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Malthusian Trap: outdated or still valid?

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Contents

Introduction

Is the Malthusian Trap outdated or still valid? As every good economist would answer: “it depends”. We will see that there will not be a unique response, but it will differ according to the country we are considering. In the first chapter, we will describe what Malthusian Trap means at the theoretical level, while the relevance of Malthus’ theory in the history of economic thought is considered in the second chapter. This latter chapter will be divided into two parts: the first will analyse the literature that influenced Malthus in writing its essay and that bring someone either to blame him of plagiarism or to belittle his contribute; the second one will include the divergent opinions on this topic by past influent economists us Adam Smith, David Ricardo, Karl Marx, John Stuart Mill and Alfred Marshall. The third chapter presents an assessment of Malthus’ theory, based on the historical data that are available after more than two centuries since the publication of the *Essay on Population*. In the fourth chapter, we will introduce an economic model which divides the history of the world economy in three periods, regarding to some parameters; this will help us to contextualize the Malthusian Trap and to understand if it has had any relevance in the past. The fifth chapter will combine the history of economic thought and economic history in an attempt to highlight the most relevant factors that enabled countries to grow economically, or just gave them a comparative advantage relative to the others. Then, in the sixth we will continue to talk about growth focusing in particular in the process of Malthusian Trap escape and, of course, we will learn more about European history, as a driving region in the process. Eventually, in the seventh and last one, we will study more in-depth current realities that seem to be still affected by it and virtuous policies applied by some developing countries who have escaped from it in recent times.

1. Malthusian Trap: the economic intuition

The Malthusian Trap owes its name to the economist Thomas Robert Malthus (1766-1834) who presented it in his *An Essay on the Principle of Population* (1798). The economic intuition was that people are rich and poor by nature, hence it is useless for the government to intervene with social policies in order to struggle against poverty and redistribute income. Malthus started reasoning accepting as valid a couple of assumptions: food is necessary to the existence of man and passion between the sexes is necessary and will remain nearly in its present state (Barber, 1967). What he added is:

1. Population has a tendency to multiply very rapidly (in geometric progression);
2. There is a far slower (in arithmetical progression) growth in the amount of means of subsistence;
3. The present-day poverty of the broad mass of the population is simultaneously the result of a divergence between the quantity of means of subsistence and the size of the population, and a means (together with vice and abstemiousness) of doing away with this discrepancy. (Rubin 1929, p. 294)

Point 3 is the result of the combination of point 1 and 2: the population is limited by nature due to an insufficient growth of means of subsistence and every time that population grows more than its means of subsistence, a series of causal effects bring it at the initial equilibrium (Figure 1):

N ↑ , Demand for food ↑ , Price of food ↑ , $\frac{w}{P}$ ↓ , mortality ↑ and fertility ↓ , N ↓

With the assumption of ΔN >> Δresources (in the long run), a higher population will raise demand for food and hence its price. Higher prices will shrink real wages; translated, it is a loss in standard of living who bring down N to the original level.

Real wages of workers cannot grow in the long run, but they can only fluctuate close to the *level of subsistence* [1]. More in detail:

- If w > level of subsistence: **standard of living ↑ , N ↑ , Demand for food ↑ , Price of food ↑ , $\frac{\mathbf{w}}{\mathbf{P}}$ ↓**
- If: w < level of subsistence: **mortality ↑ and fertility ↓ , N ↓ , Demand for food ↓ , Price of food ↓ , $\frac{\mathbf{w}}{\mathbf{P}}$ ↑**

What should be the government response to this situation? In Malthus' opinion, there are two check possibilities on population: the first is called *positive check* and it is not related to the government policies but it concerns all negative shocks that affect the population: famine, pestilence, war, etc.; the second one, instead, is called *preventive check* and concerns government prevention tools: birth control, postponing marriage and celibacy. The fundamental aim of the Malthusian theory is to counter the idea that population poverty was fostered by bad government because poor people will always remain in their economic condition whatever the quantity and quality of social policies. Nevertheless, Malthus is not subversive as it seems: he proposed public education and public health assistance in favour of the poorest.

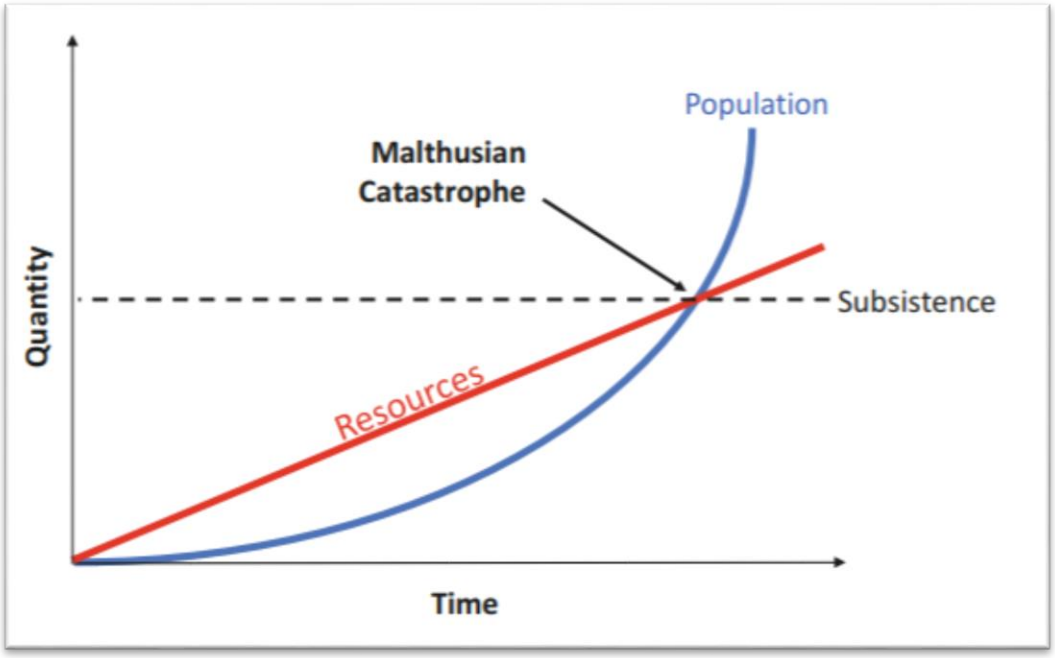
> The lower classes of people in Europe may at some future period be much better instructed then they are at present; (…) they may live under better and more equal laws than they have hitherto done, perhaps, in any country; and I even conceive it possible, though not probable, that they may have more leisure. (Malthus 1798, p. 88)

Last but not least, although Malthus' theory leads to a pessimistic view of society, its purpose should be beneficial: make the poorest know the truth of their economic status. In this way they could accept more patiently their disruption without starting a struggle between classes or blaming the

[1] Level which allowed workers not only to survive, but also to form a family and raise children (Roncaglia, 2001)

institutions; at the same time, they could be more grateful with forms of assistance carried out by private or by the government (Rubin, 1929).

Figure 1



(Burger, 2020)

2. Debate on Malthusian Trap

2.1 Precursors

The assertion that poor people cannot change their economic condition because of their nature is in today's way of thinking inconceivable, because inequitable and classist. Thomas Robert Malthus did not bring to the fore this issue but, on the contrary, this debate was already popular for a while when he was born. Roncaglia (2001) provided an adequate reconstruction of Malthus precursors: as early as 1588 with his *Delle cause della grandezza delle città* the philosopher Giovanni Botero had stressed the tension between the potential of population growth and the difficulties in increasing production of means of subsistence to keep up with it. Then, in 1790, the economist Gianmaria Ortes worried about the potentiality of the population to grow in geometrical progression in his *Riflessioni sulla popolazione delle nazioni in rapporto all'economia nazionale* and just four years later another economist, Nicolas de Condorcet, published *Esquisse d'un tableau historique des progr`es de l'esprit humain*, related to the dangerous growth of population. Nevertheless, compared to Malthus, he proposed an optimistic conclusion: he highlighted the existence of the simple remedy of contraception which could reconcile improvements in the standard of life with moderate population growth. Last but not least, are quoted in Malthus essay as his precursors the economist Robert Wallace with *Various prospects of mankind, nature and providence* (1761) and the banker Jacques Necker, whose relevance is given by the opposition to the French minister of finance[2] Anne-Robert-Jacques Turgot who centred his reforms in social policies for the poor during French Revolution.

[2] Turgot was the minister of finance from 1774 to 1776 while Necker hold the post before the French Revolution.

> Necker, one of the pioneers of the study of population in France, described the misery of the poor as a fact of nature. The growth of population, he said, is the consequence of "the impetuous attraction that nature has placed between the sexes." It will eventually come to an end, "with suffering and mortality," when population exceeds subsistence (Rothschild 1995, p. 721).

Contrarily, two important philosophers who sustained the potential efficiency of the social policies were Thomas Paine and William Godwin. The latter, in particular, received the first quotation in the preface of Malthus essay which starts as follow:

> The following Essay owes its origin to a conversation with a friend, on the subject of Mr Godwin's essay on 'Avarice and Profusion' in his Enquirer (Malthus, 1798).

Curiously, the mentioned friend was his father, Daniel Malthus, who supported Godwin and his willingness to pursue social policies as an instrument of economic human development.

2.2 Classic and Marginalist's polarization

What was the position of classical economists about Malthus' theory? While David Ricardo and John Stuart Mill sustained it, Karl Marx refused it and also Adam Smith would disagree with him.[3] Ricardo's theory of rent[4] is based on Malthus' idea that workers salary is always stagnant at the subsistence level.

> "The Malthusian theory lent support to the subsistence theory of wages and prepared the way for the Ricardian preoccupation with the land-using bias of economic progress; by explaining poverty in terms of a simple race between population and the means of subsistence, it provided the touchstone for all classical thinking about economic policy" (Blaug 1997, p. 67).

[3] Smith died eight years before publication of Malthus' essay, but his position comes out very clear in his *Wealth of Nations* (1776).
[4] Ricardo demonstrate that, in the case of cultivation of land, marginal returns diminishes as land increases.

Marx, instead, blamed Malthus' of plagiarism[5], totally rejecting his theory. In Marx' logic, the competition created by capitalism provides incentives to higher capital investments that raise the surplus of supply of workers relative to their demand; this mechanism generates unemployment and poverty. Friedrich Engels, who collaborated with Marx for the development of Marxism[6], acknowledges Malthus' intuition that unemployment and poverty were caused by a lack of purchasing power and higher mechanization. However, while for the Marxists these were the kind of problems that could only be resolved by a socialist government who take care of the management of agriculture and industry (Meek, 1955), in Malthus' theory these were only secondary determinants compared to the principle of population and, as we already know, in Malthus there is a pessimistic acceptance and no solution provided. On the other hand, Smith's theory differs in many aspects. First of all, Smith defined uncertainty as a brake to economic initiative.

> Security was a psychological as well as a juridical condition, and one that was founded on social as well as legal reforms. (…) The great prospect, for Smith, in modern Europe and especially in modern England is that liberty and security will be extended to the poor and the landless. A civilized society is one in which even the poor have the right to secure lives (Rothschild 1995, p. 713)

Secondarily, Smith did not believe in "poverty by nature", which is in contrast with any explanation of low salaries based on the Malthusian Principle of Population. There was, instead, a different bargaining power between workers and capitalists which may push down wages at subsistence level (Roncaglia, 2001). Nevertheless, despite this distortion, Smith believed that the population had a self-regulating nature, being a dependent variable of employment available and comfort

[5] The complete reference is from *Capital* (Marx, 1867): "A schoolboyish, superficial plagiary (…) not a single sentence thought out by himself."
[6] Engels was co-author.of *The Communist Manifesto* (1848).

standards. He showed how in England in the XVIII century, in parallel with the boost of economic development and the demographic growth, there were improvements in both workers' salaries and comfort standards (Bowman, 2006). As Smith explained:

> "Where wages are high (…) we shall always find the workmen more active, diligent, and expeditious, than where they are low" (Smith 1776, p. 68).

Smith neither worried about under-population, as mercantilists had done before him, nor did he worry about over-population, as Malthus would do afterward. His belief was that division of labour enhanced the productivity of labour[7]. The polarization is evident: Smith's and Marx's positions, even if very different because one in favour and the other against capitalism respectively, have an optimistic solution to struggle against poverty. On the contrary, Malthus, Ricardo and Mill's pessimism regarding the prospects of progress for the working classes and society as a whole, led the public opinion of the time to identify political economy as a defeatist science. Nevertheless, since the first half of the XIX century, after some structural change in human life and economic performance that will be discussed in the following chapters, diffidence grew and the so-called Marginalist Revolution, among other things, changed the theory of income distribution, which came to depend not on bargaining power as in Smith or on Malthus' Principle of Population, but on the availability of resources (factors of production) and, above all, technology. The cultural turning point had as maximum exponent Alfred Marshall.

> Few of the practical conclusions of Smith, Ricardo, and Malthus (…) were "applicable to the modern age of steam, electricity and education of the masses" (Marshall, quoted in Whitaker 1996, p. 270)

[7] We will analyse his formula more thoroughly in Chapter 5.

Marshall shared Smith's optimistic view, but for partially different reasons. He disagreed with a perspective of self-regulation and considered the effects of technological change and growing demand for educated labour on the evolution of employment and the skills structures of society; he believed that individual choices together with religious, moral and legal sanctions had made the Malthusian Trap an antiquated theory for civilized countries. Marshall had the capability to switch from the demographic mechanism of Malthus and Ricardo of a single class of workers to a more detailed description of professional and non-professional classes he saw emerge during the XIX century (Bowman, 2006). Crucial in this respect is to notice that both year of marriage and fertility level were determined by the children's possibility to settle and by the standard of living of the parents. This meant that the greater the middle-class relative to the poor class, the more likely it was that population growth would become almost stationary. This can be shown by the growth in the artisan class and the shift of high skilled workers to be from less than $1/6$ to $1/2$ of population, due to increasing demand for educated workers in the society (Marshall 1920). Therefore, the institution's task is first of all to invest in education and secondarily to convince people that from simple labourers they will become efficient men, in a way that both state and individuals will gain from the investment: men in quality of life and state in GDP per capita growth fostered by a slowdown of fertility rate.

> (…) the famous failure of the great classical economists, like David Ricardo and J.S. Mill to reflect at all adequately the significance of the Industrial Revolution, and the several technological breakthroughs that drove it and changed history. That failure underlies their tendency still to focus on the stationary state as the likely terminus of capitalist evolution, just when the age of continued growth asserted itself (Solow 2010, p. 1113)

3. Fact-checking: Malthus' mistakes

Let's try to follow all Malthus reasoning accompanying it with actual economic answers on the issue:

> 1st assumption: population has a tendency to multiply very rapidly (in geometric progression);

As a matter of fact, it is false. As becomes clear from Marshall onwards, it can vary depending on economic and social conditions[8].

> 2nd assumption: there is a far slower (in arithmetical progression) growth in the amount of means of subsistence;

Even the second assumption is false because Malthus completely underestimates technological progress: his computations assumed away the development of labour productivity and any progress in agricultural technology, which in fact proved to be the key factors that determine the growth of the amount of means of subsistence.

> 3rd assumption: the present-day poverty of the broad mass of the population is simultaneously the result of a divergence between the quantity of means of subsistence and the size of the population, and a means (together with vice and abstemiousness) of doing away with this discrepancy.

Given the invalidity of the first two assumptions, it becomes obvious that also the third does not hold: we cannot be sure that an increase in population will always cause a fall in real wages as if there was no technological progress. It was due to this wrong causation that Malthus concludes that a growing population, cutting real wages, implies an increase in mortality. Contrarily, the huge increase in the population of the last two centuries (Figure 5) has gone hand in hand with an overwhelming reduction in infant mortality (Figure 2.1) and an expansion in life

[8] In the following Chapter we will see how changed incentives to have children; existence of different trends is anticipated in Figure 5.

expectancy (Figure 2.2). Other wrong assertions are: “wages always fluctuate close to the level of subsistence” and “there are people irremediably poor by nature”: accept them would mean ignore the tremendous results on increase in GDP per capita (figure 3) and reduction of extreme poverty (figure 4) that have taken place in the last two centuries. Last but not least, it is not always correct that a better standard of living implies an increase in population, because if that was the case, we would expect a constant rise in population growth until today. Instead, despite a persistent improvement in standard of living, from the second half of the XX century population growth has started to decline (Figure 5).

Figure 2.1

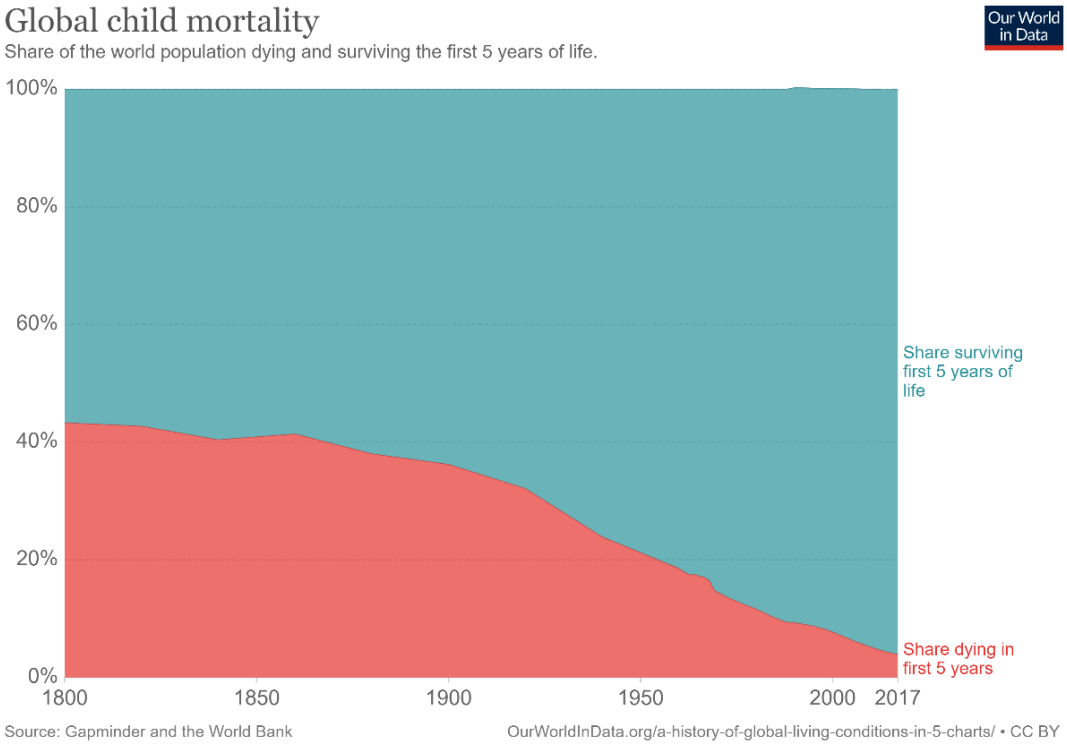


Figure 2.2

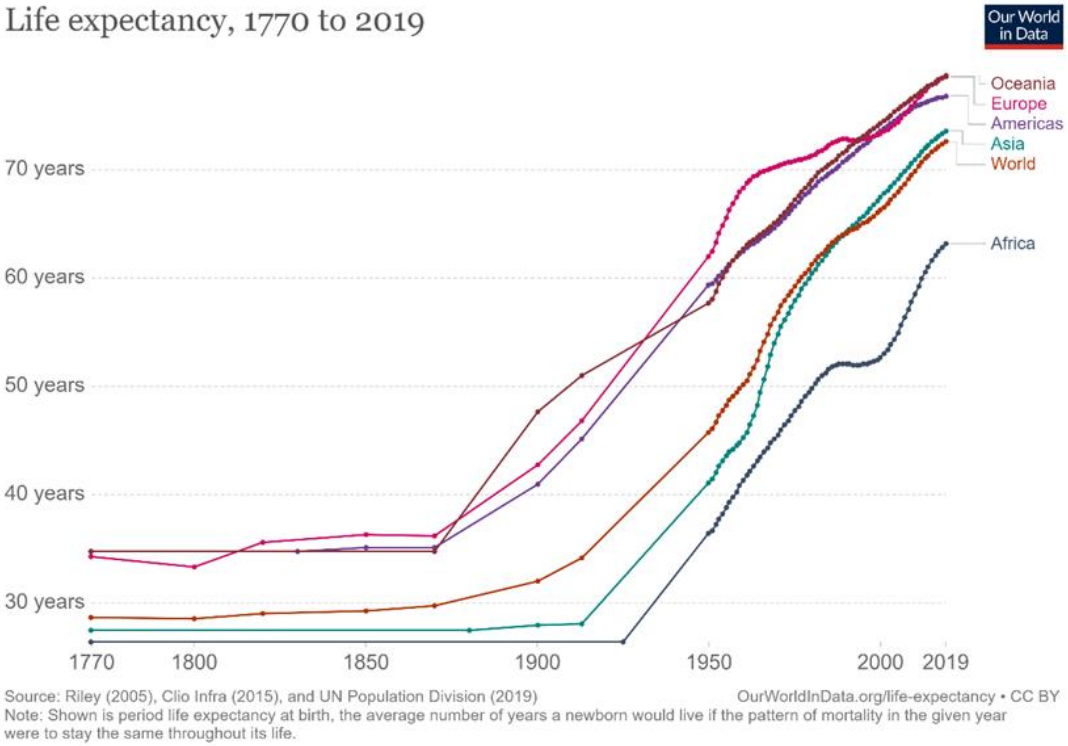


Figure 3

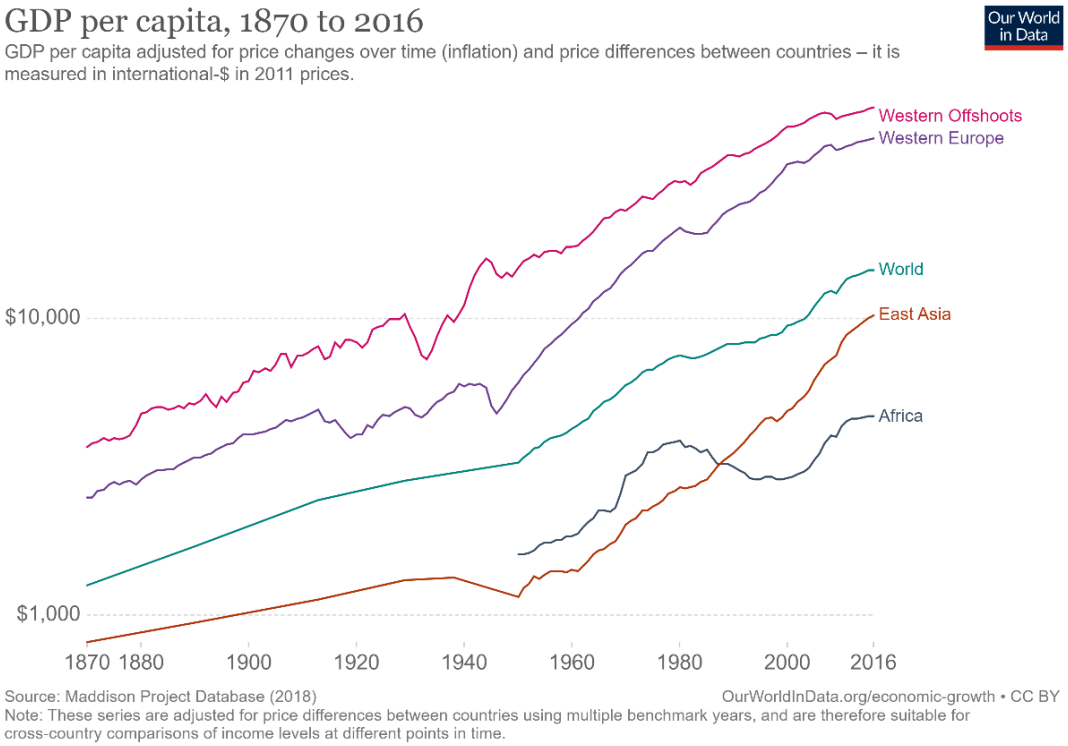


Figure 4

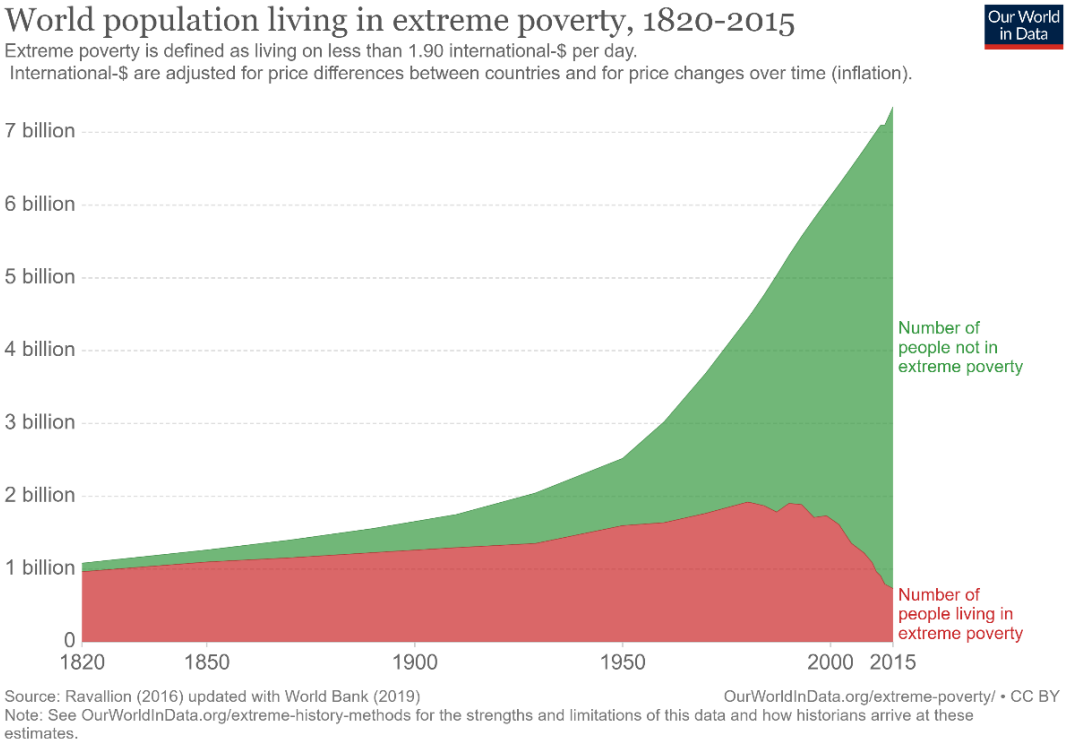
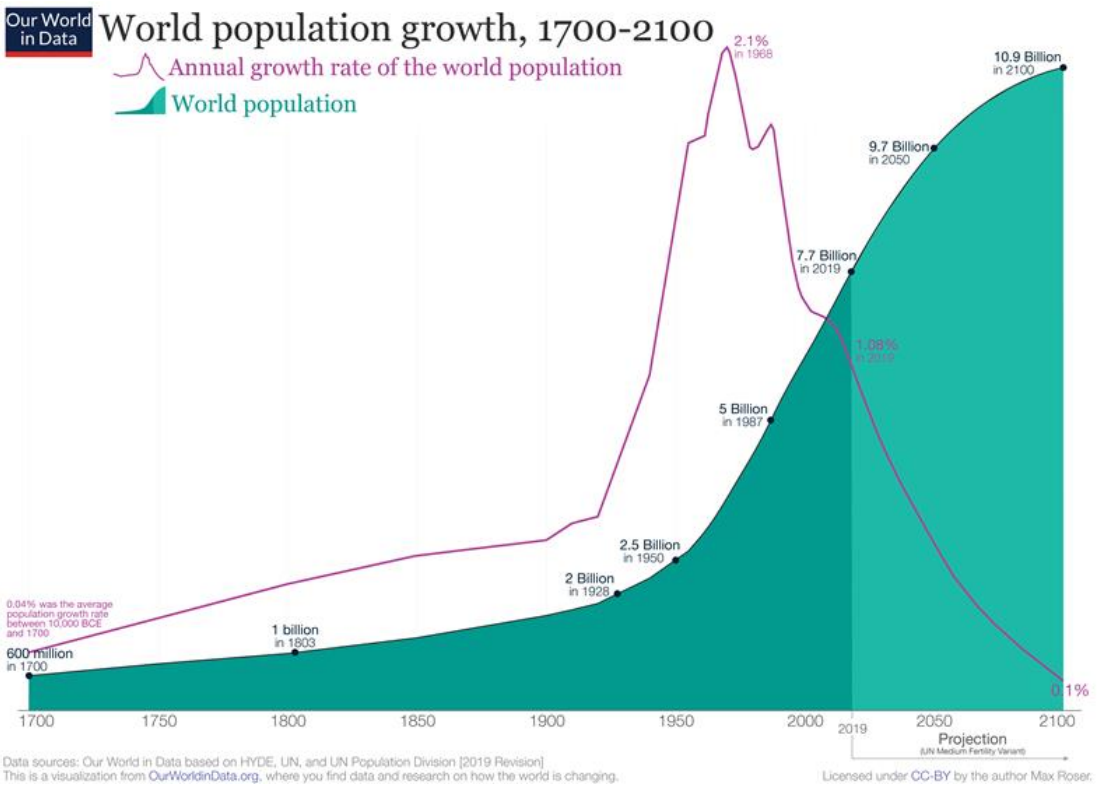


Figure 5



4. Unified Growth Theory: understanding Malthus' relevance

From a superficial analysis, Malthusian theory seems totally unsupported by facts. Before judging it, it is necessary to establish some premises: firstly, considering data globally could be misrepresentative because we are including at least three kinds of countries running at extremely different speeds: developed, developing and least developed countries; differentiation make deductions much more relevant because countries from the same basket share some fundamentals. The second premise concerns historical periods: countries' growth in terms of GDP, population and productivity has not had a constant and predictable path and this is why today the Malthusian Trap is not a hot topic in the economic literature that deals with developed countries. Nevertheless, as economic history textbooks do, we use precisely developed countries as a landmark to describe different epochs and to understand Malthus' theory relevance. Actually, it is difficult to state precisely the years of beginning and end of different regimes: first of all, because we're just considering developed countries' growth history and excluding all others, and secondly because also between current developed countries there are differences in the historical path of growth (Figure 6). We will define periods according to the Unified Growth Model (Galor and Weil, 1999), hence analyzing the historical evolution of the relationship between population growth, technological change, and the standard of living (Figure 7). The first phase is called Malthusian Regime being very close to Malthus' description of society, hence characterized by slow growth in population and stagnant GDP per capita due to slow technological progress. Some data in support can be found in Maddison (1982) who estimates a growth in GDP per capita nearly 0% between 500 and 1500; similarly, the population growth

rate from year 1 to 1750 was at 0,064% per year (Massimo Livi-Bacci, 1997). The second phase is called Post Malthusian Regime.

> Ironically, it was only shortly before the time that Malthus wrote that humanity began to emerge from the trap that he described. The process of emergence from the Malthusian trap was a slow one. The initial effect of faster income growth in Europe was to increase population. Income per capita rose much more slowly than did total output. And as income per capita rose, population grew ever more quickly. (Galor and Weil 1999, p. 151)

Technological progress was the engine that enabled humanity to escape from the Malthusian Trap; the increase in GDP per capita, who can be read as an improvement in living standards, has had a direct consequence in fertility rate growth and mortality rate fall. Livi-Bacci's documented evidence (1997) shows a rise in life expectancy at birth between 1740 and 1840 in England and France: it was respectively from 33 to 40 years and from 25 to 40 years; in general, fertility rates raised until the second half of XIX century in most of Western Europe peaking in England and Wales in 1871 and in Germany in 1875 (Coale and Treadway, 1986). Then, around the turn of the century, a positive correlation between income per capita and population was no more experienced and the so-called Modern Growth Regime started; briefly, technological progress grew always faster and its consequential increase in income per capita was accompanied by a reduction in the population growth. While the first transition (from Malthusian Regime to Post Malthusian Regime) occurred due to technological progress, the one who brings our world economy to the Modern Growth Regime has been possible thanks to higher investment in human capital.

> Increased technological progress initially has two effects on population growth:
>
> 1. improved technology eases households' budget constraints, allowing them to spend more resources on raising children.

2. it induces a reallocation of these increased resources toward child quality. In the Post-Malthusian regime, the former effect dominates, and so population growth rises along with output growth.

Eventually, however, more rapid technological progress due to the increase in the level of human capital triggers a demographic transition: the return to child quality continue to rise, the shift away from child quantity becomes more significant, population growth declines, and output growth rises. (Galor and Weil 1999, pp. 152-153)

Basically, lower child mortality brought people to reduce fertility[9] and the switch from quantity to quality had a multiplier effect: the technological progress growth in the Post Malthusian Regime increased the rate of returns in human capital, people invested much more in human capital boosting technological progress (Modern Regime). This process has considerably improved the standard of living (Maddison, 2006):

Table 1

	LIFE EXPECTANCY 1820 (years)	LIFE EXPECTANCY 1999 (years)
WESTERN EUROPE	36	78
UNITED STATES	39	77
ASIA (without Japan)	24	66

From this model we deduce that Malthusian theory is relevant for one step (currently the longest) of human history and its evidence can be showed comparing regions growth rates: before 1700 they were all below 1% per year with Western Europe as the star performer in XVI century with 0,4% growth rate per year, while Western Offshoots[10] grew by 2,4% per year from 1700 to 1820; similarly, Asian GDP growth rates varied between an

[9] Lower mortality does not cover all explanation of lower fertility: during Modern Regime, economic development and accumulation of capital raised women's relative wage making cost of children increase, thus reducing fertility.

[10] US, Australia, Canada and New Zealand.

average of 0,07 and 0,19% per year from 1 to 1820 while the mean in the 180 years after was between 1,94 and 3,69% per year (Kenny, 2010). Important evidence of a close relationship between the size of the population and the level of wages comes out from the UK, the country that first drove his population out of the Trap.

> From 1200 to 1650, as population changed under the influence of disease shocks, the income-population points lie along one downward-sloping line. This implies a completely stagnant production technology for 450 years. After 1650 the implied technology curve shifts upward, but not fast enough to cause significant increases in output per person. Instead technological advance, as predicted, resulted mainly in more people. In particular in the later eighteenth century all technological advance created only a larger population without generating any income gains. Before 1800 the rate of technological advance in all economies was so low that incomes could not escape the Malthusian equilibrium. (Clark 2007, p. 30)

According to economic literature Malthusian Trap existence is not debatable, while there is not unanimity in establishing the end of the Malthusian Regime: Weil and Galor's model assumes that it characterized all human population until the First Industrial Revolution (1760) and they show it in some graphs derived from Maddison's paper of 2001. Contrarily, Maddison (2009) criticized their approach: in 19 out of 21 graphs they used an arithmetic scale instead of a logarithmic one and this is misleading when presenting growth rates in income per capita over 2000 years (Figure 8.1 and 8.2). We will not study in-depth this debate, as it falls out of our scope; a general overview is enough to justify our initial premises on time series and difference between countries (e.g. in Figure 8.2), and above all, accept the Malthusian Trap relevance in economic history.

Figure 6

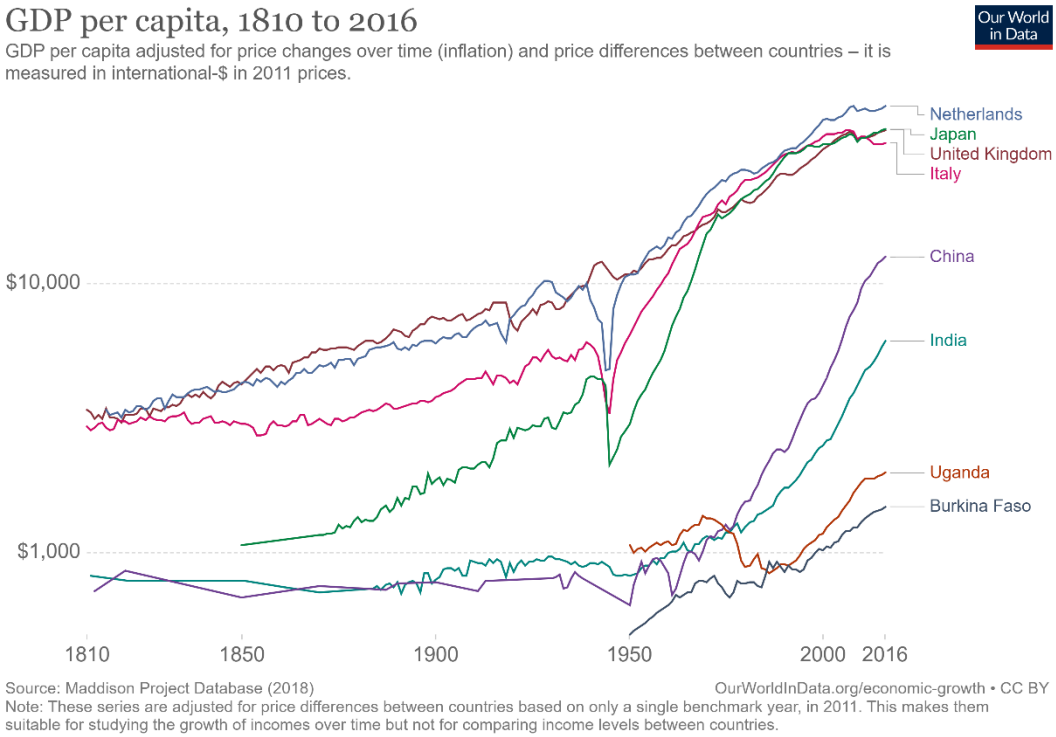
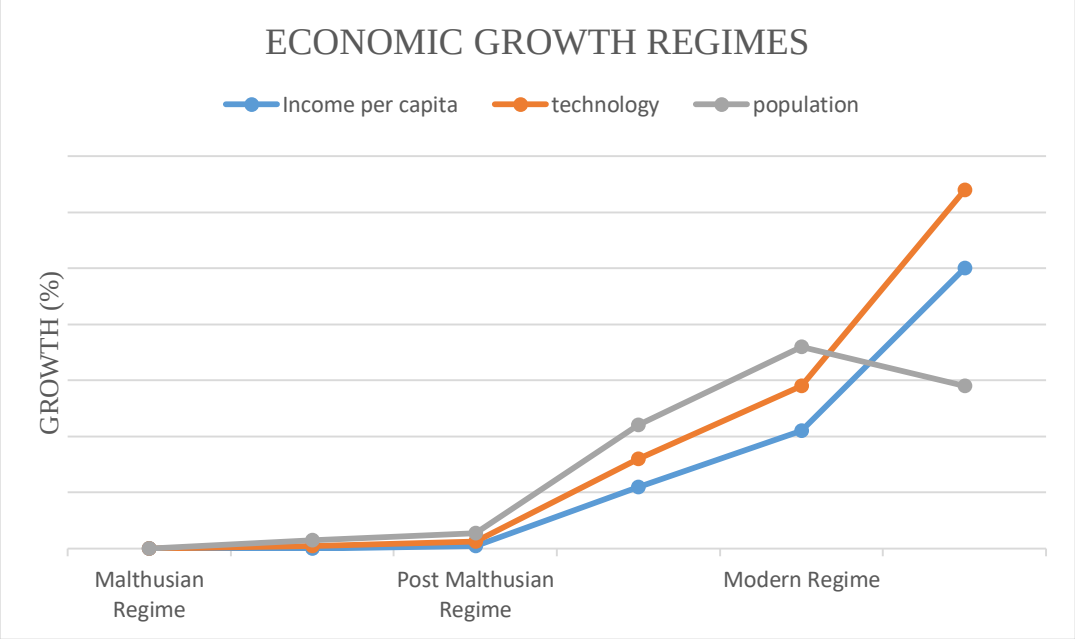


Figure 7



Author according to Unified Growth Model theory

Figure 8.1

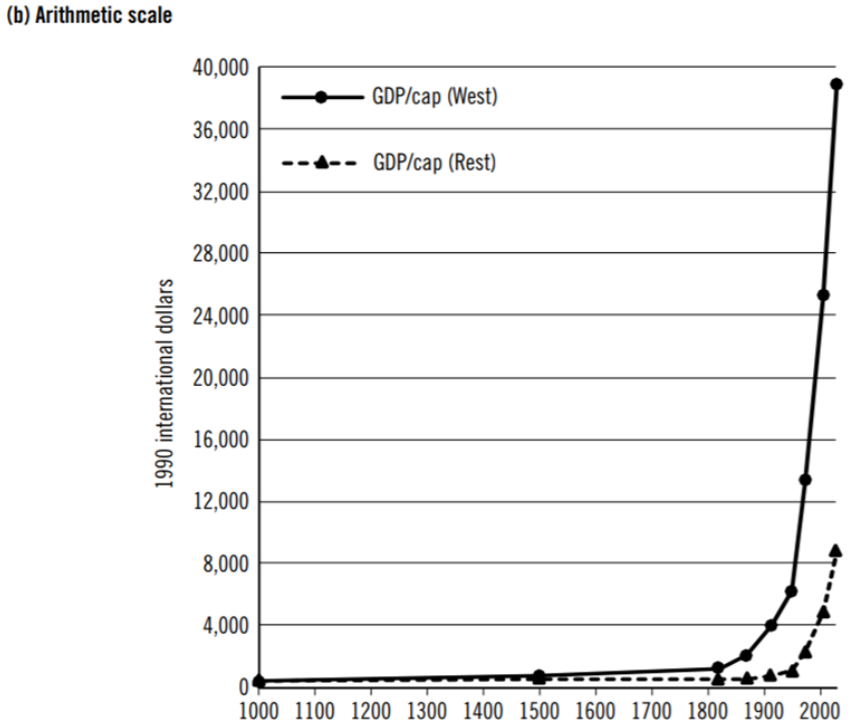
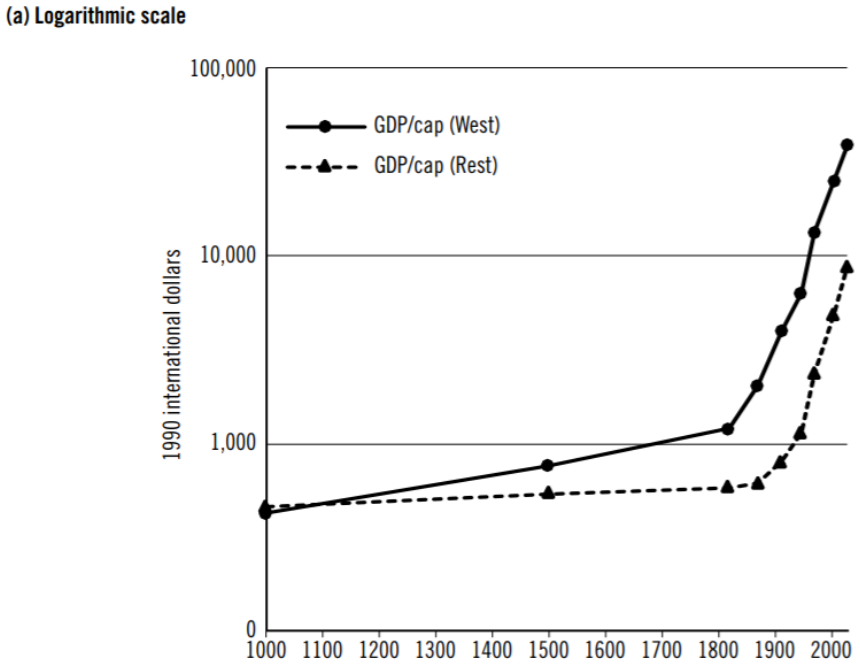


Figure 8.2



Maddison (2009)

5. From the dualism Smith-Schumpeter to Acemoglu: the main tools of economic development

> A country's economic growth may be defined as a long-term rise in capacity to supply increasingly diverse economic goods to its population, this growing capacity based on advancing technology and the institutional and ideological adjustments that it demands. (Kuznets 1973, p. 247)

Mokyr (2010) describes the two most relevant approaches to economic growth that influenced economic thought history: the Smithian and the Schumpeterian approach. Key concepts of the Smithian approach are: accumulation of capital, division of labor and international market development. Adam Smith in *Wealth of Nations* (1776) shifts the focus from GDP to GDP per capita, which he computed multiplying labor productivity of workers with a fraction of workers on total population:

$$\frac{Y}{L} = \pi \ \frac{L}{N}$$

He indicates institutions as the determinant of increase in labor productivity and percentage of workers, in fact, transport enhancement and liberal policies on trade boost division of labor and hence its quality; at the same time, if the government provide laws on mandatory education and child labor, a higher percentage of the labor force will be composed by productive workers. If institutions are capable to start this virtuous cycle, they will generate an accumulation of capital that can be a potential multiplier if invested to implement means of production, a source of new jobs (Roncaglia, 2001). Differently, Schumpeter (1934) focuses more on technological aspects of economic development: the introduction of new goods, new methods of production, new industry organizations, new markets and new sources of raw material are his five relevant points. Excluding for a while the last two points which include also a geographical element, we observe how in the Schumpeterian approach the key figure is

represented by the entrepreneur who enables the economy to overcome the steady-state economy-level by improving technology and efficiency and who need not worry about accumulation of capital, because he can borrow money from the bank[11]. There is not a better approach, they are both necessary: without a market integration there would be no free movement of goods, capital, services and labor and without innovation firms would be almost stagnant because they would exploit only specialization and an increasing number of workers. Today some of their considerations on economic growth are resumed in the Augmented Solow Model (Mankin et al.,1992)[12]; In the Cobb Douglas production function, productivity and capital and labor (accumulation factors) determine output, as per the below equation:

$$Y = A\,K^{\alpha}\,h^{1-\alpha}$$

Hence, the growth accounting formula results in:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} \;\alpha\; \frac{\Delta K}{K}\;(1-\alpha)\frac{\Delta h}{h}$$

According to the Augmented Solow Model, growth in productivity depends on the ability to innovate and introduce new technologies while physical capital (machines, computers, and infrastructure, etc.) depends on saving rate; additionally, human capital is provided by the education system and affects positively labor component. More precisely, productivity can be computed as technology × efficiency where technology is knowledge of how to produce output in terms of R & D and scientific progress, while efficiency has to do with firm management and institutions policies (openness to international trade, firms incentives, etc.); productivity growth is the major source of growth in output.

[11] In Schumpeter's view, banker is another key figure: the one who enable entrepreneurs to start their activity with loans.
[12] Mankin et al. reformulated Solow Model (1956) adding human capital.

> Using development accounting, we saw that given quantities of labor, physical capital, and human capital would produce more than six times as much output in the richest one-fifth of countries as in the poorest one-fifth. (Weil 2013, p. 504)

Leaving behind the two elements that compose the output's formula, there is another factor, already mentioned in the Smithian approach, that significantly influences it:

> Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction (…) they structure incentives in human exchange, whether political, social, or economic. (North 1990, p. 3)

According to Acemoglu (2005), institutions have the aim of allocating resources efficiently and determine the structure of the economic society through market regulations, giving more or less incentives to invest in human and physical capital, technology and organization of production. They are endogenous, hence determined by a society or a segment of it: in the case of tyranny or oligarchs power is restricted while in a democracy power is divided among groups who try to gain political power to pursue their interests[13]. Good political institutions, along with redistributing resources, have to ensure property rights and choose economic institutions and, in order to do it efficiently, necessitate a separation of powers[14] and a political power in the hands of a relatively large group that includes those who have access to the most important investment opportunities. Are these two conditions enough to ensure good institutions? No, they are not: wrong institutions could be the result of a wrong political ideology or moral hazard. A famous example is the historical difference in the path of growth of North and South Korea: North backwardness could be initially explained by the Communist ideology that characterized it until today, but after the eighties, it seems clear that even if policies were unsuccessful,

[13] Democracy arose with the enrichment of middle class who forced governors to grant them rights. Contrarily, autarchies as Nazism and Communism were born where middle classes were weak or absent (Moore, 1966)
[14] The typical division is into three branches: a legislature, an executive and a judiciary.

leaders continue to implement it to pursue their interest at population expense. Finally, other characteristics that affect directly economic development and indirectly, through institutions, are: geography and climate, culture and history. Geography and climate relevance was sustained already in Marshall's famous *Principles of Economics* (1890), then followed by the Nobel Prize winner Myrdal (1968) and Bloom and Sachs (1998). The three thesis they carried on were respectively: work attitude depends on climate, geography and climate have an impact on soil, vegetation, animals, humans and physical assets, and poverty in many areas of the world is linked to "disease burden" which is higher in the tropics than in the temperate zones.

> Bloom and Sachs (1998) claim that the prevalence of malaria, a disease which kills millions of children every year in sub-Saharan Africa, reduces the annual growth rate of sub-Saharan African economies by more than 1.3 percent a year. This is a large effect, implying that had malaria been eradicated in 1950, income per capita in sub-Saharan Africa would be double of what it is today. (Acemoglu 2005, p.14)

Even culture is important as a determinant of people preferences and beliefs. An example of cultural influence is the causal relationship between protestant reformation and the origin of the industrialization in Western Europe (Weber, 1930): a religion which emphasized the idea of predestination led people to focus on hard work, thrift and savings in order to be consistent with the description of the "chosen by God". Last but not least, history plays a crucial role. From the colonization of the American continent, we can observe how Europeans set up developmental institutions more conducive to economic growth in North America and extractive ones in the South, which have precluded a possible autonomous economic development.

> Proximate factors behind Europe's conquest of the Americas were the differences in all aspects of technology. These differences stemmed ultimately from Eurasia's much longer history of densely populated, (…) which was in turn determined by geographical differences between Europe and the Americas. (Diamond 1997, p. 358)

6. Modern Economic Growth: how countries escaped from the Trap

After having described the most relevant characteristics that affect economic development, we will see chronologically how and at which intensity they influenced the world economy in the last millennium. First of all, we know how after 1000, Western Europe had a better path of growth compared to the rest of the world which was essentially stagnant all the time (Figure 6). The main reasons for this divergence are reconstructed by Maddison (2009):

- Important urban trading centres with autonomous property rights emerged in Flanders and Northern Italy in the eleventh and twelfth centuries, the development of accountancy helped make contracts enforceable and new financial and banking institutions provided access to credit and insurance, facilitated risk assessment and large scale business organization throughout Western Europe;
- Systematic experimentation, the spread of university education and the creation of academies of science started a process of secular knowledge which was a fundamental prerequisite for later technological development;
- The influence of the Christian church meant that marriage became monogamous, with a ban on concubinage, adoption and divorce, with strong discouragement of remarriage of widows or widowers. This contrasted with the polygamy of the Islamic world and the extended family systems of India and China;
- Advances in maritime technology and navigation techniques revolutionized European knowledge of world geography. The discovery of the Americas, new routes around Africa to Asia, and

Magellan's circumnavigation of the globe led to the development of merchant capitalism and colonialism with global horizons[15];

- The emergence of nation-states in close propinquity, with significant trading relations and relatively easy intellectual interchange despite linguistic differences, stimulated competition and innovation; migration to or refuge in a different culture and environment were options open to adventurous and innovative minds.

As we said, there is a debate on the exact moment of transition from the Malthusian to the Post Malthusian Regime: evidence from Pereira (2003) shows that between the periods 1500-1820 and 1820-1870 there were discontinuities in the process of world economic development but at the same time his cross country regression demonstrate that literacy was highly correlated with the level of economic development and the rates of per capita growth, the average number of children per woman was negatively correlated with per capita GDP growth as well as literacy rates, and urbanization was positively correlated with literacy. These are all phenomena which took shape in an embryonic form in Western Europe described above.

> The experience of Western Europe in the centuries before 1820 was a long and necessary apprenticeship for the faster growth which followed. The absence of such experience elsewhere is the major reason why growth performance elsewhere was so much slower. (Maddison 2009, p. 78)

What followed was Modern Economic Growth, described by Kuznets (1973) as a period of:

- High rates of growth of per capita product and population;
- high rates of growth in productivity, hence output growth per unit of inputs;

[15] This concept was argued before by Adam Smith (1776).

- High rate of structural transformation of the economy: it includes the shift away from agriculture to non-agricultural pursuits and then from industry to services, but also a change in the scale of productive units, and a related shift from personal enterprise to impersonal organization of economic firms;
- Fast change in social structure and its ideology due to the modernization process which led to urbanization and secularization;
- Development of technology, particularly in transport and communication (both peaceful and warlike), which allows developed countries to reach out to the rest of the world.[16]

How such structural change was possible, not only at the economic level but also involving the standard of living? Mainly, because of the three Industrial Revolutions:

- The First (1750-1830) created steam engines, cotton spinning, and railroads;
- The Second's (1870-1900) main inventions were electricity, the internal combustion engine, and running water with indoor plumbing. Moreover, during the two decades 1950-70 its benefits were still transforming the economy, including air conditioning, home appliances, and the interstate highway system;
- The Third (1960-present) includes inventions that replaced tedious and repetitive labour by computers (Gordon, 2012).

The economic growth turning point was for sure the Second Industrial Revolution: the third one made entertainment and communication devices smaller, smarter, and more capable, but do not fundamentally change labour productivity[17] or the standard of living; the first one, besides being

[16] There would be a sixth point expressed by Kuznets: it regards the fact that growth spread is limited to ¾ of the population: we will cover it later when we will analyse the causes of their failure.
[17] "We can see the computers everywhere except in the productivity statistics." Robert Solow

more localized, was based on a combination of serendipity and patient experimentation, instead of having a scientific base.

> It created a chemical industry with no chemistry, an iron industry without metallurgy, power machinery without thermodynamics. Engineering, medical technology, and agriculture until 1850 were pragmatic bodies of applied knowledge in which things were known to work, but rarely was it understood why they worked. (Mokir 1998, p. 1)

The value of the Second Industrial Revolution is given to the fact that it was not only technology but also science-based, hence the beginning of what we call "Research & Development". New technologies reached the daily lives of the middle class very rapidly, increasing their purchasing power and living standards and firms thrived exploiting economies of scale. Nevertheless, as we said in the previous chapter, Schumpeterian and Smithian approaches have to coexist: that is the reason why, in parallel to the Second Industrial Revolution, a crucial factor was the process of trade internationalization (Figure 9) which developed always more after the Cobden-Chevalier Treaty (1860) until World War 1; only the combination of these factors brought Western Europe to Modern Economic Growth. The process of integration, arrested from the beginning to the World War I until the end of the World War II, restarted with a generous and effective role played by the US from 1948, who provide a substantial flow of aid (Marshall plan), fostering liberal trading policies and creating a functioning international order with explicit and rational codes of behavior and institutions for cooperation. As result, from 1950 to 1973, West European per capita GDP grew 4% per year, three times as fast as in an earlier phase of development (Maddison, 2009).

Figure 9


Globalization over 5 centuries
Shown is the "trade openness index". This index is defined as the sum of world exports and imports, divided by world GDP. Each series corresponds to a different source.
Our World in Data
60%
50%
40%
30%
20%
10%
0%
1870
1900
1920
1940
1960
1980
2000
2017
Penn World Tables (9.1)
Klasing and Milionis (2014)
Source: Estevadeordal, Frantz, and Taylor (2003), Klasing and Milionis (2014), Feenstra et al. (2015) Penn World Tables 9.1
CC BY

7. Are there still countries in the Malthusian Trap? Case studies: East Africa and Burkina Faso

As discussed in the previous chapters, from the first Industrial Revolution until today, almost all of the world countries have begun a growth path which has enabled them to escape from the Malthusian Trap. Are there cases in which it persists even today? To answer this question, we need to analyse the poorest continent of our planet. From 1960 to 2000, according to the World Bank, only 11 African countries have had a GDP growth under 2%[18] and, taken collectively, they share other encouraging data (Kenny, 2010):

- African GDP in 2000 has been almost 6 times of GDP in 1950 and production per worker has increased by 20%, both fostered by land expansions and diffusion of technology and fertilizers;
- Countries in which occurs a growth in fertility rate has fallen from 23 in the period 1963-1968 to 1 in the period 1998-2002;
- Mortality under 5 years has declined from an average of 26,2% in 1960 to an average of 14,7% in 2005 and, in conjunction, life expectancy has grown by 10 years;
- Food consumption has grown by 100 calories per capita from 1970 to 2000 (Wik et al. 2008).

Kenny (2010), in order to confirm the absence of the Malthusian Regime, verified if there were countries with two correlations along 45 years: between GDP growth and population growth and between population growth and decrease in GDP per capita[19]. Data arising from a sample of 46 African Sub-Saharan countries showed that 13 countries complied with the described correlations and in only 4 of these there was moderate

[18] 2% was the average global GDP growth between 1900 and 1950.
[19] Typical paths that describe economic fluctuations of countries in the Malthusian Regime (kindly refer to Chapter 4).

evidence (higher than 0,3): they are precisely Tanzania, Togo, Mauritius and Angola. These favorable data have to be contextualized: if we analyse GDP per capita development in Africa we may divide regions into at least two groups: countries from the North and the South that have gained better results and countries close to the equator that seem to have had much more troubles (excluding virtuous cases of Equatorial Guinea and Gabon whose economic growth is strongly affected by their oil resources). Korotayev and Zinkina (2015) have compared data of some East African countries (Kenya, Tanzania and Uganda) with data related to North African countries. It seems clear that North African countries have diversified their economies, while East African countries have not been able to expand significantly its share of the labor force in secondary and tertiary sectors: according to Figure 10 and 11, we notice that employment in agriculture (primary sector) in 2000 has been considerably higher in Kenya, Tanzania and Uganda, and their labour productivity in agriculture along the second half of the XX century has been stagnant; the lack of structural diversification is highlighted also by the slowness in the urbanization process relative to North Africa from 1970 to 2010 (Figure 12). Other countries who experienced these issues are Burkina Faso and another East African, Rwanda. The first is a country where the development in agriculture has been characterized mainly by land expansions instead of modernization and technology adoption and its rapid urbanization has not included an industrialization (Grimm et al., 2014). According to Galor and Weil model (2000) Burkina Faso is in the so-called Post-Malthusian Regime, experiencing high population growth and low economic growth and it is at a crossroads: invest in technology and education moving to the Modern Growth Regime (exploiting also its monetary stability, a not excessive government expenditure and the trade liberalization of 1991-1993) or come back to Malthusian Regime given its lands no more expandable, its decline of cotton exportation and its lack of industrialization (Figure 13 shows the lack of transition into secondary

and tertiary sectors in the last years). For what it concerns Rwanda, despite a GDP growth, started from the 90ties, mainly after the famine[20], a decrease in exporting prices (hence increase in export) and trade liberalizations (1990-1994), the country has shown up the same difficulties in escaping the Trap: slow development in agricultural technology, slow growth of industry and services and a lack fall in fertility rates that have hindered GDP per capita growth (André and Platteau,1998). Bearing all, the main common issue is the too weak fall in fertility rates: to get the picture we have to know that only in 2003 and 2007, respectively Kenya and Rwanda gained the same fertility rate of Italy in his year of unification (1861) and that Uganda, Burkina Faso and Tanzania are close to this level even today. If these countries really want to escape from the Trap need to copy past virtuous examples like Egypt and, above all, Bangladesh (Figure 14 illustrates a fertility rate comparison from the second half of the XX century until today). The first one, under the Mubarak's government of 1981 started to fight high fertility in collaboration with USAID (United States Agency for International Development) and exploiting religious leader dissemination of family planning program: the results have been positive, in fact in 5 years (from 1988 to 1992) fertility rate has fallen from 5 to 4 children per woman, confirming the transition from Post Malthusian to Modern Growth Regime (Korotayev and Zinkina, 2015). The Bangladeshi scenario has been even more successful:

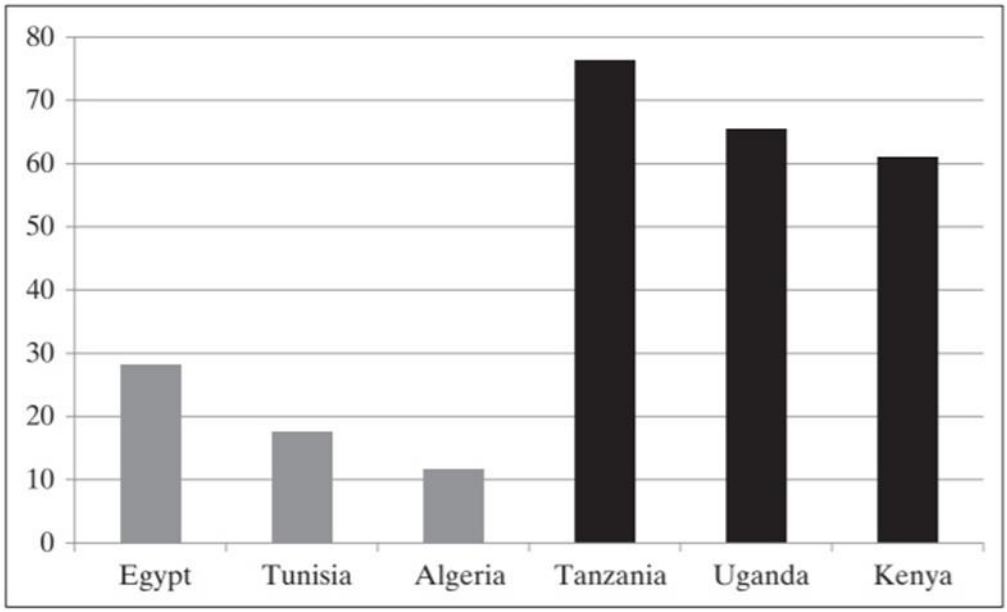
> Before that Bangladesh followed the "East African path" a very fast population growth "ate" almost all the GDP growth. Note that while the Bangladeshi GDP doubled between 1970 and 1995 (i.e., a 25-year period), per capita GDP remained almost the same. By contrast, after Bangladesh had managed to bring TFR[21] below 4, the per capita GDP in this country increased in 15 years by about 100 percent (Korotayev and Zinkina 2015, p. 401)

[20] Example of gain by a positive check, described in Chapter 1.
[21] TFR= total fertility rate

The policies implemented by Bangladesh's government have been: introduction of compulsory universal secondary education, family planning programs and the rise in the legal age of marriage with parental consent. These measures, accompanied by substantial increases in agricultural labour productivity and a decline in the percentage of population employed in agriculture, make possible the escape from the Trap by the poorest countries.

Figure 10

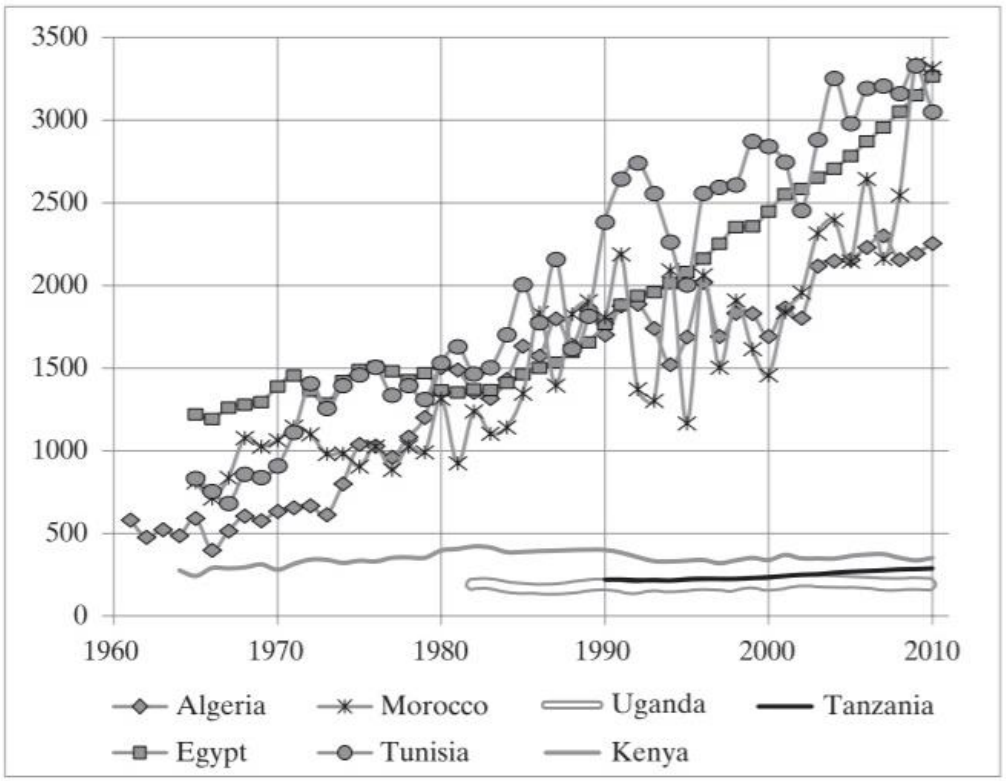
Employment in Agriculture, Percentage in North and East Africa in the 2000s



Source: World Bank, 2014, file SL.AGR.EMPL.ZS.

Figure 11

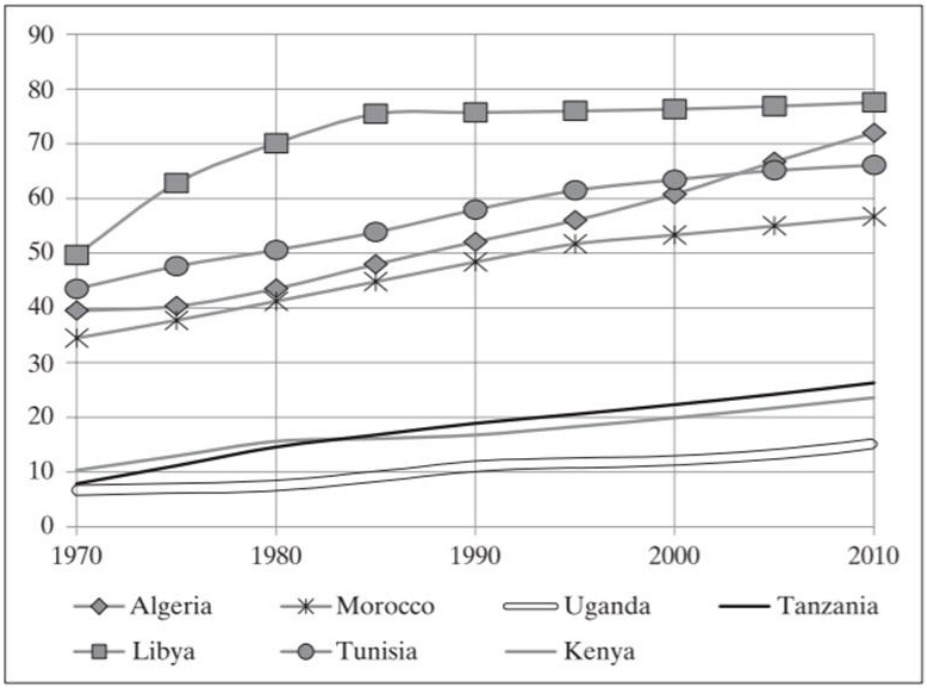
Dynamics of Labor Productivity in Agriculture (constant $2,000 dollars per worker) in North and East Africa (1961–2011)



Source: World Bank 2014, file EA.PRD.AGRI.KD.

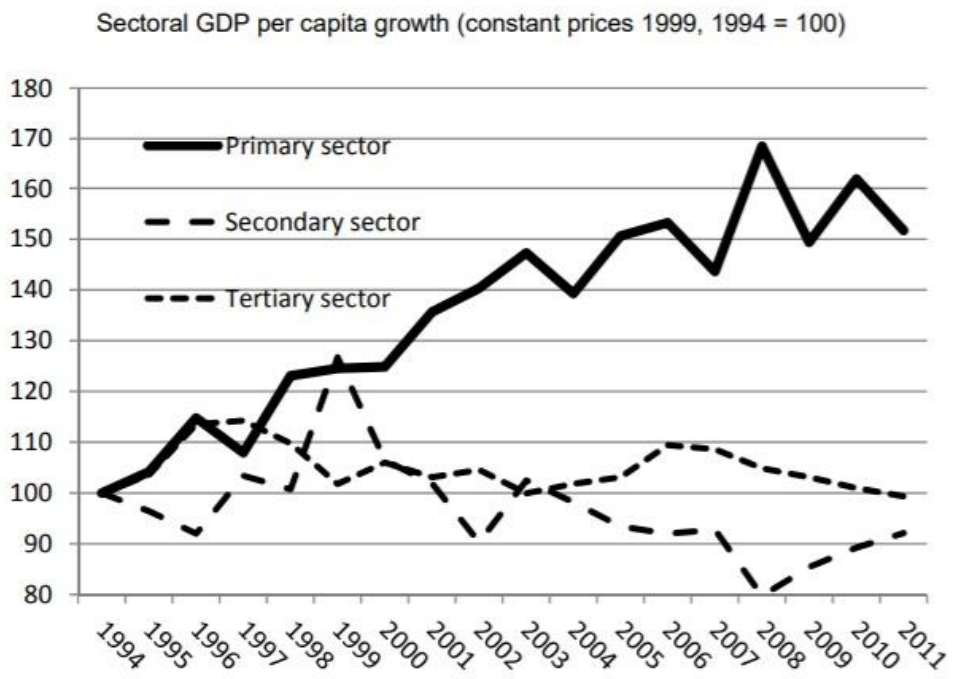
Figure 12

Percentage of Urban Population in North and East Africa, 1970–2010



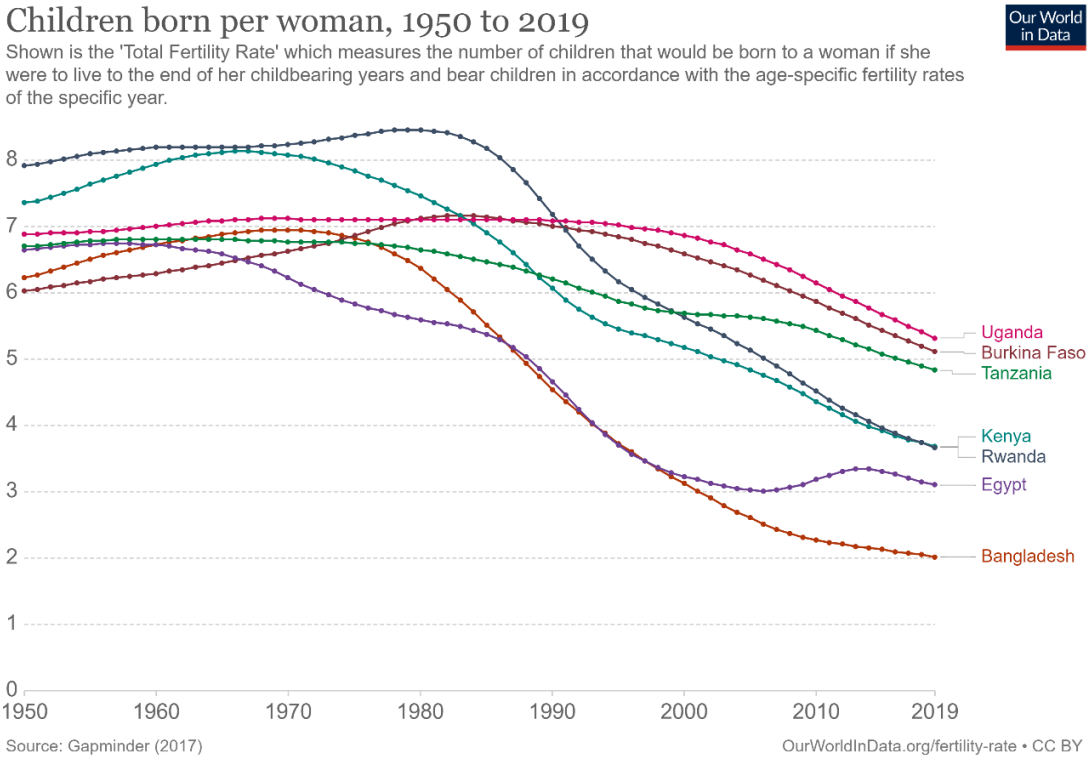
Source: UN Population Division (2014).

Figure 13



(Grimm et al. 2014)

Figure 14



Conclusion

The starting point of our discussion was the question of whether the Malthusian Trap is outdated or still valid. These chapters show how Thomas Robert Malthus in his theory has described accurately at least 1500 years of history (from 0 BC to 1500) of most developed countries, and undoubtedly at least 1800 years of history (from 0 BC to 1800) of developing and less developed ones. Nevertheless, his contribution cannot be considered useful only for academics and people who are interested in history of economic thought or past economic history: his intuition, with the adequate adjustments, can be noticed in our current reality, in some of the least developed countries. Not all the countries have already experienced Industrial Revolutions, a substantial urbanization and a huge increase in human capital and health provided by adequate systems of public education and healthcare. There are still some countries with the vast majority of the population who is employed in the primary sector, with an average fertility rate that shrinks the GDP per capita growth and with a calories supply per capita lower than the minimum requirement. These countries, for reasons that often are resumed in a hostile climate, an unfortunate history characterized by colonization or conflicts due to natural resources, have the possibility of escaping the Trap as the developed ones did. Their institutions have to follow the Bangladeshi model, which consists, as we have already seen, in introduction of compulsory universal secondary education, family planning programs and the rise in the legal age of marriage with parental consent; in such a framework, we could assume that Malthusian Trap will be certainly outdated.

Formulas

- GDP per capita $= \frac{Y}{N} = \frac{GDP}{population}$
- Real wage $= \frac{\mathrm{w}}{\mathrm{P}} = \frac{wage}{price}$
- GDP per capita (Smith) $= \frac{Y}{L} = \pi \ \frac{L}{N} =$ productivity of labour $\times \frac{number\ of\ workers}{total\ population}$
- Output $(Y) = A\ K^{\alpha}\ (hL)^{1-\alpha}$
- Change in output $(\frac{\Delta Y}{Y}) = \frac{\Delta A}{A}\ \alpha\ \frac{\Delta K}{K}\ (1-\alpha)\frac{\Delta h}{h}$

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