

TECHNOLOGY AND WEALTH: CREATION AND DISTRIBUTION

Challenge to Inequality

BY

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Technology helps in creating new products and services and in turn promotes creation of more wealth. Economic “forces” create demand for generating new products and services. The economic forces (market forces) also lead to innovation of newer methods of distribution of products and services and in turn distribution of wealth for various people in the value chain.

It is not necessary to look into all the details of this intertwined evolutionary progress of humanity which has progressed over millennia by using technological tools and also shaping economic practices. From the food gathering stages to barter deals for agricultural produce to present day e-commerce (of almost all products and services) operating at global scale, it is a mind boggling story of progress.

Creation and distribution of variety of products and services have led to enormous growth of wealth. It requires many complex mechanisms to deal with such wealth. Modern day economics as a discipline comprises many super specialties. In that process governance of money (which in economics is an equivalent of “energy” in physics, as per the description of Murray Gell Mann, a Nobel laureate in physics) has itself become an “autonomous” discipline. So much so even the words “financial engineering” has become accepted with academic degrees awarded in that name! Technology wades into this discipline as well, as paperless money and internet transfers, now being handled by people through mobile phones. Studied at a macro level, such e-money transfer mechanisms would appear as great equalizers.

But “inequality” or “inequalities” in human society appear(s) to be much more complex. At first a quick review of the growth of wealth in human society and large scale spread of prosperity will be done. In that process the issues of inequality present all through the millennia would be pointed out. Then a brief review of technologies which helped humanity on a large scale leading to the “technological prowess” in many areas will be made. A critical examination will also be done about the inherent nature of “inequality” built along with technological growth, ubiquitous presence of technology in many walks of life and the new dimensions of inequality.

HISTORY OF HUMAN WEALTH

The author of this paper while researching on the processes of wealth and technology over millennia, to obtain a few clues for speedy actions in India, learnt that growth of technology and therefore of wealth, started stagnating in India from around 13th or 14th century and later started declining. The following few paragraphs are reproduced from the initial write up by the author from these researches. It is an attempt to provide a quick overview of growth of wealth in the world.

“Nature has endowed many treasures on the earth. But it took the evolution of human being to convert them into a great wealth. Human ingenuity has been growing over the past many millennia. This is now the evolution was:

Sl.No.	PERIOD	POPULATION GROWTH	PERCAPITA INCOME GROWTH	WORLD GROWTH
1	0 ACE to 999 ACE	600%	0%	negligible
2	1000 ACE to 1999 ACE	2200% over the earlier millennium (22 fold)	1300% (13 fold)	30000% (300 fold)
3	1000 ACE to 1820 ACE	400%	50%	-
4	Post 1820 ACE	500%	800%	-

(Information derived from Ref 1)

“B”

Sl. No.	YEAR	LIFE EXPENCTANCY	SURVIVAL
	1000 ACE	24 years	Only two third of children born survive beyond 1 year Rest who survive died of starvation, epidemics and natural calamities
2)	2000 ACE	66 Years	
3)	Later 21 st Century	~90 to 100 years	

(Information derived from Ref 1)

Since per capita income is not the only indicator of wealth available for each individual human being (as it is a large scale average of the wealth of the poor and rich persons) let us look at other factors. This average age will increase to much higher level as they grow up in the 21st century due to continuing new developments in nutrition, sanitation, modern health care, as well as the concepts of social justice.

However it is common knowledge that the economic growth or growth of human wealth is not uniform all over the world. All countries of the Western Europe, USA, Canada, Australia, Japan and later Korea and a few smaller countries like Singapore, Israel, Kuwait and United Arab Emirates have achieved high levels of per capita income (as well as substantial wealth in the hands of all the citizens) and also a good degree of individual and social well being. So much so that people from other parts of the world like to immigrate to these countries even by having a status with lesser political rights.

As per Ref 1, by 1820 the group of Western Europe, North America, Australia and Japan had forged ahead to an income level of **twice** that of the rest of the world. By 1998, the gap was 7:1. Between the US and Africa, it is 20:1. The gap is still widening. These countries which have developed very well in economic and social terms are also growing very slowly now in terms of their overall economy and population. A small percentage of their citizens face problems of unemployment and resultant vagaries in their quest for good life. Also there are various forms of insecurity and violence in these societies, some relating to the unemployment, some relating to the immigrant minorities and some due to various other reasons including affluence.

In other parts of the world like China, India, Brazil, South Africa, Malaysia, Thailand, Russia, East European countries, Arab countries and Central Asian countries, the picture is very complex. Some of these countries are growing very fast but their wealth and resultant conditions of better lives and well being are not uniformly distributed (Nor was it uniform when Europe or USA was growing fast during the 18th and 19th centuries). Some of these countries face difficult political dilemmas in balancing the needs of wealth generation and the provision of distributive social justice in terms of better living conditions to all their citizens. (Such political dilemmas and even conflicts have not altogether disappeared in the developed world as well!).

Countries in Africa and some other parts of the world have further serious problems in terms of wealth generation as countries as a whole and naturally the well being of all their people. In addition many of them also suffer from serious internal social violence not often connected with wealth generation and its distribution amongst of peoples. They relate to the emotional aspects of tribal associations or religious divisions or personality conflicts, or external interference though some of these conflicts may be couched in modern terminologies of wealth creation, wealth for individual poor people and well being of people.

QUESTIONS

There are many questions before the human kind. Let us address first those relating to wealth. A major question is whether these large disparities between many countries (and therefore between many human beings - a large number of them, in billions) can be bridged? For example the divergence of growth in wealth or well being between USA and African countries is very large and the gap is accelerating. However the growth of Asian countries (who had similar problems before) during the past few decades in terms of wealth generation and spread of better living conditions to their large populations, gives humanity a hope that the gap can be bridged. There are also signs of faster economic growth in some of the African countries in the recent years.

Even when the world population reaches a figure of about 8 billion around the year 2020 it appears feasible that wealth and better living conditions can reach all people. But is it a simple linear extrapolation? Can it be achieved through market forces of globalisation or economic reforms within the countries and through the extension of large scale aid to the underdeveloped parts of the world? What about the programmes for universal education for every human being in the world and providing a health cover? Will they lead to better wealth creation at the individual level? Do the present day wealth generation strategies, assure 'win-win' situation for all? Or are they zero

sum games? Can all keep on growing? In other words will the current wealth generation strategies leave behind a number of winners and losers? Can the losers hope to win in a reasonable period within their lives or will there be a permanent set of losers left behind in the high speed march of modern societies?

There can be many other questions added to these lists as a flow of logical thought or emotional enquiry. Readers of this book may also attempt to try to think of more questions. We have addressed answers even to some of the questions.....”

A quick review of growth of human technology follows in the next section.

GROWTH OF HUMAN TECHNOLOGY

The author prefers to use the adjective “human” because other life forms create their own ‘technologies’ and also adapt to new situations. It is not only with insects, worms, birds and animals, but also in microbial forms, which adapt themselves against many human invasions!

Starting from the food gathering stages, agricultural techniques were the great initial human inventions. Then came rapidly invention of fire, metals, alloys, etc., then use of animal power; astronomy; travel by oceans and many more. Each of these techniques have multiplied the capabilities of human brings many fold, so much so the great science-historian J D Bernal has described technology as ‘the extension man (human)’.

While the collective human wealth grew and the population increased as described earlier, the distribution was not uniform. Instead of describing each item we may refer a table from the book “India 2020 – a Vision for the New Millennium” by A P J Abdul Kalam and Y S Rajan Table 1.1, Chapter 1 (Ref 2). That table describes “Growth of technologies and human impact.”

Mass produced chemical products started around 1928. Extensive use of fertilisers started around 1958; as also extensive use of oral contraceptive (not in India). India started using chemicals even before independence. Things like DDT which is banned now, helped to greatly to minimise many diseases and epidemics in India especially in post independence periods. Massive use of fertilisers and high yielding varieties of wheat and rice during the Green Revolution starting mid 1960’s made recurring famines in India, a thing of the past.

While many technologies developed elsewhere in the world helped post-independence growth story in India, it was clear that the absence of appropriate economic policies and resulting governance systems were crucial for the spread of benefits of ‘technologies’ to a large number of people. Despite green revolution, and industrialisation mainly through Public Sector Units (PSU’s, Indians suffered through massive shortages in the distribution system (be it for grains, milk, or sugar) and other items like automobiles, two-wheelers, domestic appliances cooking gas cylinders, telephones etc., Most of these shortages were due to autarkic economic planning, licensing, inspection etc., **All these were aimed at equitable distribution of wealth to Indian people. The resultant shortages stymied the benefits of technological adaptations. Nor did well being of the people at the bulky base of India improve.** Availability of educational and medical facilities was very poor. However, it is to be recognised that the modern technologies (mostly imported into India from abroad through PSU’s)

helped a great deal in reducing epidemics and famines. Vaccines reduced infant/child mortality from the earlier high levels. Thus on the whole, there was a surge in average life span of Indians. It was in one sense positive. But along with slow economic growth, the inequalities increased. Mostly because of the rapid population growth of about four to five times, thanks to the application of modern technologies in food production and public health system, coupled with slow economic growth and tardy public distribution systems operated by government (govt controlled) agencies, increased the absolute number of Indians, who were illiterate, poor, having TB etc., Percentages of such persons compared to overall population had come down but the absolute numbers rose to staggering levels. They were substantial percentage of world's illiterate, blind etc. **Thus one sees a dilemma. Technologies are crucial for enabling many parameters of human well being. But there are also many parameters outside the realm of technology that lead to unequal access.**

Let us also examine two areas of science and technology, India embarked upon without basically the types of fetters mentioned above: Atomic Energy and Space.

It was expected that atomic energy will power most Indians with electricity. Nuclear power is still a small percentage even after sixty years. Similarly it was expected that nuclear applications such as irradiation would help Indians agricultural produce from wastage. Again such applications are almost negligible.

The expectation that satellite based education television will transform lives of rural people living in 600,000 villages, the original vision of Dr. Vikram Sarabhai, has taken different shapes. No doubt television has reached most remote corners in India, with a satellite antenna over many huts in Indian villages, its being a tool for direct education is elusive, though Edusat was attempted by ISRO recently. Inequality in Indian education system is still very high. But in other areas like rapid spread of telecom, entertainment TV, rapid remote sensing surveys and above all in advance warning of cyclones, thus almost removing the annual death tolls in the eastern coast of India – which was an accepted reality before INSAT, (the Indian National Satellite) are all marvellous applications of space technology.

These elements are pointed out to note that 'technology' may not always succeed due to variety of reasons: organisation of the S&T institutions, social nature of the applications, governance systems, and even economic forces. Also its role in terms of inequality – removal, is questionable.

We do not refer to other big ticket items floated in India – like super conductivity etc., as they were not focussed in end applications as was Atomic Energy and Space. Many such items in the Science and Technology (S&T) scene came up with big fanfare and disappeared without being noticed. These were much more due to S&T community itself and lack of oversight by government and parliament; they reposed blind faith in science funding!

However there are a number of many small items including a huge size of human resource trained in science, engineering and medicine (in institutions of varying "quality"), have contributed positively in generation and distribution of wealth and well being among people of India.

There had been always a tension between a number of "forces" with S&T system: some who believe that more of basic research will transform India by creating new products;

some who believe that the “latest” technologies are the only solution to reach benefits of technology for all; some who believe in “appropriate” or intermediate technologies with a wide spectrum of interpretation of these terms. Then the question of indigenous versus imported. While a number of reports are generated, most of these had neglected the “economics” aspect of generation and application of technology as well as the market forces (which includes acceptance by consumers, affordability etc.,). **In addition, there has been huge hiatus in the knowledge of technologies amongst economists, politicians, administrators industry chiefs etc.,**

Therefore even the broad acceptance within all these stakeholders, arrived at in generating the Technology Vision for India 2020 by TIFAC (Technology Information Forecasting and Assessment Council) during 1994-1996 and the book India 2020 referred to above, the actual technological and economic growth path taken by India was different. **Care was taken in the India 2020 book and the TIFAC studies, to balance technological capabilities required for employment, future impacts etc.,** However these were left off in actual implementation by allowing the license-raj to grow stronger on one-side and laissez faire in some other areas of technology businesses. The result was uneven growth. **While Indian economy really grew well, inequalities grew faster. Also technological inadequacies in Indian institutions and industry in various sectors led to large increase in imports without matching increases in exports. These also led to much slower growth in employment. (jobless growth, as described in media).**

Chapter 1 of the recent book by Dr. APJ Abdul Kalam and Y S Rajan - Beyond 2020, a Vision for Tomorrow's India (2014) Penguin (Ref 3), captures such inadequacies in the Indian systems in terms of technological paths, economic policies and administrative methods. Thus job creation in India has been very inadequate not keeping pace with the emerging young human resource base. Inequalities grow more with larger unemployment and simultaneously, increase in TV channels and the high pressure advertisements in all Indian languages increased the aspiration. Thus perceptions about inequalities grew even more sharper.

Chapter 14 of the book Beyond 2020 (Ref3) under the title “Emerging Technologies: Catching up and Forging forward” captures the essence of the book. To quote the beginning of the Chapter:

“In the previous chapters we have discussed where India stands in the world today with respect to various sectors like agriculture, manufacturing, education, and health care and where we are in terms of meeting domestic needs and demands. We have also looked at the opportunities we have missed and the problems still facing us. The reason for this exercise had been to ensure that we do not repeat our past mistakes as we forge our way forward.”

The chapter 14 attempts to summarize the crucial elements for action starting with agriculture. Agricultural income is crucial for most Indians to escape poverty. Some elements requiring technological inputs pointed out are: Monsoon-proofing of agriculture: increasing production per hectare to almost the double the present day capacity (will require GM crops genetically modified crops as well); improved animal health care chains; improving agricultural infrastructure; agro-food processing and agro-waste processing etc.,

The book emphasizes in various chapters and also in the chapter 14 “Agriculture can be liberated only if a large number of persons who are dependent on agriculture can be absorbed into the manufacturing sector.” Then it describes the three fold challenges before manufacturing sector: (i) building low end, relatively simple-skilled Micro-Small-Medium-Enterprises (MSME’s) keeping in mind that bulk of Indian work force including youth have not received a good education and skill training; (ii) catch up in medium- and high – tech areas (as India had neglected manufacturing in the post-liberalisation period and manufacturing alone can give jobs to bulk of Indians who are in the low end of socio-economic spectrum); and (iii) go beyond these two into many emerging areas of manufacturing.

It is not the intent here to point each one of these items in this paper. This book not merely describes the technologies and technological paths for various sectors as well as for the S&T/academic institutions to pursue, but also provides a fuller picture by addressing the economic, social, and administrative aspects. The experience of the past over fifteen years regarding the missed opportunities, had been helpful in attempting such a interlinked approach.

Technologies are crucial for human well being and to spread the prosperity. But they alone cannot provide benefits to people, as the creation or absorption of right technologies and their distribution to large segments of Indian people critically depend on economic policies, the quality of governance and the nitty-gritty right administrative/legal procedures. Even assuring that the latter can be provided, does it guarantee a good level of equality let alone removal in inequalities in India (or any other human society of this size)?

INEQUALITY

Human needs, if defined in terms of some per capita consumption of products and services (such as proteins, calories, water, dress, habitat, electricity, medicine, computers, vehicles, phone connectivity etc..) as minimum essential, perhaps these could be met with a combination of technologies, economic and social policies, governance etc; that itself may be a great challenge. **But if defined in terms of comparative consumption, one runs into several serious problems: first and foremost being the earth’s capability to sustain and impact on local, regional and global ecosystems.**

The author had addressed this question in an article in a monthly magazine Kisan World (December 2014) (Ref 4) with a title “Earth With 10 Billion People” in the Indian context. The article derived much of information from an excellent study report published by National Research Council (2014), USA (Ref 5) “Can Earth and Society’s Systems Meet the Needs of 10 Billion People Summary of a Workshop”.

In the context of the question of “Inequality,” let us look at a quote from the report Ref 5, as described briefly in Ref 4. “...as it is given in many parts of the report discussing inequality, it is impossible to have a near-total equality even in the horizon of three to four decades.”

The article (Ref 4) further states: “One interesting information is worth noting in this context” (of use of Gini Coefficients), “the mean poverty line globally in US\$ 1.25 per day but in the United States the mean poverty line is \$ 14-15 per day; this amount is equal to 75th percentile of world income distribution”.

Let us not forget that USA is the world leader in Science, Technology, Engineering, Maths (STEM) and Medicine and also several other modern services, trends, fashion etc. **These are being pursued in USA in a different context: that is their levels of economic parameters and most importantly to keep up their leadership role in the world. What happens to others who are mostly catching up?**

Despite several Indian reports, talks and plans, it is difficult to find any different STEM paths in India or industrial / business models or even in education (being pursued) after sixty decades. Therefore a big question before India and similarly placed countries is about the inequalities within their countries, which may grow sharper. Health sector is a classic example: excellent world class private sector health care units exist in India along with languishing health care facilities for access to poor, lower middle/ middle class people. The Mobile Diagnostic Health Clinic successfully implemented by TIFAC (details of which are given in Beyond 2020 Ref4) and highly praised by USAID in a detailed report, is not spreading all over India speedily though Ministry of Health has accorded importance to such mobile units in its plans.

There are considerable researched information and discussion about “Inequality” in a seminal book “The Origin of Wealth: Evolution, Complexity and the Radical Remaking of Economics” by Eric D Beinchocker Random House Business Books (2007).

Some quotes from ref 6:

“Through grit, determination, and hard work, the Horatio Algers of the world must be able to rise from rags to riches. These stories do indeed happen, particularly in the United States, but overall social mobility in the U.S. is lower than one might think.....”

Discussing the influence of parental income on child’s income level at adulthood the book states with data “.....there was a 59.1 per cent chance of that same child remaining in upper middle class (upper 3 of the deciles) and only a small probability of that child dropping to the bottom of the income distribution. Conversely a child born to bottom decile parents had 31.5 percent chance of staying at bottom decile, two-third chance of remaining lower class and only 1.3 per cent of making the Horatio Alger.....”

The book (Ref 6) discusses as to what is being inherited from parents and states that **“many researchers believe that the missing pieces from the equation are culturally driven behavior and social capital.....”**

Indeed rightly such a conclusion would make one to look for solutions in universal education and much more increased access to higher education. At a macro level there appears to be a correlation between incomes of persons and the number of years of education, in various studies. In India also we carry a hope of increasing educational opportunities and increasing Gross Enrolment Ratio many times more. **There is no doubt that universal literacy as well as economically relevant skills and much larger higher education for the youth are important.** It will help many millions of Indians to enter into employment in the modern globalised economy. The benefits of technology can flow only when all citizens are highly educated and have the capability to pursue “life - long - learning” all through their lives, as technologies and businesses are changing at a rapid pace, around the world and in India as well.

But can higher education be the final panacea for removing inequality? It will be useful to refer to a recent well researched book titled “Degrees of Inequality Culture,

Class and Gender in American Higher education” by Ann L Mullen (The John Hopkins University Press). Ref. 7. It is a detailed study of students of Yale and Southern Connecticut Universities about 2 miles away from each other.

Let us look at some conclusions in the book: “Habitus reflects the students’ sense of what is reasonable to expect from themselves; from their education; what makes some choices thinkable and others unthinkable; and what lies in the realm of the possible and the impossible....In this way, habitus becomes a powerful mechanism of self-selection. The Southern students did not end up in Southern because their applications to Yale were rejected, but because they never applied.....” The author of the book after summarizing many of the findings and also quoting from other studies states that: “Elite colleges and universities work to sustain their legitimizing myths by publicizing their selectivity.....and requiring students to live in campus residence hallsElite institutions also intentionally remain small in size as another means of proclaiming their selectivity.....”

“In these ways, the elite tier of higher education is a powerful engine of social reproduction, whereby accidents of birth are transformed into legitimate achievements. Social privilege is first converted into educational advantages, which then result in admission to elite institutions.” In the policy recommendation Ann Mullen had addressed several issues of inequality. Some glimpses:

“If expanding higher education has not increased equality of access, has it helped to level social inequalities at large? Again the evidence is bleak”.

“.....if United States is serious about reducing social inequality, then it should abandon its attempts to social equality by increasing access to education. Instead it should address social inequality directly.....”

As to the gender inequality the book points out: “By celebrating women’s entry into higher education it ignores the reality that in the first year after graduation, women earn only 80 percent of what men do, a figure that drops to 69 per cent ten years after graduation. Without fundamental changes to US economic and social policies, Americans can hardly hope for higher education alone to produce moderating effect for social inequality”.

CONCLUSION

With little doubt technology had helped the human beings to have increased well being over millennia. Especially since the last millennia it has helped to raise the average person’s life very considerably: for food, health, habitat, mobility, entertainment, leisure.....in all walks of life. Even the lives of those in the bottom per centile have increased in India considerably. It continues to rise and spreads ‘inclusion’. If Digital India is well implemented, what the Union Minister of Communications and Information technology Ravi Shankar Prasad has stated in a recent article in Times of India 02-02-2015. “I imagine a scenario where gardeners, plumbers, drivers, shopkeepers, tutors, tailors can all find new markets through their mobile phone” could be a reality in about a decade. Note along with this a World Bank quote given in Beyond 2020 (Ref 3) “ A 10 per cent increase in mobile and broad band penetration increases the per capital GDP by 0.81 per cent and 1.38 per cent respectively in the developing country.” These are all good news, and technology will continue to create more and help spread and distribute more products and services.

But the same technologies are used by those in the upper percentile much more and their income levels, consumption etc., grow very much more!

Therein lies the dilemma of “Challenge to Inequality”!! Benefits from technology can be derived by various segments of the human society, only through right economic and business policies as well as governance systems. **What is right is a big debate: each specialist looking from his/her silo. Added on to these complex tensions, are the challenges posed by Nature: erosion of natural resources; impact on local, regional and global environments; spread of new pandemics, etc.,**

Rapid progress also leads to rapid obsolescence. For those who are laggards and are trying to catch up, have many more challenges. The legal regimes introduced to protect knowledge, perhaps with valid economic and business reasons, place further hurdles.

One thing is clear: Technologies alone (science etc., included) cannot meet the challenges of inequality. Nor is education which is crucial to create technologies. Economics and governance have greater roles; but it appears they have their limitations too. Much more needs to be understood regarding the “inheritance” of inequality through various social processes.

One can only keep up a hope from the fact that these issues are addressed by the best minds in the world including in this workshop and therefore some solutions may be found in not-too- distant-a-future

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