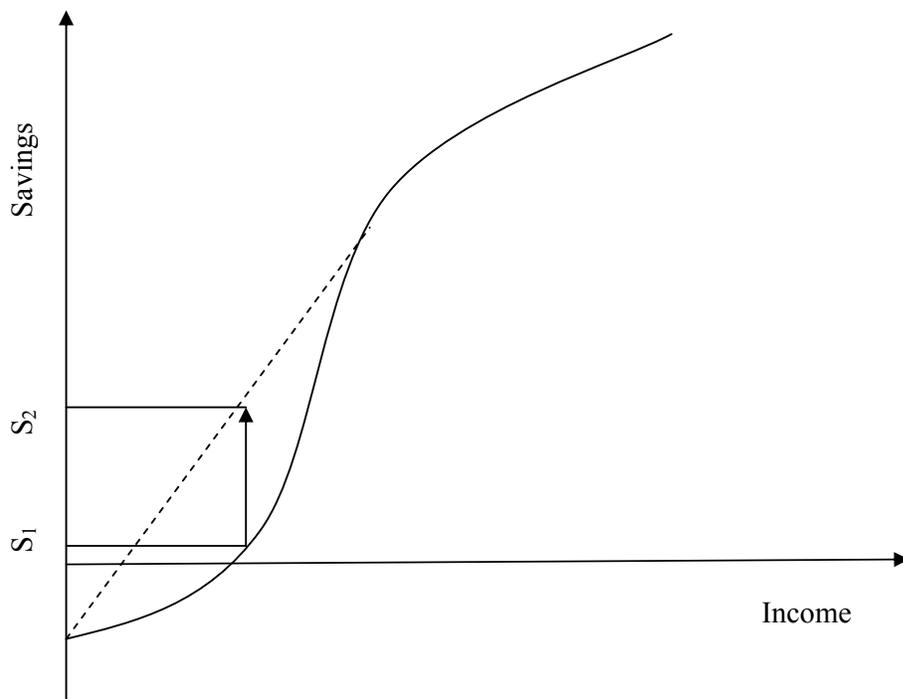
In this section we will bring together the Theoretical conventions of section 2 and the results learned from section 3 and 4, in bringing out a simulation of how these results will stimulate the variables discussed in the theoretical section and will help in devising a long run inclusive growth strategy for India.

Firstly, we have seen in the last section, how revamping of manufacturing sector can facilitate the labor mobility and a smooth transition from low to high productive sectors. This will contribute towards movement of masses from a low remunerative sector to a higher one and will help in easing off the Income inequalities. The reduced inequalities will bring about a smooth consumption pattern amongst the masses. Now, how this movement from lower income groups to comparatively higher ones will affect the marginal propensity to consume?? To answer this we have to move back to the theory. Empirically it has been argued that a tendency to save takes the following pattern with an increase in Income of masses<sup>27</sup>



<sup>27</sup> Development Economics by Debraj Ray, Oxford University Press, chapter-7, Section 7.2.4

Which means that at lower levels on income, there is no savings, at a higher level of income, there are increased savings due to anticipation of a good future and at very high levels of income, there is again no tendency to save. In this paper, we have talked about movement of labor from very low incomes to comparatively higher ones, so I am interested in the lower and middle parts of curve to know about the savings behavior.



In this figure we can see, how easing off the inequalities between a lower income group and a middle income group (eg. Shift from agriculture to manufacturing), will depress the aggregate savings propensity and will increase the consumption propensity (point  $s_2$  should be reached but a point  $s_1$  on the curve is reached). This proves that enhanced labor mobility and hence a movement from a low productive to a high productive sector will increase the MPC.<sup>28</sup>

This increase in MPC means increase in current consumption and will enhance the labor productivity, as per the first model of section 2 (section 2.2.1). This enhanced labor productivity and increase in current consumption expenditure will increase the current utility directly and indirectly and will contribute towards achieving a high rate of growth and also inclusive development.

<sup>28</sup> Development Economics by Debraj Ray, Oxford University Press, chapter-7, Section 7.2.4

Similarly, this increased in current consumption will enhance the human capital (as shown my second model in section 2.2.2). This enhanced human capital will act as stimulating the total capital base in endogenous growth models, which might turn out to be achieving increasing returns to scale and will achieve higher rates of growth, which can be sustained for long run.

Confirmation of this analysis with the theoretical models suggest that suggestions given in this paper can strengthen the current fragile structure of growth and can take it on long run high growth trajectories.

## 5.2 IS-LM Analysis: Increased expansionary effects of Growth

Increased Income must induce increased consumption expenditure as the demand of basic and other necessities increase initially in a developing economy. This consumption expenditure multiplies itself in the economy and induces further more consumption from economic agents. This process as a whole work towards increasing the “**Aggregate Demand**” in an economy.

In an economy, shifts in aggregate demand are determined by the intersection of IS and LM curves: Where, the monetary multiplier (Differentiating Y w.r.t M/P in the intersection of IS and LM curves)<sup>29</sup>

$$\frac{\Delta Y}{\Delta(M/P)} = \frac{b \gamma}{h}$$

$$\gamma = \frac{\alpha_g}{1 + \frac{(k \cdot \alpha_g \cdot b)}{h}}$$

$\alpha_g$  = Govt. spending multiplier

$k$  = sensitivity of money demand to level of income

$h$  = sensitivity of money demand to interest rates

$b$  = sensitivity of investment to interest rates and

M/P = Money supply

Now, for a LM curve to shift more (hence AD to shift more)

**(h) & (k) should be smaller and (b) & ( $\alpha_g$ ) should be larger.**

<sup>29</sup> Macroeconomics, 6<sup>th</sup> Edition, by Dornbusch & Fischer, Macgraw Hill Inc., Ch-4, Page 116-119

To apply and analyze it in the Indian context, I have applied methods to get the measure of sensitivity of one variable over the another, as required to know the estimated values of the parameters (b), (h), and (k) for the time period of 10 years starting from 2002-03.<sup>30</sup> To get an estimate of these parameters in Indian context I have used the concept of the responsiveness of the one variable over another, which is calculated by **dividing the percent change in one variable by the percent change in another variable (See Appendix 4 for details)**

For eg. To get the responsiveness of investment to interest rates (to get an estimate of “b”), I have divided the percent change of investments over the time period to the percent change in interest rates over the same period.

$$\text{Responsiveness} = \frac{\% \text{ change in one variable}}{\% \text{ change in another variable}}$$

The respective estimate of the variables came out to be as follows in the Indian context:

$$(h) = 6.855, (k) = 2.884, (b) = 2.992$$

Now, for the estimate of ( $\alpha_g$ ) in Indian context, we find ( $\alpha$ ) = 2.1915

we know that, ( $\alpha$ ) > ( $\alpha_g$ ), so we can say that

$$(\alpha_g) < 2.1915$$

Hence, our cumulative estimates of the variables come out to be:

$$(h) = 6.855, (k) = 2.884, (b) = 2.992 \text{ and } (\alpha_g) < 2.1915$$

In Indian economy (h) & (k) are larger and (b) & ( $\alpha_g$ ) are smaller.

But the condition required for a LM curve to shift more and hence AD curve to shift more is just the other way around.

Here comes the role of boosting the consumption demand. Enhanced consumption demand will enhance the MPC initially because the demand of basic goods increases as we move from low productivity to higher productivity sector (Low productive sector with low returns to start with).

We see that there is a room to enhance the consumption so as to increase

$$(\alpha_g) = \frac{1}{1-c(1-t)} \quad \text{where, } c = \text{MPC}$$

Because, as the consumption increases, MPC increases and hence ( $\alpha_g$ ) increases. Which contribute to the condition of ( $\alpha_g$ ) being larger for a LM curve to shift more. When the LM curve shifts more, Aggregate demand increases in the Indian Economy.

**Result: This creates the multiplier effect which will show up in enhanced growth rate of GDP with sustained increased in money supply as the economy grows in its all dimensions.**

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<sup>30</sup> Source: Handbook of Statistics, RBI

## 6. Summary and Conclusion

In section 1, we saw that current growth rate story has been consumption led, but service dominated and credit fuelled, which might have its implications on long run growth. In section 2 we saw some empirical works, demonstrating the role of productive consumption, which are also generalized in forms of 2 models later, dealing with labor productivity and human capital enhancement. In section 3, we learned about the fragile structure of consumption led Indian Growth story, which was later analyzed in terms of Inequality in consumption and welfare contributions of distinct classes of items. It was found that increasing MPS was the illusionary display of the actual situation, wherein Basic and Necessities consumptions are depressed but they have contributed maximum to the welfare. With identification of the problem in opportunities for Income earnings, we saw the dismal status labor mobility brought about by unusual transitions, which has fuelled the gap of inequality and hence resulted in a fragile growth structure. Next we discussed about factors inhibiting the mobility and with a case study of Indian Manufacturing sector, I established that, how enhancing the sector can contribute towards facilitating labor mobility and hence, easing off the Inequalities, which as a whole will strengthen the growth process. In section 5, I brought the results from analysis together and showed, how they fitted into the models, to sustain and strengthen long run growth story. This was also proved by an IS-LM analysis of increased expansionary effects.

Indian growth rate story has been unusual and touches many extents of unconventionality. In spite of that it has achieved growth targets beyond expectations. But this overwhelming excitement of achievements has a hidden word of caution in it. No matter how well it has served the political interests and has gained a worldwide hype in its image and position, there is another side of this story which shows increased vulnerability to shocks and factors beyond control. Growth stories are made successful and sustainable by united efforts and contributions from every section of society and economy, not by individualistic achievements which pose a threat to its future prospects. In this regard, looking back at conventions of sustainability and integrating them with local conditions, will generate results, which are equitable, prosperous and sustainable.

## 7. Appendix

### Appendix 1 (Calculation of Gini's coeff. And the welfare index)

#### Appendix 1.1 (Gini's Coefficient Calculation)

The Formula used to calculate Gini's coefficient is:  $G = \frac{2}{n^2 \bar{x}} \sum i (x_i - \bar{x})$

where, i = Rank

#### RURAL

##### Class 1:

$$G = [2/(12)^2 \cdot (447.79)] \cdot [1(-29.48)+2(-248.46)+3(-216.5)+4(-186.4)+5(-158.55)+6(-125.19)+7(-96.37)+8(-55.33)+9(-2.87)+10(73.63)+11(168.96)+12(407.21)]$$

$$G = 5606.81 \times 0.0000310 = \mathbf{0.1739}$$

##### Class 2:

$$G = [2/(12)^2 \cdot (199.03)] \cdot [1(-171.93)+2(-162.06)+3(-155.74)+4(-142.69)+5(-132.02)+6(-119.25)+7(-106.13)+8(-87.85)+9(-58.7)+10(2.59)+11(116.02)+12(601.97)]$$

$$G = 3641.12 \times 0.0000698 = \mathbf{0.2541}$$

#### URBAN

##### Class 1:

$$G = [2/(12)^2 \cdot (653.27)] \cdot [1(-438.4)+2(-378.93)+3(-336.58)+4(-277.88)+5(-227.71)+6(-181.73)+7(-124.62)+8(-60.87)+9(32.04)+10(149.63)+11(296.67)+12(725.98)]$$

$$G = 6853.93 \times 0.00002126 = \underline{\underline{0.1457}}$$

**Class 2:**

$$G = [2/(12)^2 \cdot (575.91)] \cdot [1(-525.53)+2(-508.46)+3(-482.59)+4(-450.76)+5(-417.37)+6(-364.29) \\ +7(-302.81)+8(-227.53)+9(-111.57)+10(118.68)+11(496.52)+12(1886.17)]$$

$$G = 15272.67 \times 0.00002412 = \underline{\underline{0.3683}}$$

**Appendix 1.2** (Welfare Calculation)

The welfare function is :  $\mathbf{W = \mu(1-G)}$

Where,  $\mu$  = Average expenditure

**For Rural:** Class 1

$$W = 447.19 (1 - 0.1739) = \underline{\underline{369.424}}$$

Class 2

$$W = 199.03 (1 - 0.2541) = \underline{\underline{148.459}}$$

**For Urban:** Class 1

$$W = 653.27 (1 - 0.1453) = \underline{\underline{558.076}}$$

Class 2

$$W = 575.91 (1 - 0.3683) = \underline{\underline{363.789}}$$

## Appendix 2

### (The Decomposing Exercise, formal model)

#### Productivity Accounting

Consider aggregates of output ( $X_t$ ), composite inputs ( $S_t$ ), and total factor productivity ( $A_t = X_t/S_t$ ). These aggregates are the sum (or chained indexes) of industry output, inputs, and productivity ( $X_{it}$ ,  $S_{it}$ , and  $A_{it}$ ). We can rewrite these as built up from industry values ( $i = 1, \dots, I$ ) as follows:<sup>7</sup>

$$\begin{aligned} A_t &= X_t/S_t = (\sum_i X_{it})/(\sum_j S_{jt}) \\ &= \sum_i [(X_{it}/S_{it})(S_{it}/(\sum_j S_{jt}))] \end{aligned}$$

or

$$(7) \quad A_t = \sum_i A_{it}w_{it}$$

where  $w_{it}$  = share of total inputs devoted to industry  $i$ , that is,  $w_{it} = S_{it}/(\sum_j S_{jt})$ . Note that in the ideal case of perfect competition and constant returns to scale, with no indirect taxes, the share of inputs is also the share of nominal outputs.

We can calculate the change in total factor productivity as follows:

$$\begin{aligned} \Delta A_t &= \sum_i A_{it}w_{it} - \sum_i A_{it-1}w_{it-1} \\ &= \sum_i A_{it}w_{it} - \sum_i A_{it-1}w_{it} + \sum_i A_{it-1}w_{it} - \sum_i A_{it-1}w_{it-1} \end{aligned}$$

or

$$\Delta A_t = \sum_i w_{it}\Delta A_{it} + \sum_i A_{it-1}\Delta w_{it}$$

Now dividing by  $A_{t-1}$ , we have

$$\Delta A_t/A_{t-1} = \sum_i w_{it}(\Delta A_{it}/A_{it-1})(A_{it-1}/A_{t-1}) + \sum_i (A_{it-1}/A_{t-1})\Delta w_{it}$$

Define productivity relatives as  $R_{it} = A_{it}/A_t$ . This leads to

$$\Delta A_t/A_{t-1} = \sum_i w_{it}(\Delta A_{it}/A_{it-1})R_{it-1} + \sum_i (A_{it-1}/A_{t-1})\Delta w_{it}$$

We now define  $s_{it} = w_{it}R_{it-1} = S_{it}/S_t A_{it-1}/A_{t-1} = (S_{it}/S_t)(X_{it-1}/X_{t-1})/(S_{it-1}/S_{t-1})$ . For smooth time series and small time steps,  $s_{it} \approx X_{it}/X_t = \sigma_{it}$ .

$$(8) \quad g(A_t) = \sum_i s_{it}g(A_{it}) + \sum_i R_{it-1}\Delta w_{it}$$

Finally, add and subtract  $\sum_i s_{ik}g(A_{it})$  from equation (8), where  $k$  is the base year. This yields the final equation:

$$(9) \quad g(A_t) = \sum_i s_{ik}g(A_{it}) + \sum_i (s_{it} - s_{ik})g(A_{it}) + \sum_i R_{it-1}\Delta w_{it}$$

As long as all series are smooth series and with small time steps, this becomes

$$(9') \quad g(A_t) = \sum_i \sigma_{ik}g(A_{it}) + \sum_i (\sigma_{it} - \sigma_{ik})g(A_{it}) + \sum_i R_{it-1}\Delta w_{it}$$

Where, these three terms are called Pure productivity effect, Boumul effect and Denison Effect respectively. The resultant decomposition of Aggregate average productivity is summarized as follows:

<b>0.9298</b>	<b>=</b>	<b>1.363</b>	<b>+</b>	<b>(-0.315)</b>	<b>+</b>	<b>(-0.1183)</b>
(change in prod.)		(Pure Productivity effect)		(Boumul effect)		(Denison effect)

### Appendix 3

#### Appendix 3.1 (Direct and Indirect effects)

$$\text{Direct Effect : } Q = A \cdot F [ K , L , I(K_i) ]$$

Where, A = Aggregate productivity

I(K<sub>i</sub>) = Infrastructural Capital

$$\text{Indirect Effect : } Q = A [\theta, K_i] \cdot F [K, L]$$

Where,  $\theta$  = Any other factor influencing productivity

### Appendix 3.2 (Regression Report)

Following is the Regression Report with Infrastructural Index as Independent and the Index of Manufacturing output as the dependent variable, derived in the MINITAB statistical software:

#### Regression Analysis: Y (Index of Manufacturing) versus X (Index of Infrastructure)

The regression equation is

$$Y \text{ (Index of Manufacturing)} = -44.9 + 1.37 X \text{ (Index of Infrastructure)}$$

Predictor	Coef	SE Coef	T	P
Constant	-44.874	6.521	-6.88	0.000
X (Index of Infrastructure)	1.36522	0.03842	35.53	0.000

S = 5.32359    R-Sq = 99.1%    R-Sq(adj) = 99.0%

#### Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	35785	35785	1262.69	0.000
Residual Error	12	340	28		
Total	13	36125			

#### Unusual Observations

Obs	X (Index of Infrastructure)	Y (Index of Manufacturing)	Fit	SE Fit	Residual	St Resid
14	236	287.20	277.59	3.06	9.61	2.21R

R denotes an observation with a large standardized residual.

Durbin-Watson statistic = 0.425987

### Appendix 4 (IS-LM Analysis)

All the methods of calculation and types of Data used for statistical analysis are explained as follows:

1). Calculation of (b), (h), (k) and (α)

As mentioned earlier, for estimation of sensitivity of one variable to another variable, method for calculating responsiveness is employed.

$$\text{Responsiveness} = \frac{\Delta(\text{one variable})}{(\text{Variable at the previous period})} \times \frac{(\text{Second variable at previous period})}{\Delta(\text{second variable})}$$

This method is employed for calculating estimation values for (b), (h) and (k).

2). For calculation of (α):

$$\text{MPC} = \frac{\Delta(\text{consumption expenditure}^1)}{\Delta(\text{National Income})}$$

$$\text{And } (\alpha) = \frac{1}{1-\text{MPC}}$$

3). For Money Demand “**Currency with the public**” from money stock data is used.

4). For Investments “**Gross domestic capital formation**” from data regarding national income aggregates is used.

5). <sup>1</sup>For consumption expenditure “**Private final consumption expenditure**” from data regarding national income aggregates is used.

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