The Malthusian Trap: Economic Relevance and Endogenous Escape

by Hugo Vitrac
ECON 460: History of Thought I
Edited by Romain Perusat, Matthew O'Boyle, & Sehrish Ahmed

Introduction

Throughout the late 18th century and early 19th century, political economy was referred to pejoratively as the "dismal science" (Sandmo, 2011) because of its long-run pessimistic view on the stationary state and the "iron law of wages". The view widely held by the school of the classical economists (mid-18th to mid-19th) that humankind was bound to live at the subsistence level, with constant per capita income and food supply in the long run, was stated by Malthus in the first edition of his *Essay on Population* (1798). Malthus' observations relied upon his travels in Europe where he gathered demographic data from various countries and ultimately developed a long-lasting idea. He proposed that different growth paths of population and food supply (geometric and arithmetic respectively) implied that any improvements in the standards of living were only temporary and disappeared in a matter of one generation. Society was trapped at the subsistence level by two checks on population size: vice and misery. Malthus' views expressed in his first *Essay on Population* were very influential at the time. They can be found in Ricardo's iron law of wages, and in his Corn Model (Sandmo, 2011) and are also said to have inspired Darwin's theory of evolution (Malthus & Appleman, 2004). But in 1803, five years after the first edition, Malthus published a revised version of his *Essay on Population* which can be considered an entirely new book. In addition to vice and misery, he introduced "moral restraints" (Malthus & Appleman, 2004) as a third check on population size. Malthus did not totally reject his first essay's conclusion, but he developed it further, introducing the prospect of long-run improvements in standards of living. Despite Malthus' revisions, most of his contemporaries stuck with his first version. Indeed, Malthus' initial pessimistic view accurately depicted the economic and demographic dynamics not just of his time but of the pre-Industrial era.

The relevance of the mechanism described in his first *Essay on Population*, commonly referred to as the Malthusian trap, as a possible explanation for the pre-Industrial economic stagnation has been debated in the economic literature. The Malthusian trap, if ever pertinent, was successfully overcome with the Industrial Revolution and its dramatic and sustained increase in population, technology, knowledge, and productivity. What made it possible to escape the Malthusian trap?

Many reasons have been stated such as exogenous technological progress, agricultural productivity, and greater division of labour. Here, the escape from the Malthusian trap will be conceptualized as an endogenous one, resulting from human capital accumulation, a factor synonymous with population growth.

The Malthusian Trap and its Historical Relevance

Malthus' Theory of Population

In the first edition of his *Essay on Population*, Malthus introduced two postulates: "First, that food is necessary to the existence of man. Secondly, that the passion between the sexes is necessary, and will remain nearly in its present state." (Malthus & Appleman, 2004). Malthus derived these two postulates from the laws of nature, by definition as immutable as Newton's law of gravity. From these simple observations, Malthus identified an incessant contest between population size and food supply due to differences in their growth paths: "Population when unchecked increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. […] By that law of our nature which makes food necessary to the life of man, the effects of these two unequal powers must be kept equal" (Malthus & Appleman, 2004). This permanent tension between population size and food supply implies that the faster population growth rate must be constrained to the slower growth rate of food supply. Two checks on population growth are identified by Malthus in his first edition, vice—birth control per his Puritan view—and misery—famine, diseases, and war. These two forces acted as checks on population growth, preventing it from growing beyond its means of subsistence. Malthus' theory allowed for temporary improvements in standards of living, but these improvements would release the pressure on natality, thereby increasing the number of children and putting downward pressure on wages, moving back toward the subsistence level in the long run. This is the "iron law of wages" (Sandmo, 2011:67), a central concept to Classical economists.

Preventive checks such as birth control, given its precarity at Malthus' time, played almost no part in his first essay (Malthus & Appleman, 2004). He was left with only one positive check on population growth: misery. Malthus wrote, "This argument appears to be conclusive… against any marked and striking change for the better … [and against] any great and decided amelioration of the condition of the lower classes of mankind" (Appleman). Malthus' population theory as stated in his first *Essay on Population* was coined 'the Malthusian trap'. Lee and Anderson, in their *Journal of Population Economics* article, described it as an equilibrium system with three essential elements. First, the growth of the Labour force at any given level of demand encounters a diminishing marginal return in agriculture (capturing the difference in growth paths) which leads to a decreasing real wage in the economy. Second, a higher wage decreases mortality through improvement in the standard of living and increases fertility. Finally, these two causes and consequences of population change in Malthus' population theory jointly form an equilibrium system at the subsistence level, the natural wage (Lee & Anderson, 2001). Hence, in the long run, changes in population and

technological progress act on this equilibrium in such a way as to leave standards of living unchanged (per capita food supply, income and real wage constant): the economy is trapped at the subsistence level.

Economic Relevance to Explain Past Economic Stagnation

In an article published in 2019 in the *European Economic Review*, Madsen, Robertson and Ye investigate the economic relevance of the Malthusian mechanisms to explain pre-Industrial economic stagnation against competing theories like the lack of technological progress (Madsen, Robertson & Ye, 2019). In their literature review, they stress the fact that despite its wide acceptance as a theory, there is very little empirical support for the Malthusian trap as an explanation for past economic stagnation. Econometric studies found statistically significant but economically weak Malthusian mechanisms: population growth as a response to economic improvement could take centuries before reverting to its equilibrium level (Lee & Anderson, 2001). The results from Lee and Anderson's article were found to stand in sharp contrast with the existing literature. Using large samples across 17 OECD countries, which differed from the earlier literature focusing on only one country, statistically and economically significant Malthusian mechanisms were found from 900 BCE to 1870 CE (Madsen, Robertson & Ye, 2019). Based on their econometric investigation, they state that “there was rapid convergence back to the steady-state wage following a shock, so that wages gain from technological progress, or land expansion, would have been substantially eroded by population growth in the course of a generation” (Madsen, Robertson & Ye, 2019). This rapid wage convergence toward the steady state, described as constant per capita income in their model, is consistent with the Classical “iron law of wages”. Their article suggests that demographic changes and Malthusian mechanisms explain pre-Industrial economic stagnation.

In his opening speech to the American Economic Association in 2000, Gale Johnson seemed to share the same conclusion: “Unfortunately, the Malthus of the first edition provided a model for population growth that accurately depicted the experience of nearly all human history and was generally valid up to the time he wrote” (Johnson, 2000). The relevance of the Malthusian mechanisms, namely demographics and fertility, as an explanation of past economic stagnation also shows the importance of understanding how these mechanisms are overcome in the context of today’s underdevelopment and growth divergence.

Endogenous Escape from the Malthusian Trap

The Role of Knowledge

In contrast to an economy trapped at the subsistence level, with the standard of living left unchanged in the long run, an escape from the Malthusian trap would be a situation where the economy generates an exponentially growing income per capita, and population growth driven by low levels of mortality and fertility. Since the 19th century, there has been sustained exponential

growth in global GDP and population. As Johnson pointed out, the global population increase in the 1980s was equivalent to the total population in 1820. Similarly, the increase in GDP per capita in the 1980s was equal to the GDP per capita in 1800 (Johnson, 2000). What has made this exponential growth possible? Johnson (2000) provides a simple but powerful answer: "the creation of knowledge". This allows us to conceptualize the escape from the Malthusian trap as an endogenous one, found within the population. If constant distribution of talent in the population across space and time is assumed, population growth is found to be sufficient enough to lead to an escape from the Malthusian trap and the stationary state. Interestingly, John Stuart Mill, often considered the last classical economist, when examining the stationary state did not regard it with the "unaffected aversion" (Sandmo, 2011) of his contemporaries. For him, the stationary state was one of material growth but not of intellectual improvement. Stressing the idea of continued intellectual improvement, the accumulation of human capital as the driver of economic growth becomes evident.

Steinmann, Prskawetz and Feichtinger in an article published in 1997 in the *Journal of Population Economics*, constructed a model of the escape from the Malthusian trap. The sole precondition for the model is positive population growth which is positively correlated with technology and has a constant distribution of talent across space and time. Indeed, a larger population size implies a greater stock of human capital. They argue that once a threshold of human capital has been reached, technological progress sets in. This provides the economy with prospects of exponential growth and increasing returns to scale. In this model, "endogenous technology constitutes the engine of growth" (Steinmann, Prskawetz & Feichtinger, 1997). Thus, the escape from the Malthusian trap is the outcome of the cumulative process of the accumulation of human capital through population growth rather than the consequence of exogenous technological progress.
Their model can be stated as follows: population size is a positive function of human capital, which is in turn transformed into technological progress, and technological progress drives economic growth. This process happens in the economy once a certain human capital threshold is reached: "you have to accumulate enough human capital for the process to be self-generating" (Steinmann, Prskawetz & Feichtinger, 1997). Johnson stressed that the process of human capital accumulation also allows for greater specialization in the creation of knowledge, with the allocation of more resources to institutions such as universities and research institutes. These infrastructures dedicated to the creation of knowledge can be conceptualized as clusters which increase the rate of human capital accumulation (Johnson, 2000:7) and enable increasing return to scale in the economy.

The Fertility/Mortality Ratio

In their article, Steinmann, Prskawetz and Feichtinger also emphasized the crucial role of demographics in relation to technological progress by stressing the distinction between different levels of fertility and mortality as components of the population growth rate. Indeed, "human capital is knowledge embodied in people" (Steinmann, Prskawetz & Feichtinger, 1997), hence the mortality

rate also represents the rate of depreciation of human capital. Thus, among countries with the same population growth rate but different mortality rates, those with higher mortality rates will experience faster depreciation of human capital. This would in turn have a negative impact on technological progress. Hence, within this model of endogenous technological progress, the sources of population growth, namely fertility and mortality level, are relevant for long-run convergence and divergence among countries. These two determinants of population growth are endogenous and negatively related to economic growth in the model. As noted by Johnson, population growth in developed countries during the 19th century, and later in the 20th century in developing countries, "was due almost entirely to mortality declines and not fertility increases" (Johnson, 2000). This is consistent with the model's conclusions as well as Malthus' third check on population introduced in the 1803 edition of his *Essay on Population,* allowing him to talk about the prospect of long-run improvements, namely the desire for self-improvement. Because of moral restraints, people change their reproductive behaviour through late marriage and fewer children, effectively decreasing the fertility rate. From this, he introduced the possibility for some improvement: "Though our future prospects respecting the mitigation of evils arising from the principle of population may not be so bright as we could wish, yet they are far from being entirely disheartening, and by no means precludes [...] gradual and progressive improvements in human society" (Malthus & Appleman, 2004). From their model, Steinmann, Prskawetz and Feichtinger suggest that the causes of the Industrial Revolution are not to be found in exogenous factors but in the very process of human capital accumulation, driven by population growth. And indeed, two periods in demographic history, one from 8000 BC to the 18th century have been characterized by a slow growth rate of population of approximately 0.5%, and another from the 18th century onward with a population explosion (Artzrouni & Komlos, 1985). In light of this model, the threshold of human capital necessary for technological innovation can be identified as having been reached at the end of the 18th century.

Conclusion

Much has been written on Malthus and his theory on population despite its failure to capture modern patterns of economic and population growth. This is because the relevance of the Malthusian trap lies in its ability to effectively explain pre-Industrial stagnation, and understanding its successful overcoming is relevant to explaining long-run convergence and divergence among countries. Therefore, Madsen, Robertson and Ye conclude their article by stressing the continued relevance of Malthusian mechanisms, "Fertility and demographic factors were an important source of past economic stagnation, therefore, may also remain an important source of contemporary underdevelopment." (Madsen, Robertson & Ye, 2019) And indeed, the model of an endogenous escape from the Malthusian trap (Steinmann, Prskawetz & Feichtinger, 1997) stresses the close ties not only of population growth but also of fertility and mortality with technological progress. For the same population growth rate, a country with a higher mortality rate will tend to have slower economic growth due to its higher depreciation rate of human capital.

References

Artzrouni, M., & Komlos, J. (1985). Population growth through history and the escape from the Malthusian trap: a homeostatic simulation model, *Genus*, *41*(3/4), 21–39.

Johnson, D. G. (2000). Population, food, and knowledge. *American Economic Review, 90*(1), 1-14.

Lee, R. & Anderson, M. (2002) Malthus in state space: Macro economic-demographic relations in English history, 1540 to 1870. *J Popul Econ* 15, 195–220 (2002).

Madsen, J. B., Robertson, P. E., & Ye, L. (2019). Malthus was right: Explaining a millennium of stagnation. *European Economic Review, 118*, 51-68

Malthus, T. R., & Appleman, P. (2004). *An essay on the principle of population : influences on malthus, selections from malthus' work, nineteenth-century comment, malthus in the twenty-first century* (2nd ed., Ser. A Norton critical edition). W.W. Norton.

Steinmann, G., Prskawetz, A., & Feichtinger, G. (1998). A model on the escape from the Malthusian trap. *Journal of Population Economics, 11*(4), 535-550

Sandmo, A. (2011). Economics evolving: a history of economic thought. Princeton University Press.