

C/U & G Henry George and Poverty Perpetuation: Dynamics, Mechanisms, and Reforms

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Abstract

This essay on poverty perpetuation focuses on identifying and analyzing the multiple determinants of poverty, the reasons for its perpetuation, and its impact on economic growth. Sir Henry George, a century and a half back in his book, “Progress and Poverty” provided an insight into the mechanism of Poverty Perpetuation. George explained why the progress of modern technology, social services, and education failed to alleviate poverty, and why the growing wealth of industrialized economies tended to stay concentrated in the hands of the few (george_1987_henry). He believed that poverty originated from the inherent trends of injustice and inequality in any market economy. The problems of, poverty amidst plenty, the corrupt relation between wealth and political power and the suffocated social order, that the world today faces, aligns with the problems George sought to address.

In this essay, using contemporary economic theories and models, I want to revitalize George’s doctrine and seek to address such determinants that are distinct from the traditional assumption of poverty being driven by overpopulation, the lack of investment, and capital accumulation. This essay is an inquiry and assessment of the circular relationship between the causes and consequences of poverty that trigger a trap for sustained economic stagnation and deprivation. Reviewing poverty thresholds and take-offs, (Semmler & Ofori, 2007) I inspect various growth models to understand the steady state of rich and poor economies and their technical issues. Through this essay, I also investigate the correlation between poverty, ecological imbalance, and climate change to highlight the threat of poverty to sustainable development.

Introduction

“A poverty trap is a set of mechanisms whereby countries start poor and remain poor: poverty begets poverty so that current poverty is itself a direct cause of poverty in the future.”(Kraay & McKenzie, 2014)

A complex societal issue, poverty, is the most prevalent and pervasive problem in the world today. Affecting 9.2% of the global population (United Nations,2022) it is an urgent concern facing both developed and developing countries. Across the globe, economies are struggling with rapid population growth, migration, and massive environmental impacts among many others, which are the causes as well as the effects of the menace of poverty. Breeding from several situations, which may be social, political, economic, or even spatial, a persistent poverty situation drags individuals and economies into a perpetual state of stratification. This stratification may result from a lack of opportunity, discrimination, and general prejudice against the poor in a society. Such a persistent situation creates a spiraling mechanism that does not let people or countries escape this vulnerable situation and they are caught in a never-ending loop of the poverty trap and thus Poverty becomes a self-perpetuating vicious cycle.

“Poverty research has shown that while many poor people experience poverty temporarily and some are able to climb out of long-term poverty, others are stuck in poverty traps. These chronically poor people are structurally positioned so that escape is difficult or impossible without significant changes to the contexts in which they live and work.” (World Development Report 2000).

Different schools of economic thought have perceived poverty from different dimensions and have assigned different theories to this multidimensional and complex issue. This essay is an effort to unveil the underlying reasons for poverty perpetuation and focuses on the dynamic mechanisms of poverty traps that emerge from this circular relationship between the causes and consequences of poverty.

Poverty perpetuation worldwide results from a series of events and mechanisms that may be specific and varied in different regions and economies as the economies across the globe have different macroeconomic performances. There has been a marked transition in the viewpoints of scholars and economists about the causation of poverty for centuries. Economists and scholars have figured out different reasons for the emergence and perpetuation of poverty. **The first section** of this essay “Outset of Poverty Traps ”explores the various contributing factors for the existence of poverty and its persistence. with a special reference to the views of Sir Henry George who stressed that ”we have based our political system (in which human beings are theoretically equal) on a foundation of social inequality” (Progress and Poverty, n.d.). This section also

attempts to review poverty thresholds and take-offs (Semmler & Ofori, 2007) that correspond to global issues in the contemporary world and seeks to address multiple determinants besides the traditional assumption of poverty being driven by a lack of capital and capital accumulation.

The persistence of poverty has also been related to the state of economic growth in economies at a global level. These growth theories have used different variables as exogenous or endogenous to explain the causality of this persistent state that economies face. Different economies have different reasons for falling into this self-perpetuating loop and the remedy to those will help economies emerge out of it. In short, economies need to concentrate on these factors to escape any cause-and-effect drama. **The second section** of this essay “Poverty traps mechanism: through the lens of growth models ” runs from the classical perspective to the modern viewpoint of economic growth failing which the economies remain caught in the poverty traps.

The third section is the concluding section that gives an assessment of how poverty appears in multiple dimensions and has been perceived as the most complex and pressing issue of all times. The essay concludes with an agreement with Henry George’s views that poverty exists because of inequalities and injustice in our societies. It reviews various growth models and theories and provide suggestions for sustainable poverty reduction, as economic growth is the single most important factor that influences poverty.

1 The Outset of Poverty Traps

The prevalence of poverty in a population is correlated with several independent social and economic variables. Many economists have researched and provided evidence to show poverty traps’ causation and mechanisms. As a global phenomenon, the poverty trap exists in all economies with varying levels of development; they may be developed, developing, or underdeveloped. There are vicious circles, processes of circular and cumulative causation, and poverty outcomes of these circles reinforce themselves. To understand the dynamics of these traps it is pertinent to know what causes poverty.

1.1 Thinking Poverty

The absence of minimum sustenance is what poverty is generally attributed to. From a wider perspective, poverty is a global, socio-economic phenomenon that portrays a state that shows impoverished living conditions. Inaccessibility to housing, education, health services, clean water, and basic sanitation is not the only basis for being poor; Poverty also conforms to unsafe work conditions, inability to participate in political life or justify their rights in court, suffering unequal treatment or discrimination due to the status of being poor. There has been a marked transition in the thinking on poverty over the past two centuries. Economists and social thinkers have perceived poverty as originating from varied determinants. Predominantly it is believed

that inequality in its many forms has been the most significant poverty-increasing factor.

Poverty according to Adam Smith “did not subject the individual to hunger, malnutrition, disease, lack of clothing or shelter; rather, it shamed him through a pained awareness of his inferior position in the social scale”(Gilbert, 1997).

Thomas Robert Malthus in his first essay, “An Essay on the Principle of Population” projected that populations grow geometrically while the means of subsistence increases arithmetically and thus poverty is caused by men and women having larger families than they can support.¹ He believed that famine and poverty were natural outcomes of population growth and assigned God’s will as the ultimate reason for those outcomes (Malthusian Poverty, n.d.).

Standing in contrast to the Malthusian paradigm, the Marxian political economy rested its belief in poverty as the product of historically specific modes of production. they insisted that each historical mode of production has its own unique dynamic for creating poverty (Harvey and Reed, 1992). Marxists believed that the proletariat ² were the social class having no significant ownership of the means of production and whose only means of subsistence was to sell their labor power for a wage or salary. Poverty to them was an inevitable consequence of a capitalist society, which is a direct outcome of the inequality inherent in the class system.

Disapproving the Malthusian paradigm of poverty, Sir Henry George in his book “Progress and Poverty: An inquiry into the cause of industrial depressions, and of increase of want with increase of wealth: the remedy ”, published in 1879, asserted that population growth is fully compatible with material progress. He understood the simultaneous advancement of poverty and wealth and refuted the thought that increase in population tends to reduce wages and produce poverty. George stressed on the reason for poverty existence amidst technological advancements that created more prosperous societies (George, n.d.).

Critiquing Malthusian doctrine George quoted, “In countries where poverty is deepest, the forces of production are evidently strong enough, if fully employed, to provide for the lowest not merely comfort but luxury” (George, 1987). He further added, “This fact, the great fact that poverty and all its concomitants show themselves in communities just as they develop into the conditions toward which material progress tends, proves that the social difficulties existing wherever a certain stage of progress has been reached, do not arise from local circumstances, but are, in some way or another, engendered by progress itself”(George, n.d.). . George was concerned about the high poverty levels in developing countries as he said, “We are investigating and reviewing how currently accepted theories attempt to explain it. We want to discover why

¹This electronic edition is made freely available for scholarly or educational purposes, provided that this copyright notice is included. (1998). An Essay on the Principle of Population Thomas Malthus London.

²In ancient Rome the proletariat consisted of the poor landless freemen. It included artisans and small tradesmen who had been gradually impoverished by the extension of slavery.

poverty persists despite the increasing wealth.”(George, 2006, Ch.1. Par.1)

He strongly professed that, “The industrial paralysis, the commercial depression which curses the civilized world today, evidently springs from no lack of productive power. Whatever the trouble, it is clearly not in the want of the ability to produce wealth” (George, 1987). George’s answer to the simple question, “Why does poverty exist? ” was in land ownership. He argued that “all generated wealth is produced by applying labor to land. Capital multiplies that labor, but it is essentially an add-on to the labor-land relationship”(Progress and Poverty, n.d.).

George asserted that economics focuses on money and employment and disregards natural resources where these two factors were engaged. Land, with all its resources, the minerals oil, gas, coal, metals, etc...which are under the soil, is an important factor and was owned disproportionately and allowed owners of land to generate wealth using labor and capital. Wealth disparity arising from unequal land ownership distribution created social injustice. He also alleged that leaders in most societies illegally amassed wealth and ignored poverty in setting priorities and that caused all ills. In George’s view, Land should be made a common property, and should not be monopolized.³

In one of his addresses, delivered in an opera house in Burlington, Iowa, George examining the social roots of poverty said, “I hold that poverty is a crime;not an individual crime, but a social crime, a crime for which we all, poor as well as rich, are responsible. ”(The Crime of Poverty by Henry George, n.d.) Henry George’s views resonate with the issues of inequality and social injustice in the modern capitalist setup, as they sought to explain “why the progress of modern technology, social services and education had failed to alleviate poverty, and why the growing wealth of industrialized economies tended to stay concentrated in the hands of the few. ”

Post Henry George, economists, and thinkers have tried to conceptualize poverty from different thresholds and dimensions which are more contemporary to their times. The world today suffers from concerns similar to what Henry George,150 years ago focused on in his book “Progress and Poverty.” We have a large population suffering from deprivation amidst technological up gradation and scientific development.“Developed” countries with strong economies also have a significant number of people who are struggling to survive amidst plenty. The causes of poverty are extremely complicated with different factors contributing to the problem. It may emerge from discrimination of any kind, poor governance, conflict, political instability, or corrupt leaders, beyond just lack of basic necessities, and these inequalities trap people and communities in a vicious cycle.

³Excerpt from Henry George Progress and Poverty 1879, 1876-1900, Documents: American History from Revolution to Reconstruction and Beyond, n.d.

1.2 Poverty Thresholds and Takeoffs

Poverty research has shown that while many poor people experience poverty temporarily and some are able to climb out of long-term poverty, others are stuck in **Poverty Traps**. These chronically poor people are structurally positioned so that escape is difficult or impossible without significant changes to the contexts in which they live and work. Poverty in such cases becomes a complex phenomenon. The causes of poverty traps aim at describing and investigating this complexity, and these dynamics. Lack of Industrial and technological advancement, growing markets, human capital formation, financial development, capital formation, poor demographic structure and social norms, climate change, and polarization of income, give an account for multiple causes of poverty. (Semmler & Ofori, 2007).

It is believed that income inequality has been the most significant poverty-increasing factor. It is paradoxical that in the world's richest nation, a substantial part of the population has incomes far below the considerable levels of minimum sustenance standards. Polarization and unequal distribution of income and wealth are chronic miseries that give rise to both wealth accumulation with a few and poverty at large. Poverty is a consequence of how society is organized and resources are allocated. According to the World Bank.

“When markets are imperfect (in credit, insurance, land, and human capital), inequalities in power and wealth turn into unequal opportunities, leading to wasted productive potential and to an inefficient allocation of resources ” (World Bank, 2006; World Bank, 2013).

1.2.1 Wealth Gap

The mechanisms that reinforce poverty may occur at any scale of social and spatial accumulation. The disparity of cumulative assets across races and ethnicities in an economy also drags them into a situation of persistent poverty. Estimates suggest that almost half of the world's wealth is now owned by just 1% of the population, amounting to \$110 trillion, 65 times the total wealth of the bottom half of the world's population (Fuentes Nieva and Galasso 2014).

The fundamental difference between the rich and the poor arises from the stark inequality in their income and wealth. The growth of wealth by people in a community can be understood by the transition equation (Garbinti et. Al 2020).

$$W_{t+1} = (1 + g)[W_t + s(Y_t + rw_t)] \quad (1)$$

Where, $Y_t = (1 + g)Y_{t-1}$

This equation implies that the per capita labor income of (Y_t) of people in an economy,(in current time) evolves with a growth rate $(1+g)$. The accumulation of per capita wealth (W_{t+1}) is determined by the rate

of savings by the households (s), capital gains (q) and return on wealth (r).

The growing difference between the rich and the poor is purely indicated by the value of these variables. The poor in the country have a low rate of saving, low capital gains, as well as a low rate of return on their wealth. The rich and the poor may have the same growth opportunities, but their choice of investments decides the returns on these investments. This ultimately decides the accumulation of wealth over a span of time. Since the poor have little income to invest and make poor investment choices, their wealth grows at a low rate in comparison to the rich who achieve a higher growth rate.

This poverty trap has widened the wealth gap between the rich and the poor in the US economy over one and a half century. The distribution of wealth in the economy highly unequal with the wealthiest 1% of families holding about 40% of all wealth and the bottom 90% of families holding less than one-quarter of all wealth (Leiserson, McGrew, and Koppaaram 2019). It means 25% of families have less than \$10,000 in wealth. The share of income received by the highest-income families is substantially smaller than the share of wealth held by the wealthiest families. Such disparity leaves the poverty-stricken Americans deprived of the opportunities enjoyed by the wealthier groups.

1.2.2 Protection of Property Rights

For persistent economic growth, many other strands lie in the viewpoints are given by other scholars who have argued that the institutions which facilitate the protection of property rights and enhanced technological research and the diffusion of knowledge is the key factor which enabled the great technological divergence across the globe. Lack of protection of property rights like expropriation of private wealth, corruption in the system, excessive taxation and barriers to the adoption of new technologies, can result in slow economic growth.

An insecure system of property rights can cause poverty traps and if a country can escape that will have a permanent low level of per capita income. Such violations of property rights create a need for the government institutions to implement policies to protect, still some economies may not be able to escape the poverty trap in spite of the government's allocation of optimum resources towards the protection.

1.2.3 Political Setup

The lives of the poorest and most vulnerable are profoundly affected by the way in which their governments operate. The governments fail to provide basic security or basic services to the poor segment which can have detrimental consequences on the vulnerable poor countries, where there is economic, political, and social inequality. They suffer serious consequences of frequent occurrences of wars and that causes a vicious cycle of poverty that they can't escape.

Poor coordination between states and poor governance makes poor marginalise and hence they are ignored. Governance is a multi-faceted process of exercising political power and authority, running political institutions, mobilizing political resources, and gaining political legitimacy. The poverty reduction strategies and initiatives for poverty alleviation is influenced by multiple political factors, and the performance of pro-poor policy implementation.

Political turmoils, corruption, judicial system, racial, gender and ethnic discrimination and the public-private coordination is directly related to how politics affects poverty in some countries of the world. The institution-specific variables that include electoral systems, political parties, courts, administrative agencies, sub-national power structures, and social movement profoundly influence the pro-poor policies. Transformation of political systems and restructuring of governmental institutions through neo-liberal pathways which are not politically motivated ensure strong institutions and good governance and improve the outcomes of poverty alleviation.

1.2.4 Public Private Partnership

Economic growth and poverty reduction are contradictory yet complimentary issues. The conditions of simultaneous poverty reduction and economic growth have to be created with appropriate policies. Infrastructure investments accelerate much-needed growth in developing countries and also help reduce income disparities. But the governments face several constraints resulting in poor infrastructure like insufficient public funds, poor planning, weak analysis underpinning project selection, or corruption.

Infrastructure assets are also often poorly maintained. It is important for the government to create the appropriate environment that enables the private sector's coordination for providing pro-poor benefits to the vulnerable section. The corporate and the private sector can help create sustainable impact by changing the economic status of the poor. The public-private partnership is essential not only for the provision of the basic infrastructure but for food security and even finance. The efficiency of the government sector can increase by using management skills and innovative derive of the private sector.

PPPs are an instrument to respond to market failures as well as minimizing the risk of government failure. The private and the public sector both are reluctant to work in collaboration in the lower income countries where the public health benefits of clean water and sanitation are highest, the involvement of the private reaching just over 10% in lower middle income and just over 5% in low-income countries. It is important that the benefits of PPP must be looked at as an effort for ending extreme poverty and promoting shared prosperity, as PPPs can help improve infrastructure, spur economic growth that eventually reaches the poor by way of trickle-down effect.

1.2.5 Climate Disaster

Considering climate change as one of the most relevant factor that impacts the livelihood of people in economies across the world, it is pertinent to answer a few questions to gauge the impact of climate change on the poverty status;

- Does climate change pose a constant threat to the livelihood and well-being of people?
- Is it posing a risk for the non-poor to become vulnerable to poverty?
- Can climate change have any impact on the ability of poor to escape poverty?

‘Climate change is only one of many determinants of poverty outcomes, but climate impacts represent a serious obstacle to the sustained alleviation of poverty. Poverty causes environmental damage that in turn poses a serious threat to humanity. Deforestation, pollution, land degradation, depletion of resources, overuse, and misuse of resources, biodiversity, and many such factors affect poor people the most. People living in poverty bear the brunt of environmental damage and are often caught in a downward spiral, where they are forced to overuse resources to survive. They not only create scarcity or depletion of resources for the current population but for future generations too. According to UNCTAD Least Developed Countries Report 2002, the average rate of forest depletion (measured as a percentage of GDP) has sharply increased in the LDCs during the 1980s and 1990s, which is over three times the rate of deforestation in other developing countries.’⁴

Climate change has a multidimensional impact on economies in terms of; ecological balance, flora, and fauna, investment and consumption, productivity and prices, asset accumulation and even challenges to survival. Poverty prognosis is heavily dependent on the socio-economic conditions, demographic structure, and the economic growth of economies across the globe and climate change acts as a threat multiplier (Werrell & Femia 2015). The impact of climate change is clearly visible among poor people as they are exposed and vulnerable to the prices, assets, productivity, and opportunities, and barely have the capacity to fight and adapt. These shocks have a magnifying impact on the poor and increase over time and chase away the sustainable goals of poverty eradication.

Both humans and animals face new challenges of survival with the frequent natural calamities, intense drought, storms, heat waves, rising sea levels, melting glaciers and warming oceans that create disasters and challenges to life. The impacts of climate change can only be predicted through the course of future development, hence become highly uncertain. People living in poverty bear the brunt of environmental damage and are often caught in a downward spiral, where they are forced to overuse resources to survive.

⁴Climate Change and Poverty Conference (2015) A 2-day conference organized by climate change and poverty groups of the world bank with 150 participants to discuss Climate Change and Poverty February 9-10 2015 in Washington, DC,

They not only create scarcity or depletion of resources for the current population but for future generations too.

1.2.6 Financial Market Constraints

The financial sector supports an efficient allocation of resources and economic growth. Macroeconomic instability leads to degrowth in developing economies, thus it is important to encourage the creation of diverse financial markets, coupled with a wide range of financial institutions and better macroeconomic risk management. Such diverse institutions broaden the reach of financial markets, reducing liquidity constraints and offering some insurance against the fallout from boom-and-bust cycles in each institutional type as each institutional type only covers a limited market segment. Greater diversity initiates faster growth, larger credit markets, a broader deposit base, and a smaller chance of asset bubbles, all contributing to more stability Frankema (2020) **Multiple Financial Markets Failures (MFMF)**:

Taking:

c = consumption, x = income, A = assets, α = ability, δ = discount rate, θ = asset shock, τ = depreciation rate, F_h = high technology (with fixed cost), F' = low cost technology (no fixed cost)

MFMF Assumption: no borrowing and no insurance options available. Based on the assumption here is an MFMF model. (Barrett & Carter 2012)

$$\max_{cA} E_o \left\{ \sum_{t=0}^{\infty} \delta^t u(C_{it}) \right\} \quad (2)$$

subject to:

$$X_{it}(A_{it}\theta_t) = F(A_{it}\alpha_t) + (1+r)\theta_t A_{it}\theta_t$$

$$F(A_{it}\alpha_t) = \max \left[F^h(A_{it}\alpha_t) F'(A_{it}\alpha_t) \right] \quad (3)$$

Where:

$$C_{it} \leq X_{it} \text{ and } A_{it+1} = X_{it} - C_{it}$$

Given that individuals cannot borrow against their future income either to accumulate assets more rapidly, or to insulate consumption, (c) against the effects of shocks, these borrowing constraints represent the first financial market failure. If there is no insurance (contingent claims) market and the individuals have no access to insurance contracts that would compensate their asset loss, then such market failures affect poor people's lives, trapping them in the persistence of poverty. Unless economy reaches a higher scale of production with higher technology (subject to fixed costs) ensuring greater output Once that scale is reached the adoption of higher and better technology gives super marginal returns to assets as it is more productive.

The MFMF poverty trap model(Barrett & Carter 2012) depicts the deprivation of those who suffer low initial endowments or who suffer a shock that hits them below some critical asset threshold. The current consumption in this model is assumed to be less than or equal to the wealth that an individual has because of the lack of insurance for higher level of consumption or future borrowings, in addition to the fact that the assets can only be built up with the forced saving or lesser present consumption for the lack of loan markets. The coordination failure and the market failure can lead to multiple equilibria.

As **endowments are expected fate** (Barrett et al., n.d.) the the model divides the individuals according to different ability levels with different initial, or inherited, endowments of the productive assets. Some converge to a high-income equilibrium if they have **Micawber Threshold** (MT) (Barrett & Carter 2012), and some collapse to a low-level, poverty trap equilibrium due to asset fall shock. Also, risk matters, and because of the shocks, the household pushed below the MT finds it tough to recover and may converge at a lower level of equilibrium (Barrett & Carter 2012). Single and multiple equilibria poverty traps can exist at the same time individuals with varied abilities may face a unique, poor, or non-poor, equilibrium, irrespective of their initial asset levels.

Poverty has a cause-and-effect relationship with economic growth. The poverty mechanism can also be illustrated through the growth models. The greatest incidence of poverty is seen where there has been the least amount of growth. Growth can only help reduce poverty if the poor participate and share the process and proceedings of growth. Where poverty can create its own vicious circle, growth can generate virtuous circles of prosperity and opportunity as economic growth captures how output increases proportionately to input.

2 Poverty traps mechanism: through the lens of growth models

Dani Rodrik from Harvard University in his book, 'One Economics, Many Recipes: Globalization, Institutions and Economic Growth (2007)' wrote,

'Historically nothing has worked better than economic growth in enabling societies to improve the life chances of their members, including those at the very bottom.'(moodle usp: e _disciplinas)

Numerous theories have been propounded and despite the distinctive differences in them, they had the objective of conceptualizing growth and how higher growth can be achieved. These theories attempt to explain those conditions that are essential for development and growth to occur. They focus on understanding economic growth and seek to find determinants and alternative causes of growth.

2.1 Classical Perspective

Adam Smith's idea of "division of labor is limited by the extent of the market" has been put into the growth context, which highlights the importance of externalities and increasing returns to scale for generating and sustaining an accelerated rate of growth in an economy. The economies that could not manage increasing returns remained LDCs and the others could 'take off'.



Figure 1: Smith's growth progress

Figure 1 depicts how the expansion of the market as a result of increase in capital and production lead to high factor productivity and increasing returns to scale. This increases the surplus and hence more saving which culminates in more capital and creates a circular flow of growth in the economy.

Economists like Paul Rosenstein-Rodan (1943), Ragnar Nurkse (1953), Gunnar Myrdal(1957) and Walt Whitman Rostow(1960) argued that nation can achieve increasing returns only when a nation has achieved a particular the threshold level of output per capita. The poor nations get trapped in poverty because they are unable to push themselves above that threshold. Whereas the developing nations get a push over the threshold because of a massive and widespread injection of capital, and are able to "take-off".(Big Push Theory of Economic Development, n.d.)

2.2 Traditional Perspective

The poverty trap has been explicitly understood through the Solow-Swan growth model, which suggests that per capita output growth results from capital accumulation and technological progress (Solow 1956). Transitioning from the classical growth model, the neo classical economists stressed that the economies can determine the long run growth rate of output per capita They related it to three variables; rate of technological change, saving to investment rate and population growth rate. Based on the Cobb-Douglas production function, it is presumed that Labor and capital is vital for short-run equilibrium, whereas technological change, as an exogenous factor⁵,tends to offset effects of the diminishing returns accrued by the inputs of labor and capital.

⁵The labor force grows in accordance with population growth and is augmented by technical progress, both exogenously determined. Research Gate(2019)

This model states that as the economies develop they reach steady state, where the rate of investment per worker ($sf(\frac{K}{N})$) equals the rate of depreciation per worker ($\frac{K}{N}$).

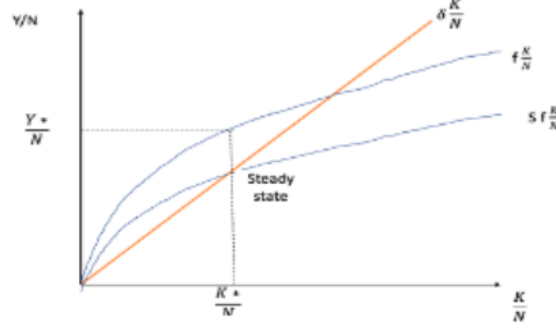


Figure 2: Solow's Growth Model

Solow propounded through his model (Figure.2) that without the exogenous the input of technology, economies, in the steady state, operate at the output level of $(\frac{Y^*}{N})$ where the input is. $(\frac{K^*}{N})$.

The infusion of technology results in an increase in the total factor productivity⁶ enabling an increase in savings that helps the economy reach a higher steady state (Figure.3) and hence significant growth.

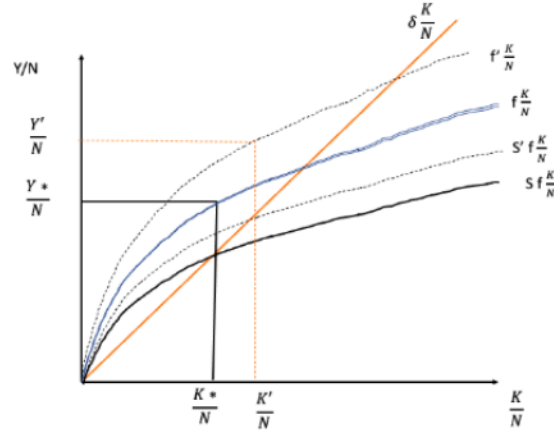


Figure 3: Higher Steady State

The model maintains that economies reach a higher level of output ($f' \frac{K}{N}$) with the introduction of technology (Figure 3.) The steady state equilibrium arrives at a higher level with investment per worker increasing to ($s'f(\frac{K'}{N})$), ensuring output per worker as ($\frac{Y'}{N}$) at inputs per worker as ($\frac{K'}{N}$).

⁶Also called solow residual as can't be explained by growth in production factors.

2.3 Modern Perspective

The endogenous growth theories are elaborations of the Solow model and its contemporary theories. They explicitly interpret the efficiency of labor as knowledge and treat its evolution over time. The endogenous growth theories as against the exogenous growth models suggest that the growth rate of technology (g_{At}) is a function of labor and capital stock at a given time. The modern growth theory is based on the idea that the growth is driven by factors inside the economy and the production function needs to be adjusted. The production function looks like:

$$Y = Af(K, H, L, I) \quad (4)$$

Here : K = Capital, H= Human Capital, L= natural resources , I = Institutions or the environment in which the decisions are made in an economy.

These institutions lead to endogenous growth. The economies that grow have introduced positive institutions and reforms such as transparent and consistent government, private property rights, and stable money and prices. Economies that have negative institutions like corruption, political instability or lack of individual freedom restrict growth and hinder people from taking decisions and long term investments which help spur innovation in an economy. The factors that foster endogenous economic growth pushes the production function up, holding the capital constant, a cheaper method to spur economic growth and develop infrastructure.

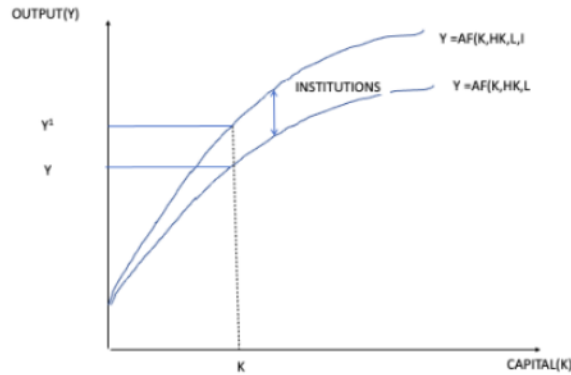


Figure 4: Endogenous Growth Model

The economy with (Figure 4) the same capital produces more with more efficiency. As this provides an incentive to people in making decisions of creating their own technology, becoming reliant on developing their new ideas and productivity. Institutions allow sustainable growth models, that is why good policies and institutions matter. The proponents of new growth model ,Scitovsky(1954), Mrydal(1957), Romer(1986) N.G. Mankiw, developed modified models to that of Solow's which explain that economies at the interna-

tional level have differences in growth rates that result from convergence to different steady states. Under endogenous growth theories, different features have been proposed as externalities that enhance the growth process. The accumulation of knowledge possessed by firms is taken as the information/knowledge embodied in employees or by workers (human capital). The neo-classical model has been modified by N.G Mankiw, David Romer, and David Well (1992) by adding Human Capital, R & D, other externalities as additional inputs in the production of national income.

2.3.1 Externalities of Investment

Externalities play a vital role in most of the theories of economic growth. The endogenous growth model asserts that the positive and negative externalities have specific impacts on the economy's growth. The positive externality of investment in physical capital has a significant impact on the growth rate of countries. It does not only increase the tangible stock but also the intangible one.(Long & Summers, 1991) The production function can be written as :

$$Y(t) = [A(t)L(t)]^\alpha K(t)^{1-\alpha} \quad (5)$$

Taking: $Y(t)$ as aggregate output, $L(t)$ as the stock of labor used, $K(t)$ as the aggregate stock of physical capital and $A(t)$ as individual stock of knowledge and $\alpha \in (0, 1)$ as the labor share in the production function.

Based on Schumpeter's concept of growth innovations that are profit motivated to drive out obsolete and outdated technology, these models produce "investment permission" as Solow calls it, the impact that is made by the investment related changes in policies. Post World War II equipment investment has been a potential key factor in growth in a cross-section of economies ranging from the richest to the poorest. Growth relying on human capital formation strictly depends on the high equipment investment in countries with different levels of industrialization. Investment in equipment associated with higher total factor productivity also gives a very high net social return on the investment. The expertise of the workforce in handling modern equipment and technology yields external benefits and helps organizations develop production efficient procedures.

This model shown in equation (3) is an abstract from investments in physical capital, taking an economy where agents derive utility from consumption and supply inelastic labor. Here population (L) is constant and the isoelastic agents' preferences are represented by the isoelastic utility function as:

$$U = \int_0^\infty e^{-\rho t} \frac{C_t^{1-\theta} - 1}{1-\theta} dt. \quad (6)$$

Subject to the budget constraint the households set a utility maximization consumption plan represented as:

$$C_t^* = \frac{r_t - \rho}{\theta} \cdot C_t. \quad (7)$$

The savings are used for innovative investments. The production function looks like:

$$Y_t = L_{y,t}^{1-\alpha} \int_0^{A_t} x_{j,t}^\alpha dj \quad (8)$$

where x_j is the quantity of the intermediate good j , A_t is the measure of intermediate goods available at t , L_y is labor and $\alpha \in (0, 1)$

Taking: ρ as a constant discount factor, $u(C)$ the increasing concave utility function; $u'(C) > 0$ & $u''(C) < 0$ r is the return to capital, W is the wage rate, and δ is the depreciation rate. The amount of labor is constant and equal to 1.

Subject to the budget constraint of

$$K^* = (rK + w) - C - \delta K, \dots, K(0) = K_0 \quad (9)$$

The maximization position for a firm in an economy in the above case would be as:

$$\max c(t) \int_0^\infty e^{-\rho t} u(C(t)) dt \quad (10)$$

This model (Greiner & Semmler 2001) analyzes that endogenous and sustained per capita growth is feasible. This implies that to initiate and ensure economic growth economies must invest in capital stock with a greater increase in the human capital, as then only the decline in the marginal product of physical capital can be offset.

2.3.2 Education and Human capital

The Uzawa–Lucas endogenous growth model developed by Uzawa was based on the concept of investment in human capital used by Lucas. (Lucas, n.d.) According to Lucas, human capital was created by investment in education and is considered a crucial factor for the process of the economy's growth. He believed that an increase in educational investment would permanently enrich the economies and would temporarily increase its growth rate during the transition to a new equilibrium. Uzawa model (Uzawa, 1961), determines the annual output with the existing capital stock and the quantity of labor employed in production assuming

that the labor is embodied with all the changes in technological knowledge. The activities of education, health construction, and maintenance of public goods in the economy create efficiency in labor. So the education sector accumulates these activities and diffuses them all over the economy in a uniform manner. This is the only endogenous growth model which has both long-run growth as well as transition dynamics.

The model is based on certain assumptions. (Mattana 2017)

1. The economy has two reproducible inputs: physical capital and human capital.
2. There are two sectors: manufacturing and education (training)
 - The manufacturing good is used in consumption and investment
 - The education produces a service that is only used in production
3. Consumption/savings are determined by a centralized planner (Ramsey planner)

The Manufacturing and Education, two sectors display production functions facing constant returns to scale relative to their own capital at the firms level :

$$Y_1 = A_1 K_1^\alpha H^{1-\alpha} \text{ --- (manufacturing)} \quad (11)$$

$$Y_2 = A_2 H_2 \text{ --- (education/training)} \quad (12)$$

Taking, H as human capital, this equation can also be written as:

$$Y = C + I_K + I_H \quad (13)$$

According to Lucas's model, the production function is given as:

$$Y = AK^\alpha (\varepsilon hL)^{1-\alpha} h^\zeta a, 0 < \alpha < 1, \quad (14)$$

Here: Y = output, A = constant technology level, K = physical capital, L= labor, H= Human Capital,

α = the share of physical capital, h = human capital per capita, ε = the fraction of labor time devoted to producing output, and $(1 - \varepsilon)$ = the fraction of labor time devoted to human capital.

Assuming, $0 < \varepsilon < 1$. εh is the total effective labor force, measured in efficiency units, employed to produce output. $h\alpha^\zeta$, measures the externally associated average human capital of the workforce. $h\alpha$, is the average human capital of the workforce, and ζ is the positive external parameter in the production of human capital.

With the capital and human capital accumulation conditions the model can be written as:

$$Max_{c_1, \varepsilon_1} \int_t^{\infty} e^{-(p-n)t} [c(t)^{1-\alpha} - 1]/(1-\sigma) dt \quad (15)$$

Where capital accumulation is:

$$k^* = AK^{\alpha}(\varepsilon h)^{1-\alpha} h_{\alpha}^{\zeta} - c - (n + \delta)k, \quad (16)$$

and the human capital (h) accumulation is as :

$$h' = \eta h (1 - \varepsilon) \quad (17)$$

(where (η) is defined as schooling productivity and population is growing at the rate n .)

In Lucas, human capital accumulation is determined by the amount of human capital created by the given resources and the number of resources devoted to human capital accumulation, which also depends on the years of education/schooling productivity.

$$h^*(t) = h(t)K(1 - u(t)) \quad (18)$$

Human capital accumulation is determined with the amount of human capital created by the given resources and the quantity of resources devoted to human capital accumulation, which also depends on the years of education/schooling productivity.

At steady state, we have $k^* = 0$, such that

$$AK^{\alpha}(\varepsilon h)^{1-\alpha} h_{\alpha}^{\zeta} - c = (n + \delta)k \quad (19)$$

That means gross investment is so high to cover the depreciation and capital dilution.

An increase in the externality parameter (ζ) causes the savings rate to increase, when households are willing to substitute their current consumption against future consumption as a response to a change in the real interest rate. When (σ) is low, people start saving more. The economy faces a movement of labor from output production to human capital production. This implies that if there is a sufficient accumulation of human capital, there can be a faster accumulation of physical capital in the economy. More care about the future would increase current consumption and faster capital accumulation. This would increase the production of consumption goods, and eventually lead to a fall in savings rate.

2.3.3 Knowledge Accumulation and Growth

Romer built a model in which the long-run growth rate was determined endogenously. His approach replicates the idea of the production of improvements in technology by including “knowledge capital” along with physical capital. Through his endogenous growth theory, Romer professed that technological change results from the efforts of researchers and entrepreneurs who respond to economic incentives. Also known as ‘learning by investment’ model, Romer’s model stresses that the creation of knowledge is a sub-product of investment and is a nonrival good.⁷(Jones 2019) Assuming other things constant, if more resources are dedicated to R & D it would yield more discoveries, and growth is achieved over extended periods.

Romer assumed his model faced constant returns to scale at the firm’s level but increasing returns at the economy’s level. Following the theory of ‘learning by doing’ Arrow(1962), Romer believed that increased productivity is related to experience and can be measured through investment.⁸ He argued, "Each new machine produced and put into use is capable of changing the environment in which production takes place so that learning takes place with continuous new stimuli." Romer(1994).

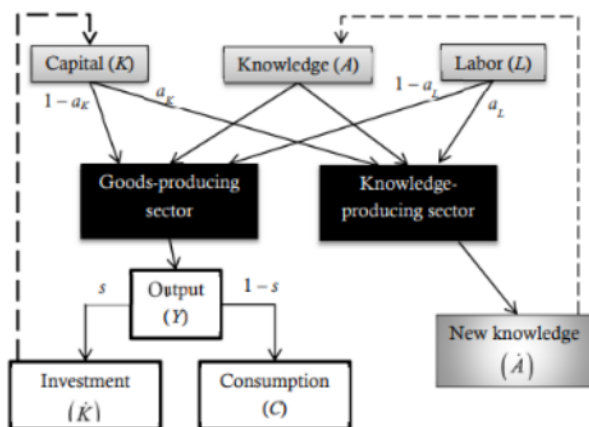


Figure 5: Romer’s Growth Model

The growth model in Figure. 5.(Introduction to Endogenous Growth Models, n.d.), set in continuous time, has two sectors, the final goods sector that creates output and the other R & D sector where accumulation of knowledge happens. This model makes technological progress endogenous, as it is determined by the actions of the economic agents and it is the technological progress that in turn determines long-run growth in output per worker.

Taking:

- Variables (L), (K), (A), and (Y) as labor, capital, technology, and output respectively.

⁷nonrivalry gives rise to increasing returns to scale and growth follows naturally

⁸Arrow indexes experience by cumulative investment. He believed in a model of learning-by-doing, which shows that experience in production, results in higher productivity and economic growth.

- $A(t)$ as the stock of knowledge at time t . (used in both sectors)
- a_L as part of the labor force used in the R&D sector
- $1 - a_L$ as the part of labor in the goods-producing sector. (both taken as constant and exogenous)
- a_K as part of capital used in the R & D sector
- $1 - a_K$ as the part used in the goods-producing sector

Assuming that the labor has productivity with the accumulation of knowledge, which in turn, depends on experience which is a function of past investment of all firms in the economy, the production function at the time (t) looks like:⁹

$$Y(t) = [(1 - a_K)K(t)]^\alpha [A(t)(1 - a_L)L(t)]^{1-\alpha}, (0 < \alpha < 1.) \quad (20)$$

Keeping in mind the constant returns to scale, the accumulation of knowledge depends on the proportion of labor and capital engaged in the research and development. To analyze the outcome of changes in other determinants of the success of R&D, taking B as the shift parameter, the production the function can be rewritten as:

$$A^*(t) = B[a, K(t)]^\beta [a, L(t)]^y A(t)^\Theta \quad (B > 0, \beta \geq 0, y \geq 0 = 1) \quad (21)$$

(The parameter $\Theta=1$ indicates a positive impact of the the existing stock of knowledge on the success of R&D).

$$\Rightarrow \frac{A^*}{A} = B[aK(t)]^\beta [aL(t)]^y A(t)^\Theta$$

$\Rightarrow$ growth rate of A depends on the equation of K and L , used for research.

This model underlies the fact that the saving rate and population both are exogenous and constant (Solow, 1956), and taking depreciation equal to zero, we have

$$K'(t) = sY(t) \quad (22)$$

$$L(t) = nL(t), n \geq 0 \quad (23)$$

In Romer's words,

“even with fixed population and fixed physical capital, knowledge will never reach a the level where it's marginal product is so low that is no longer worth the trouble it takes to do research.”.

Romer(1986a, p.1020)

⁹The model is set in Cob Douglas form and in continuous time

Technological change acts as an incentive for capital accumulation as it is an impetus to the efficiency per worker. A higher growth rate is the outcome of higher productivity from R&D, with more labor being used in the labs, and a larger population. As Romer stresses that the growth rate of knowledge depends positively on the level of the population, implying that economies with large populations should grow faster than smaller ones.

Graphically:

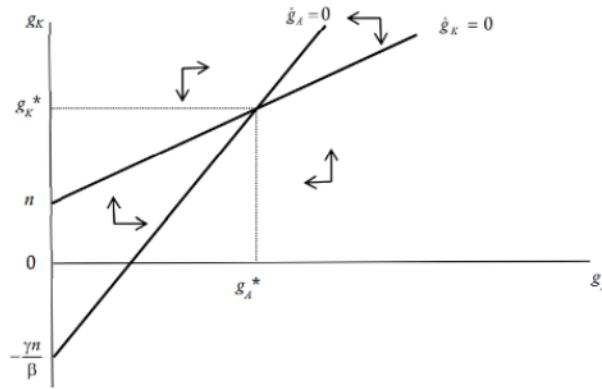


Figure 6: Local Convergence to Steady State

In Figure.6 the $\dot{g}_K = 0$ has slope of 1 and intercept on the g_K axis at $n \geq 0$. Below the line, $\dot{g}_K > 0$ and above the line $\dot{g}_K < 0$ (shown by the vertical arrow lines.) This implies that returns to scale in the production of new knowledge using the two produced factors K and A are measured by $\beta + \vartheta$. To conclude Romer's endogenous R & D model; when there was no capital: with a steadily increasing labor force, the model can converge to a steady state with constant growth only if there are diminishing returns to the produced factors. While with constant or increasing returns to the produced factors, the growth rate accelerates indefinitely.

2.3.4 Infrastructure and Growth

the development of infrastructure is another booster in the growth potential of an economy.

"International differences in productivity, as well as in endowments of physical and human capital, is because of its social infrastructure"

Figure.7 (below) reflects that social infrastructure affects capital accumulation and human capital accumulation, which in turn affects output per worker. Good infrastructure has a positive impact on the durability of private capital and hence growth. The private sector can allocate its investments to other options that work as an impetus to growth. The productivity of private capital depends largely on the state of public infrastructure (Aschauer1989).

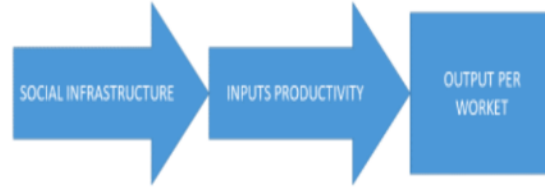


Figure 7: Infrastructural Growth

The productivity of private capital depends largely on the state of public infrastructure. Public capital complements private capital as higher private capital boosts the productivity of labor and leads to higher wages and lower interest rates for borrowings. This encourages higher investment in private capital and in turn, leads to higher GDP. The additional public infrastructure investment must not be done through additional federal debt as it may crowd out private capital, leading to lower output.

Hence, the public capital in terms of infrastructural increase decides the net effect on output. The state of social infrastructure results in differences in the level of economic performance across economies. They depend on various factors like institutions and government policies that provide incentives for individuals and firms in an economy. To enhance social capital, both social infrastructure as well as social cohesion are important. Infrastructure has a dual impact, one as a production factor and one as an influence on total factor productivity(TFP). The production function (Holtz-Eakin & Schwartz 1995) can be written as:

$$Y_t = K_t^\alpha G_t^\beta (\Psi, L)^{1-\alpha-\beta} \quad (24)$$

Here ; Y_t = Output, K_t = *privatecapital*, G_t = *publiccapital* , Ψ = technical efficiency of labor(L) and t =time.

Infrastructure provides an economic environment to boost innovations, innovation incentives and entrepreneurship which are only possible through policies and institutions. Long-run growth can only be assured with a combination of good property rights protection (to protect the rents of innovators against imitation), a good education system (to increase the efficiency of R&D activities and/or the supply of skilled manufacturing labor), and a stable macro economy to reduce interest rates (and thereby increase the net present value of innovative rents) The growth model with infrastructure (Semmler et al., world bank paper,2011) can be seen as;

$$\max_{c(t)} \int_t^\infty e^{-(p-n)t} L_o u(C(t)) dt \quad (25)$$

With the per capita production function of the form the model taking T as government revenue, r as tax, c

as consumption per person, and p as the subjective discount rate, is subject to

$$K^* + B^* = (w + r_1 K + r_2 B) (1 - r) - C + T_p - (\delta_k + n) K - nB$$

$$G^* = \varphi_3 (1 - \varphi_0) T - (\delta_G + n) G$$

$$B^* = r_2 B + C_p + T_p + I_p - T - nB$$

The model suggests that the I_p part of the resources are used for public infrastructure, c_p for transfers and public consumption, and T_p for public administration. Public investment supports market productivity, human capital, and education. The model predicts that intensive economic growth is the outcome of public capital accumulation that depends on the level of private capital. Accordingly, differences in policies toward infrastructure decide differences in output or productivity.

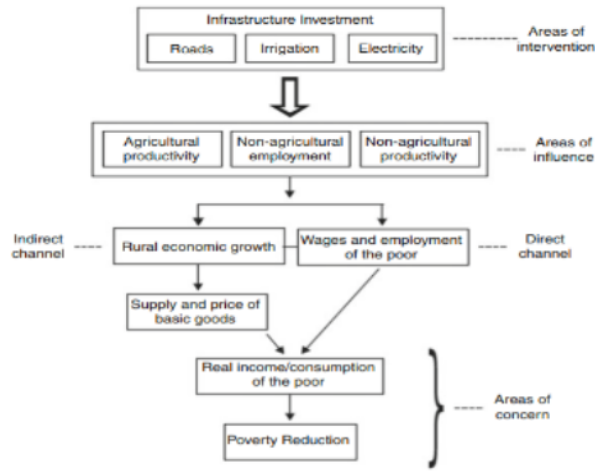


Figure 8: Multidimensional Impact of Infrastructure

In totality, growth in infrastructure has a multi-dimensional impact on the economic growth. As depicted in Figure.8, investment in infrastructure directly and indirectly supports the production activity and productivity in farm and nonfarm sectors and eventually help the economy in poverty reduction. All forces of economic growth essentially depend on public policy and how the state expenditure is planned as a fiscal expenditure. Specifically in low-income countries where the the initial capital stock is low and basic infrastructure is lacking the impact of infrastructural capital and investment is substantially large.

2.4 Unified Growth Theory

The evolutionary growth theory is called the unified growth theory (Galor, Oded 2011), portrays a dynamic interaction between the economy, social, and behavioral aspects of the process of development and evolutionary processes in the human population. It captures the processes that are triggered by the socio-economic transitions and play an important role in the observed time path of health, life expectancy, human capital,

and population growth. It also includes the elementary phases in the process of development like,

- The Malthusian epoch,
- The Malthusian trap (Komlos, John; Artzrouni, Marc 1990),
- The emergence of human capital as a central element in the growth process,
- The beginning of the fertility decline, the advent of the modern era of sustained economic growth, and
- The basis of income inequalities across nations over time.

“The theory suggests that the evolutionary pressure during the Malthusian era gradually increased the representation of individuals whose characteristics were complementary to the growth process, triggering positive feedback between technological progress and education that ultimately brought about the Industrial Revolution and the takeoff from a Malthusian epoch to sustained economic growth.” (Galor & Moav 2002)

“This theory initiates a reinforcing interaction between investment in human capital and technological progress resulting in the demographic transition and the state of sustained economic growth” (Gallup et al. 1998).

The heredity of human traits, physical or mental as per Malthusian theory, generate higher earning potential. These traits transfer to the offspring and thus generate an evolutionary advantage and would dominate the population. Thus investment in human capital and technological progress would bring a demographic transition and a shift to a sustained economic growth state.

2.5 Poverty Traps Mechanism: Graphical representation

Various growth models explain the factors that act as the exogenous or endogenous rationale for economic growth across economies. At the elementary-level poverty traps can be classified as,

a. Poverty trap ---(*Capital*) This trap is created because of low level of income which induces low level of saving resulting in a low level of investment and hence low capital formation and low level of productivity coming back to a situation of low level of income.

$$Px = f(Y) = g(C, S) = h(C, I)$$

b. Poverty trap---- (*Labor*) With low-income people have low food intake (F) which results in low productivity and hence low income.

$$Px = f(F) = g(Pr) = h(Y)$$

c. Poverty trap---- (*Technology*) Low level of income in an economy brings a low rate of research and development which results in low economic growth and development which eventually results in a low level of income.

$$Px = f(T) = g(C, S) = h(C, I)$$

The graphical representation of Poverty Traps in Appendix (2.5) portrays different growth models graphically. It depicts the poverty trap at the micro/individual level showing that the amount of money a person has determines the quantum of food he can consume and the money he spends on health, education, and ways to improve one's work, etc., which in turn influences his income in the future.

3 Summing up

Understanding the realities of poverty is crucial to deciding how to conquer it. To handle and curb poverty in the future, we need to understand the challenges that generate poverty and what poverty generates in turn around the world today. If these challenges are not handled they can create a downward spiral. Since poverty is multidimensional an understanding of poverty Thresholds and Takeoffs is imperative to save future generations as they give an insight into the real issues from where poverty originates. Poverty is made up of multiple factors that are much more than just a lack of income. To adequately serve the poorest communities it is foremost to recognise poverty and its multi-dimensional aspects.

I fully agree with Henry George when he said, "prosperity for the entire world is possible provided we keep pushing out the boundaries of freedom, provide no privilege to any single class, fix the problems that are keeping people in poverty, address the underlying cause of the boom-bust cycle, and continue to innovate and trade"(Tucker, n.d.).

Empirical evidence shows that about 10% of the world's population lives in extreme poverty and most of them are not able to ever escape and are caught in a cycle. The many self-reinforcing disadvantages such as deprivation, malnutrition, poor sanitation, and lack of access to essential resources and other social services, make it virtually impossible for them to break the cycle. From the scholarly standpoint, Poverty may be looked at from different perspectives but it is critical to help the world's poor lift themselves out of destitution, whatever form it may be, improve their standards of living, achieve better health and education, and attain greater control over their lives.

The growth models propounded by renowned scholars place greater emphasis on the various factors that ensure higher economic growth but growth alone is not sufficient for poverty reduction. If growth is associated with progressive distributional changes that would have a greater impact on poverty. Hence, such policies that improve the distribution of income and assets within a society, must be a part of the poverty reduction

strategy. Land tenure reform, pro-poor public expenditure, and improvement in the poor's access to financial markets would ensure macroeconomic stability. The economies must work towards benefiting all segments of society, create equity with social justice and bring modernization without stressing the environment, and aim for self-reliance. No country can emerge out of the poverty loop unless it ensures that all its available resources in any form are fully and efficiently used, keeping in mind the future generations' needs and happiness.

Henry George's economic philosophy "**Georgism** " helped sparked the progressive era and left a powerful message for current times and the centuries to come.

"To educate men who must be condemned to poverty, is but to make them restive; to base on a state of most glaring social inequality political institutions under which men are theoretically equal, is to stand a pyramid on its apex."(Progress and Poverty, n.d.)

Appendix

A 2.3.3

To understand the dynamics of (K) in this model,(Introduction to Endogenous Growth Models, n.d.)

$$^*(t) = sY(t) = [s(1a_K)(1a_L)^{1-\alpha}]K(t)^\alpha A(t)^{1-\alpha}L(t)^{1-\alpha} \quad (26)$$

Replacing the constant term over time in the brackets with c_k economy's the growth rate of K is calculated as:

$$g_k(t) = \frac{K^*(t)}{K(t)} = c_k \left[\frac{A(t)L(t)}{K(t)} \right]^{1-\alpha} \quad (27)$$

To look for a steady state where K grows at a constant rate (g_K^*) we analyze the change in growth rate as follows:

$$\frac{g_k^*(t)}{g_k(t)} = (1 - \alpha)(g_A + n + g_K) \quad (28)$$

- $g_k^*(t) = 0$ if $g_K(t) = g_A(t) + n$

$$g_k^*(t) > 0 \text{ if } g_K(t) < g_A(t) + n$$

$$g_k^*(t) < 0 \text{ if } g_K(t) > g_A(t) + n$$

$$\Rightarrow g_k^*(t) = 0 : g_K^* = g_A^* + n$$

Similarly to understand the dynamics of (A) we have:

$$g_A(t) = \frac{A^*(t)}{A(t)} = [Ba_k^2 a_L^y] K(t)^2 L(t)^y A(t)^{1-\theta} \quad (29)$$

Since $[Ba_k^\beta a_L^y]$ is constant overtime therefore can be termed as c_A . The change in growth rate in this case is :

- $\frac{g_A^*(t)}{g_A(t)} = \beta g_K(t) + yn + (\theta - 1)g_A(t)$

$$g_A^*(t) = 0 \text{ if } g_K(t) > -\frac{yn}{\beta} + \frac{1-\theta}{\beta} g_A(t)$$

$$g_A^*(t) > 0 \text{ if } g_K(t) > -\frac{yn}{\beta} + \frac{1-\theta}{\beta} g_A(t)$$

$$\Rightarrow [g_A^* = 0 : g_K^* = -\frac{yn}{\beta} + \frac{1-\theta}{\beta} g_A^*(t)]$$

$$g_A^*(t) < 0 \text{ if } g_K(t) < -\frac{yn}{\beta} + \frac{1-\theta}{\beta} g_A(t)$$

- Here, $g_A^* = 0$ has slope $\frac{1-\theta}{\beta}$ and intercept on (g_K) , at $-\frac{yn}{\beta} \leq 0$.

Showing $(g_A^* > 0)$ on the left and $(g_A^* < 0)$ on the right, by the horizontal arrow lines.

Whereas the curve g_A^* has slope $(\frac{1-\theta}{\beta})$, and intercept at $-\frac{yn}{\beta} \leq 0$. (fig. 6).

This implies that returns to scale in the production of new knowledge using the two produced factors K and A are measured by $\beta + \theta$.

B 2.5

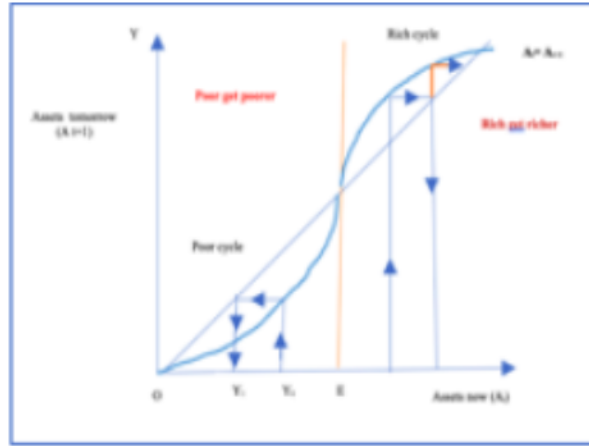


Figure 9: Poverty Trap: Micro Model

In an 'S-shaped curve (Figure 9) the poor are stuck on the left side of the diagonal line, wherein future income is lower than present income, and it continues to decrease over time.

The above figure represents a micro model and is applicable to economics at large at a macro level too. The basic need line (E), indicating expected expenditure, divides the model (Fig 9) into two parts: poor cycle and rich cycle. Since commitments are bigger than income or assets, a person falls into the trap of debt and remains poor. Poverty begets poverty.

On the contrary, the rich (on the RHS) have more assets than the commitments they have, so they can save out of their incomes. Savings lead to investments and further lead to income. Wealth begets wealth.

Solow's exogenous model (Solow 1956) and traditional models explored the possibility of convergence of low-income and high-income countries, stressing that low-income countries initially have higher returns to investment and can accumulate capital.

At the macro level, a valid reason for the economy to remain in poverty is that it starts off with a low marginal product of capital and can never benefit from the higher returns that accrue at slightly higher income levels.

Though the endogenous models advocate the importance of investment in R & D (Romer 1994) and human capital (Uzawa 1961) and social infrastructure Hall & (Jones 1999) and positive externalities to ensure a higher labor productivity leading to a higher growth rate, there is still a wide gap between the per capita incomes among countries.

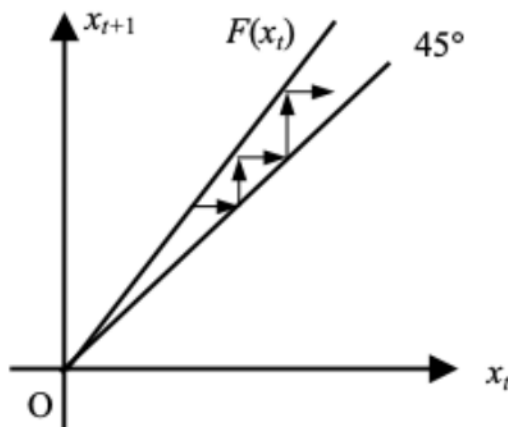


Figure 10: No Poverty Trap

The state of the economy (Figure 10) in period (t) is (X_t) . Higher X indicates more development. With the initial condition X_0 and the equilibrium path following a linear partial differential equation $X_t + 1 = F(X_t)$, we can obtain the entire trajectory of the economy. $F(X)$ stays above the 45° line everywhere, so the economy grows forever and faces no poverty trap portraying an endogenous growth model.

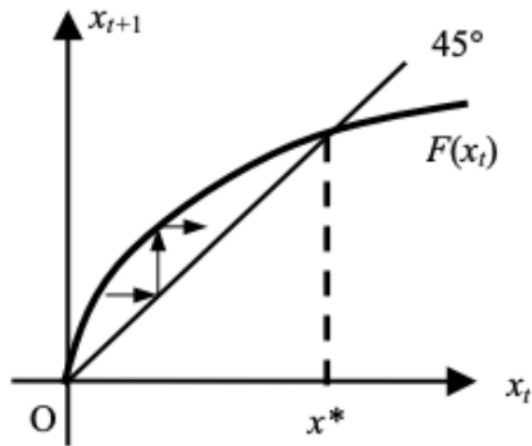


Figure 11: Exogenous Long Run Growth

On the contrary in Figure 11, for any X_o , the economy converges to X^* , typical of the Solow growth model depicting long-run economic growth exogenously and is independent of the initial condition irrespective of how underdeveloped the economy initially was.

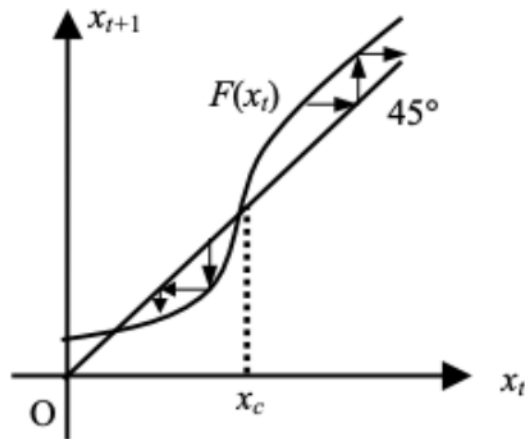


Figure 12: Growth Determined by Initial Position

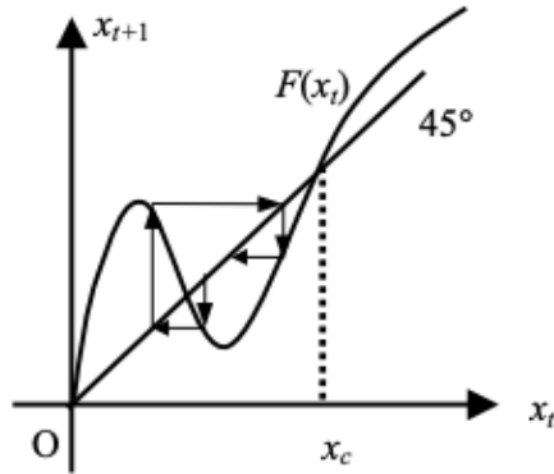


Figure 13: Self Perpetuating Trap

Figures 12 & 13 depict that the long-run performance of the economy depends on the initial condition. Figure 13 shows that if the economy starts at a level above X_c it will keep on growing forever, it depicts that the economy will converge at a low level of steady state. Whereas Figure 14 depicts that the economy will be trapped if it starts below the X_c level forever, and that it fluctuates below X_c and faces a self-perpetuating poverty trap. Both figures indicate that the poverty trap is inevitable for an economy and depict a strong form of the trap. It may be difficult but not impossible for economies to come out of it.

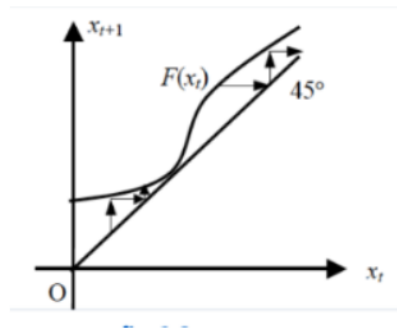


Figure 14: Weak Form of Poverty Trap

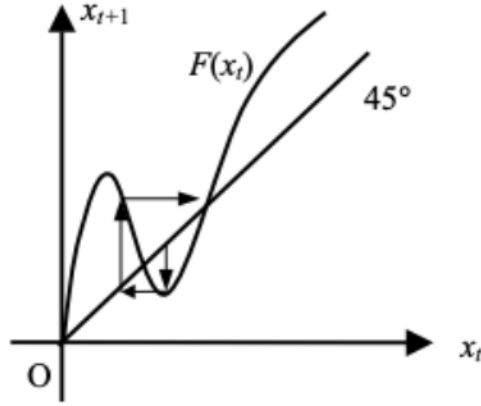


Figure 15: Model of Endogenous Stochastic Shocks

Figure 14. depicts that economy faces stagnation for a long time, but eventually takes off. In Figure 15 the economy may, or may not escape from the shocks it experiences because of many periods of volatility. These figures depict a weak form of poverty trap which is self-perpetuating. Poverty traps also occur because of various stochastic shocks that economies suffer, called a model of endogenous stochastic shocks.

$$X_{t+1} = F(X_t + \mu_{t+1}) \quad (30)$$

The economy faces random shocks (ϵ_{t+1}) like, natural disasters, epidemics, and wars could cause the capital/labor ratio to jump up and down. In the presence of such stochastic shocks, the economy may infrequently or recurrently escape or get into the trap.

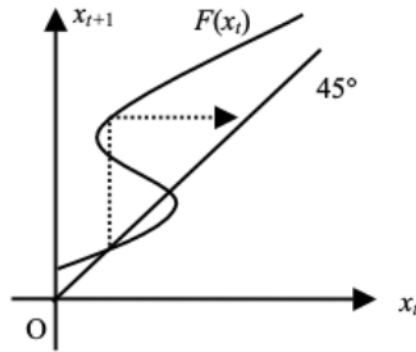


Figure 16: Caught in Coordination Failures

The economy here (Figure 16) is stuck in a low-level stationary state, which could be due to coordination failures. It could escape the poverty trap if it could succeed in coordinating on a higher equilibrium.

The United Nations has committed to ending extreme poverty as one of its Sustainable Development Goals. With an aspiring set of 17 targets, in its resolution, the General Assembly proclaimed for the world to reach by 2030 and considered that the 25 themes of the Third Decade should be "Accelerating global actions for a world without poverty," in line with the 2030 Agenda for Sustainable Development United Nations (2015).

C Summing up

The seventeen goals agenda are the world's shared plan to end extreme poverty, reduce inequality, and protect the planet by 2030. With the aim of 'leaving no one behind,' the U.N. Foundation focuses on initiatives that have larger impacts. These goals are an urgent call for action by all countries at different levels of development to act in a global partnership. The aim to end poverty must be clubbed with strategies to uplift human status while tackling climate change and working to preserve our environment. The efforts to alleviate poverty do not mean poverty will vanish. According to Sandefur, even though extreme poverty is declining, "we still have deep, intractable pockets of poverty in many countries." But the efforts must go on to make policies to alleviate poverty with elements of social development and environmental stability.

The strategies adopted at the global level must integrate economic and environmental considerations of environmental degradation as an outcome of both affluence and poverty, where developing countries like India need to invest in a comprehensive effort across macro, micro, and sectoral levels to address all of its many causes of being in perpetual poverty. The developed countries also need to play a proactive role and bear a larger burden by spending their wealth on conserving the environment. The economies must work towards benefiting all segments of society, create equity with social justice and bring modernization without stressing the environment and aiming for self-reliance. No country can emerge out of the poverty loop unless it ensures that all its available resources in any form are fully and efficiently used, keeping in mind the future generations' needs and happiness.

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