

# Demographic Dividend, Human & Knowledge Capital Management and Growth: An Endogenous Model-Based Approach

Arjun K.<sup>1</sup>, A Sankaran<sup>2</sup>, Salinikunnath<sup>3</sup>

<sup>1</sup>Research Scholar, Department of Economics, Pondicherry central University, India.

<sup>2</sup>Faculty member, Department of Economics, Pondicherry central University, India.

<sup>3</sup>Department of Economics, University of Calicut, India.

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**Abstract:** In this article, we try to establish a relation between a nation's population and its growth with the GDP growth by means of endogenous growth theories and attempt to explain India growth by means various empirical studies. India's growth associated with an increase in total factor productivity associated to have a relation with human capital and knowledge capital formation in India which is debatable. We have a very low gross enrolment ratio (GER), Education expenditure is very low for general education and it is even low for higher education. Our education system is not R&D based to a very large extent and skill development is also questionable. The government investment for R&D is low. The proper human resource management through upskilling human capital of the youth is vital through a PPP model. Macro synergy of innovation capital can be obtained only through firm level micro consistent innovation acts

**Keywords:** Innovation-led Growth, Human capital-led Growth.

**JEL Classification:** J24, O3, O32.

## I. Introduction: Demographic dividend and youth

The benefits of demographic dividend can be reaped if and only if we make proper management and utilization of youth population. Among the developed countries and countries with development potential, the present scenario indicates the advantage that India holds for the next 30 years a significant representation and retention of the youth population in the working-age group. The significant increase in youth workforces can make a positive impact on different aspects. First, in terms of the growth patterns country will hopefully achieve a positive increasing trends in the nearest future. Second, the upcoming technologies will be largely absorbed, reproduced by such minds. Finally but not lastly, the production mechanism will be largely run by the said sect of the population who are aware of their choices and received entitlements and capabilities as Sen mentioned in capability approach. Being a lone country of having such positive trend in the working population, India, could be a dynamic force behind tomorrow's world development process.

The endogenous models approach growth as an outcome of endogenous forces and nullifies the role of the external forces in the model. The economic growth therefore will always be sustainable in nature and investment in human capital creation, knowledge and associated innovations will remain as a key factors of economic growth. The historical pieces of evidence of economies such as the US, Japan, Singapore, Germany, China, and Hong Kong where either human capital or knowledge capital or both retained a positive per capita growth for decades for more than a century even. Unfortunately, the negative demographic dividend of the increased aged population act as a threat of further growth of those economies. In order to attain a sustainable growth, India therefore, has to make use of the advantages in human resources and build human & knowledge capitals further through proper channels of investments.

## Population and growth: a theoretical revision

This section is an overview of theories connecting the population with the growth of an economy. It is necessary to understand the evolution of theoretical understanding of the growth happened in the fields of economics studies which is begins from classical model of growth theories to the endogenous growth models of the same.

## The growth models: from pessimism to optimism; from stationary to an infinite growth prospects

The classical economists rightly from Smith (1776), were suspicious of the long term viability of the economic system and predicted, warned about the inherent tendencies of slowing down and ultimately achieving stationary state. Whether the modern economists agree about this or not there was some logic behind these economic theories provided the economic background with the contributing factors to growth all were different. Their prediction of stationary was a result of introspective approach towards the economic scenario they belonged to. They were cautious or meticulous about the movement of economic parameters which were pivotal and expressed their pessimism with regards to the increase in population which has got a detrimental impact on economic growth.

Meanwhile the basic ingredients of modern economic growth were elicited from conventional classical economics. These notions involve the competitive behavior and equilibrium nuances, the role of decreasing productive capability to the productive factor, the interrelation between per person income and population expansion rate, the implications of technological expansion and by inventing new products as well as the and systems of making and the role of monopoly supremacy as an incentive for technological advancement. The Schumpeter's theory first time laid the importance of innovation in the context of growth: introduction of a new product and continuous improvements in the product, and he analyzed a process of transition from capitalism to socialism.

## II. History of modern growth theory

Ramsey's (1928) paradigm of household optimization over time, optimality conditions and inter-temporally separable utility functions, are integrated into modern growth theory. The late 1950s, witnessed the emergence of well celebrated theoretical frameworks of Harrod (1939) and Domar (1946) on economic growth which tried to integrate Keynesian analysis with elements of economic growth and argued the inherent instability of capitalism. The Harrod-Domar model emphasized on the multiplier and accelerator mechanisms borrowing Keynesian and classical approaches. The basis of the Harrod-Domar model comprises of the formula,  $G=S/V$ , where  $S$ =saving income ratio,  $V$ = Incremental capital-output ratio and the model ultimately fixes the growth ceiling ( $G_n$ - Natural Growth) as the rate of growth of population which is an exogenous factor. H-D model presents three concepts of growth such as

1. Actual growth where  $dY/Y=S/V$
2. Warranted Growth Rate  $G_w= S/Vr$
3. Natural Growth Rate  $G_n = L^*/L = n$  and it highlights Knife-edge property.

In 1956, Joan Robinson familiarized the concept of 'golden age' that explains the role of labour in the growth of an economy. The golden age refers to the situation when the growth rate of capital balances with the growth rate of labour. Described as  $dK/K = dN/N$ . Equality ensures stable equilibrium and  $G_n=G_w=G$ .

Solow (1956) and Swan (1956) brought forth a paradigm with a production function, a specimen that acts according to constant returns to scale, falling productive ability to each factor and sanguine and flat substitution elasticity amongst inputs. Further, the fixed nature of the saving rate is held as a norm. Solow model explained the Neo-Classical framework projects population growth has a negative impact on growth and argue in contrast to what H-D model suggests. But he observed the positive per capita growth rate in countries such as the US, Japan, Hong Kong and Singapore which even after attaining a steady-state had a positive per capita growth rate. That is there is an increase in productivity which should not be happening because diminishing returns as envisaged by Neo-Classical sets in.

This increase in productivity, he attributed to, technological progress which is exogenous. Thus in the absence of continuous improvements in technology, the per capita growth must eventually cease. But the observance of positive growth experiences which persisted over a century led to some amendments in the theory by bringing the assumption of technological progress which been fixed exogenously. The shortcoming was that the long-run growth rate was determined by technology, and exogenously fixed factor.

The paradigm prophesies conditional convergence; the lower intercept of per capita GDP compared to the status of equilibrium which is time invariant, the more rapid the growth rate. The convergence is defined by the time invariant long run levels of capital and output per person, the rate of saving and population and production function status quo– status diverging across nations.

### Transition to endogenous growth models

Cass and Koopmans (1965) made endogenous the determination of saving rate but this did not avoid the reliance of long-run per capita growth on exogenous technological progress.. Technological advance encompasses the making of new ideas. These new notions/designs are partially exclusive and completely non-rivalrous. The return to scale tends to be increased if the such ideas are counted in as an element of production. Further increasing productivity skirmishes with perfect competition. The reward for ideas shall become zero if price is set according to marginal cost of production. It shall be the coffin of incentive to research ventures that underlie the creation of new ideas.

Arrow and Sheshinki (1967) constructed models in which each person's discoveries immediately spill over to the entire economy. Romer (1980) showed later that the competitive framework can be retained in this case to determine the equilibrium rate of technological advancement, but the resulting growth would be typically non-rival.

### Origin of endogenous growth models

The research on economic growth witnessed flourishing with the commencement of Romer (1986) and Lucas (1988) publications. The inspiration for this venture was that the appreciation that causes of long-run economic growth are critical issues. Initial paradigms did not really present a technical transformation. In these frameworks, growth will have a permanent existence because the capital goods is extended to include human capital which makes constant or increasing returns as the economy develops. The AK model represents the prototype

The amalgamation of R& D Theories and an imperfect market structure into the growth paradigm is christened by Romer (1987, 90) and forged by Aghion and Howitt (1992) and Grossman and Helpman (1991). In these paradigms, technological development is effected from constructive R&D activity and it is remunerated by pre-existing monopoly power. If economy doesn't show any symptom of the drought of the ideas, the growth rate can remain positive in the long run.

### **The theoretical and conceptual framework derived from the existing theories**

Demographic dividend → Higher youth population → leads to increase in Human Capital and Knowledge capital formation → Adding human Capital and knowledge capital to the classical production function  $Y = F(KL)$  **with diminishing returns with constant returns to scale** → a modern Human and Knowledge capital augmented production function where increasing returns with increasing returns to scale positive per capita Growth

**In a nutshell, the rate of growth of population determines  $L^*/L$ , determines  $Y^*/Y$ .**

### **India's growth and development: a historical analysis:**

Is India ready for its tryst with destiny? It was the inspiring speech from Nehru that "when the whole the world sleeps India will awake into freedom" on the very eve that India was freed from the clutches of British imperialism. From the heights of greater glories of economic prosperity that India enjoyed in terms of owning 23% of world GDP (Maddison), well flourished agricultural arena illustrious industries of textiles, ship-building, iron industry and men of expertise in handicrafts and artisanry during the advent of British, India was dragged, tortured incessantly and brutally by the British imperialism and its colonial regime. At last, when she got freed, she was moribund and had nothing except a degenerated agriculture, a wrecked industrial sector and the marks of artisanry and handicraftsmanship that India had long lost.

India's relative decline in global GDP during British period is still a debatable topic among various economists. The role and degree of British Raj colonial policies and related negative growth is still have various explanation. However, it is undeniable that British invasion in Indian was nothing but having an eye on its abundant natural resources along with the cheap labour which in turns can be utilized in favor to their home country. During the 1770's, 24.4% was India's share of the global GDP and it drastically declined to 4.2% in 1950s. It was during the same period that India's share of global industrial output went from 25% in 1750 down to hardly 2% in 1900 (Maddison, 2010). In short, the historical oppression and exploitation during the British colonial turned the India's future from a well-nourished and potential one to full-collapsed and deteriorated one.

When India won freedom in 1947, she was a pauperized nation. The idea of Fabian socialism, inspired by ideas of Gandhi and USSR, motivated Nehru and under his leadership, India started to follow the Nehruvian model of development until the realization of growing economic crisis became evidentially preternatural. From Fabian socialism to the neoliberal policy regime, India had to have a long walk filled with many realizations from the stark realities of the economic crisis that India was often confronted with. It has been 25 years since the neoliberal policies have opted. And now India is shouldering a great number of expectations from all across the world. For the first time, India outweighed china in terms of its annual growth rate. From 1990 onwards, India experienced continuous growth averaging about 7 % for the last 25 years, surely the lead is taken by the service sector. But there were critics who questioned the sustenance of India's economic growth.

On the one side, agriculture is not so dynamic and promising the industrial sector in its infant stage. The ideal way of sectoral transformation where the industry takes the lead first and then service sector succeeds and exceeds it in terms of growth has not happened in the case of India. India's industrial sector is in a nascent stage. Moreover, 92% of the entire labour force in the country is engaged in the unorganized sector. In this context, it seems to be so logical that a question is raised on the sustenance of India's growth. To address these questions require explaining the sources/engine of growth requires an engine of growth. So explain India's growth requires explaining the engine of growth.

### **India's economy from 1950 to 2017: a quick glance**

During 1950-51, the share of the primary sector (agriculture and allied activities) in GDP was 51.81%. Industry and service sector respectively contributed 14.16% and 33.25%. The sector-wise GDP composition in 2014 gives a true picture. The scenario has got largely changed the service has taken the lead t position contributing 57.9% of the GDP while the share of primary sector reduced to 17.9% and that of Industry hiked to 24.25. In 2016-2017 financial year, with a GDP of 2.5 trillion USD, the gross value added by the service sector contributes 53.66% of total India's GVA. The industry contributed 29.2% while Agriculture contributed 17.32%. At present, More than 30% of the total labour force is employed in the service sector while the primary sector accommodates almost 50 % of the labour force. In the case of Industry, it is approximately 22% of the labour force<sup>a</sup>. The GDP per capita growth at 2011-12 prices for the year 2014-2015 was 5.4 per cent. From 1950- 2000, India's per capita GDP growth rate was estimated at 2.25 % at 1993-94 prices <sup>b</sup> (Sivasubramonian, year).. From 1950 to 2012, the NNI per capita growth is 2.88% at 2011-2012) prices. There is clearly a positive average per capita growth rate of national income.

<sup>a</sup> See statistics available on the website of Ministry of Statistics and Program Implementation

<sup>b</sup> Source of economics growth in India 1950-51 to 1999-2000, Sivasubramonian

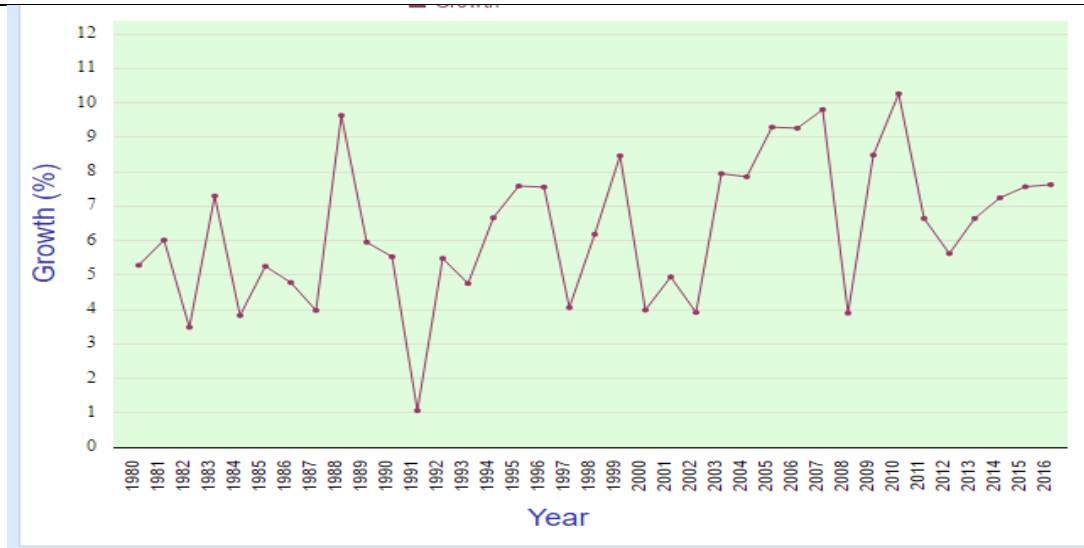


Figure 1: NNI From 1980 to 2016: a Graphical Representation

Source: Ministry of statistics and program implementation

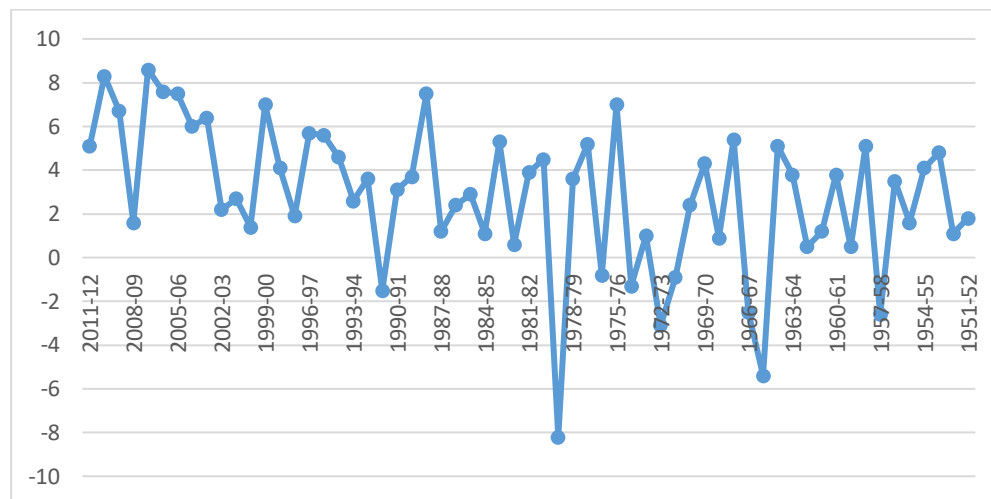


Figure 2. GDP per capita from 1950-2011

Source: Ministry of statistics and program implementation

In this context, checking the contribution of human capital and knowledge capital can be a significant contribution. As per the Romer model, the increase in population leads to More number of people getting engaged in R &D adding to the existing stock of knowledge (knowledge capital formation and knowledge labourers) and learning, applying and transferring existing Knowledge (human capital formation).

### Demographic dividend as a source of growth: international experience

As far as the developed countries are concerned there were many vital forces which work together creating an ambience for sustained growth. Institution of intellectual property rights incentivized innovations which occurred as a series in developed countries. Social cohesion, quality education, good health indicators, growth of social and economic infrastructure, transparent and investment-friendly government policies low red-tapism and corruption issues all are factors contributing to innovations, technological developments. The industrial revolution in Britain was the beginning. The transparent government system and its cordial government policies helped technological improvements in innovations thus overcoming the threshold of overcoming classical stationary beliefs that is the diminishing returns. Proper management and investment of human resources led to human capital formation and knowledge capital formation which augmented the growth. The shinnying examples are the US the Great Britain Japan and China. (Jones,2013)

When we take the case of East Asian countries like Taiwan, Singapore, Hong Kong etc. Human capital development was behind the progress of the nations. They learned to use new technologies quickly because of proper utilization of human resources that

helped in achieving sustained growth through technological up-gradation as a result of technology transfer through investment (Jones, 2013). Lau & al (1993) attributes 25 per cent of the economic growth to increased education in the workforce in Brazil

### III. Relevant Indian studies growth shifts in India

Pulapre and Paramewaran (2007) using the methodology of multiple structural breaks analyze the existence of different growth regimes. Since 1950 and gives emphasis on services-led growth at least for the last 2 decades (from the 1990s) and also writes about manufacturing-led growth in the mid the 1980s and primary sector-led growth acceleration in the 1960s. Does this indicate a trend labour participation and mobility across sectors in a chronological manner and does this reflect labour productivity increase? In another article, they talk about communications led growth since 1991-92.

### Knowledge capital and human capital in India

Shultz (1961) viewed education as an investment in human capital rather than a consumption good under the Keynes regime. Tilak (1987) states investment in human capitalise more productive than investment in physical assets. Mathur(1993) gives evidence for a strong positive relation existing between education and economic growth and that association becomes stronger at the higher education level

Aravind Panagaria (2007) talks about Indian experience of movement of workers from agriculture to industry and then to services and the bias towards skilled labour-intensive industries such as engineering goods, chemical industries, telecommunications and automobiles, pharmaceuticals and software industry all share the same issues which check the labour transition from agriculture to non -agriculture activities. But this definitely involves human capital creation which is embodied in skilled labour. Here through various studies, the researcher examines how R&D and Innovation lead to growth and relevance of various sectors. Mani and Santha Kumar (2011) deals with the diffusion of new technology and sectoral innovations in agriculture in the context of natural rubber.

Subramanya (2015) in his book review article on *Innovation in India: Combining Economic Growth with Inclusive Development* edited by Shyama V Ramani, throws light on various studies such as role of National System of Innovation (NSI) in R&D and innovation in past, present and future, universities and role of universities and public labs as a catalyst of innovation and entrepreneurship in three phases – prior to independence- from 1947-1991- and after 1991. The omission of ISRO by her is particularly noted by him. Contributions in terms of innovations in IT, Telecommunication, Pharmaceuticals, Seed & Biotechnology, Nanotechnology, research in Medicine, energy policies, such as wind power and coal power generation, automobiles and improved cookstove been highlighted. Also social innovations as pro-poor innovations such as sanitation challenges. The contribution of ISRO in science and technology is very relevant especially its low-cost space ships.

Mani (2009) talks about R&D distribution largely confined to pharmaceuticals within the domestic private sector. Increasing MNCs contribute to enhanced innovation performance in IT sector. It doesn't mean other sectors don't have innovative activities going on but more active innovations are occurring in these sectors. Mani(2014) talks about the emergence of India as the world leader of information and computer services where the multinational play the lead role followed by domestic Indian enterprises.

Maddison (2010) examines the relevance of R&D, transnational R&D discharge in explaining India's growth. The growth theories tested are semi endogenous theories and the Schumpeterian growth theories. Claimed to be the first such an attempt in the case of developing countries like India, and the important question addressed is whether R&D play a crucial role in India's economic growth or is it limited to developed countries only. The test is done using R&D data from 1950 to 2005 and the rationale behind the study is that India has experienced a significant improvement in Total Factor productivity. Showing little evidence for semi endogenous models, the study finds ample evidence for Schumpeterian growth theories.

On the one hand innovations, R&D is going on and on the other hand, we are getting access to modern technology in terms of technology transfer through FDI, programs such as Make in India. Such technology can be learned only by an educated and healthy labour force which requires proper schooling, proper health care, skill development programs etc. So, on the other hand, Human capital formation is a requirement indeed. Even though human capital formation is not directly measurable, we can take education, health, migration, on the job training of firms as sources of Human capital. Analysing the data across decades we can see per capita income moves along with the improvement of all the indicators of HDI over time.

The sustainable growth model requires a production function with increasing returns to factor and increasing returns scale. As far as India is concerned, this is a must and this will only lead to sustained steady growth with positive per capita growth for decades. Enjoying the demographic dividend for the next 30 yrs. involves planned and deliberate creation of Human capital and Knowledge capital which will lead to innovations and technological development on the one hand and on the other hand with human capital we will learn these technologies. So Demographic dividend as the word implies a dividend, a boon but mismanagement of it, lopsided policies without foresight will make it a curse. India had a very low human development index and we shifted from low Human development situation to a medium human development index showing the evolvement of a positive ambience where human capital can be evolved.

Analysis on the basis of data

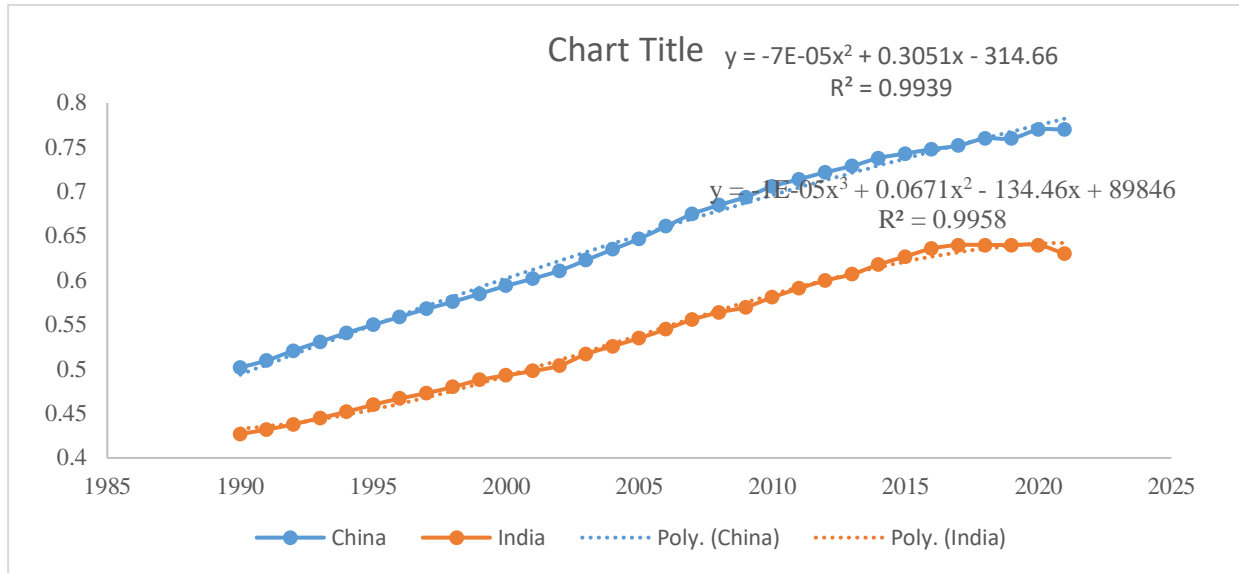


Figure 1: Divergence in HDI between India and china

Source: The World Bank

The progress India achieved in terms of HDI shows there is growing sanguine effect produced in the context of human resource management as quality of human resource indicated by the HDI index is concerned. It. But If you take a comparison with India and China which had similar conditions in the beginning, in terms of human development index position, From an 0.08 point difference in the beginning of 1990s, the index measures of the countries further widened and by 2021, the divergence between India and China reached 0.14 points. Recent trends signify that India’s HDI signifies a slight fall from 0.64 to 0.63 while China has 0.77 in 2021 from 0.76 in 2019. However, the 30 decades trend of the index points out that both of these countries provide

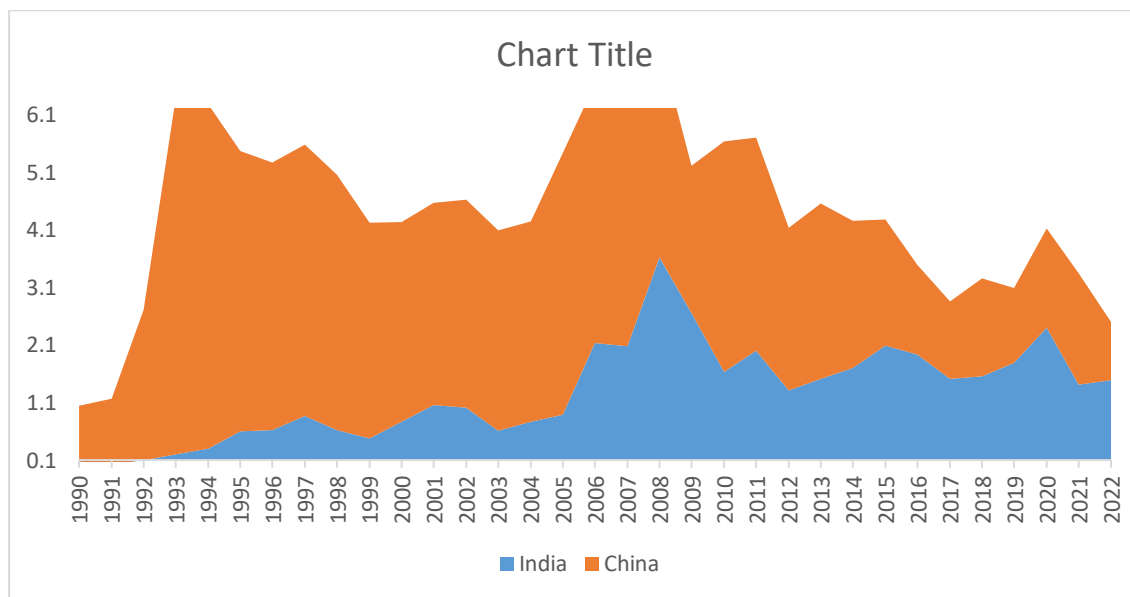


Figure 2: Foreign investment in India from 1990 to 2022

Source: Ministry of Statistics and Program implementation and\_UNDP website date on HDI

The technology transfer is intended is largely taking place in India through FDI which is also a source of R&D in India. Foreign technology is made use of and caters to economic production with improved productivity. The operation of technology requires human capital in terms of skilled labour.

From the figure, it can be observed that both HDI and PCI move in the same direction but there is no one to one correspondence between the variables. It is not possible to say with certainty that this is a certain indicator of human capital formation but about which the researcher is optimistic.

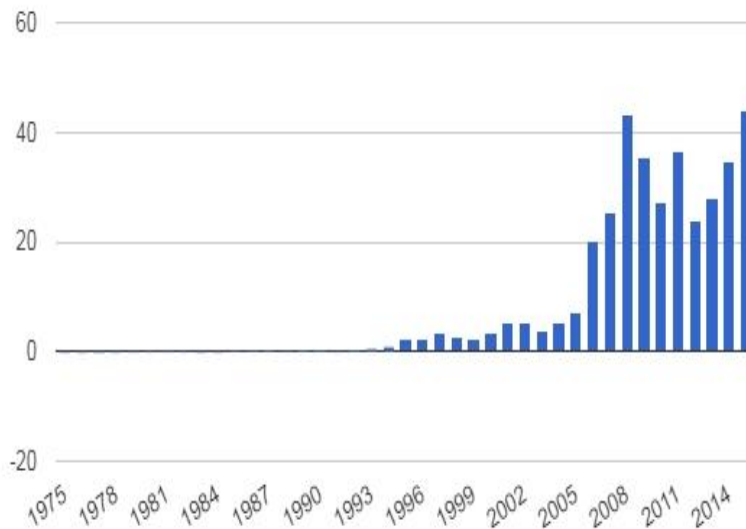


Figure 3: Foreign investment in India from 1975 to 2014

Source: The Global Economy.Com

The technology transfer is intended is largely taking place in India through FDI which is also a source of R&D in India. Foreign technology is made use of and caters to economic production with improved productivity. The operation of technology requires human capital in terms of skilled labour.

**R&D effort in India**

India’s R&D expenditure as a per centage of GDP is rather showing a down ward trend since 2008 and hovering around less than one per cent of GDP. This shows how precarious India has its R&D statusquo. The intellectual capital is very critical as afar as a firm is concerned which is vital for its survival in the long run. The study show cases that the macro R&D which is the amalgamation of the micro R&D of Indian firms are having a very weak as it is often in congruence with the national R&D structure.

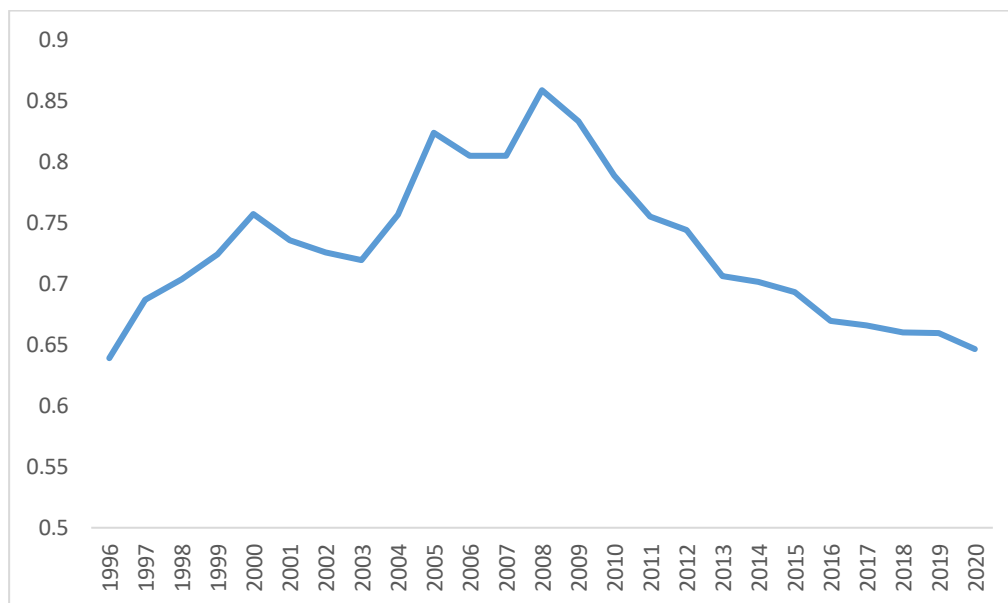
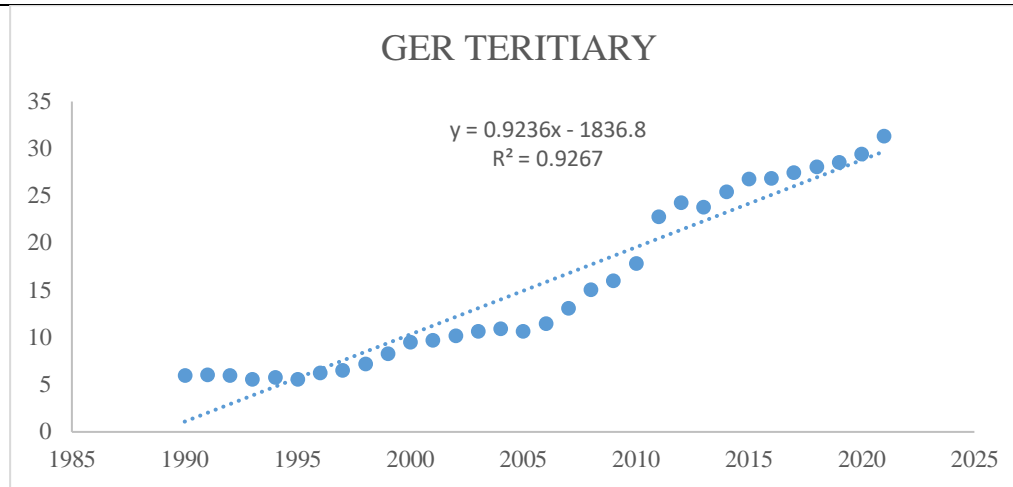


Figure 4: R&D expenditure as a per cent of GDP

Source: The World Bank date base

**Education and Employability of Youth**

The college education in terms of gross enrollment ratio even through rising marking an upward trend, the current figure is yet distantly away from its study state implying the country has still s large potential of human resource conversion into human capital and we have to rise our collge enrollment above 50 which can peak around 80 and more .



Source: online data base of the world bank

**Pinpointed by the government of India report of Economic Survey 2023-24, approximate figure of employable youth in per cent term is 51.25% and it significantly informs us on the lack of employability of the other half despite being obtained a college degree.** However during the current political regime, India could witness an improvement of employability of 34% rate from the past decades. The major reasons which government has figured out and tries to tackle through systemic change in the educational system through national education policy and complementary Skill India missions are skill mismatch and skill gap in line with industrial needs, agility to learn and acclimatise, deficiency of creative thinking, critical gap in communication skills, inadequacy in independent problem solving ability, lack of ICT and AI skills.

#### IV. Policy Recommendations

There should be a thrust on expanding R&D expenditure as a per cent of GDP which should rise to 2 to 3 per cent of GDP. Private R&D has to be increased through encouraging private participation. Technological transfer models through FDI and trade can be encouraged. Similarly India's education has to be diversified and concretised based on intensive experiential learning as envisaged in the national education policy. Already government of India has ventured into in this regard. The model of education should be characterised by experiential learning which involves testing the attitude of the child and train him/her according to her aptitude and skill. Education has to be further diversified; vocational education has to be given equal preference. It involves educating parents about the skills of the children and the need to let the children choose their passion and follow. Hence government has to venture into a social engineering in order to eliminate social taboo on non-mainstream education choices. Girl child education and choice constraint on her has to be taken into consideration and has to be eliminated through social behavioural engineering. Further their labour force participations to be increased. **Education has to be aligned with the market requirement and skills has to be augmented according to the industry requirement.**

#### V. Concluding Remarks

To conclude, India's growth associated with an increase in total factor productivity triggered to have a relation with human capital and knowledge capital formation in India which is debatable. We have a very low gross enrolment ratio (GER), Education expenditure is very low for general education and it is even low for higher education. Our education system is not R&D based to a very large extent and skill development is also questionable. The government investment for R&D was historically low and government is pondering strategies to expand it. In absolute terms, the government is increasing R&D expenditure especially in Science and technology. We have a perverse incidence of stunted growth and malnourishment problems in the upcoming generation. In such a contest, the enlargement of choice won't occur to the disadvantaged and the extent of human capital formation and knowledge capital formation is debatable. The government is deliberately venturing in in terms of strategies to create social infrastructure, and tackle hunger and malnutrition in terms of various health, poverty alleviation programs.

Still, we can see a rising growth rate and per capita growth rate of GDP as growth as population increases and the role of endogenous factors like human capital formation and knowledge capital formation cannot be dismissed about which the author is optimistic provided various empirical studies support the idea. The basic model of Knowledge capital and human capital comes under the endogenous model perspective which talks about an increase in R&D labours and skilled labours lead to an augmented production function of knowledge capital and human capital incurring increasing returns to scale retaining positive per capita growth as population increases. This argument is debatable about which the author is optimistic.

The public and private partnership by joining hands between the state, central governments in the context of human resource management by upskilling them through skill based platforms and on the job techniques as well as nurturing R&D through incubation centers and creating infrastructure is vital in achieving high level of growth in the long run. The government has now unleashed the National Educational Policy (NEP) which involves a drastic change in educational system which involves i



integrating education with experiential learning, problem solving learning, in line with the needs of the industry. Already the government efforts and intervention have triggered a significant increase in the employability of the youth. With out micro level R&D expansion from the part of firms, Macro level synergy of intellectual capital cannot be obtained and it affects the firms longevity and economic growth of the nation.

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