

POPULATION AND ECONOMIC GROWTH: A REVIEW ESSAY**Marinko Škare^{1*} and Sanja Blažević²**^{1) 2)} *Juraj Dobrila University of Pula, Faculty of Economics
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Abstract

For centuries, scientists from various scientific fields have been leading lively discussions on the (bidirectional) relationship between population growth and economic growth. Particular attention was given to the nature of the population growth variable, i.e. whether it is an endogenous or exogenous variable. The goal of this paper is to position this discussion into a historical, empirical and institutional perspective in order to establish population as an important factor for socio-economic prosperity, mostly measured in terms of economic growth. Regardless of ambiguous empirical conclusions about the influence of population growth on economic growth, the political aspect is crucial. Population effect should not be measured only in terms of population growth, measured by the increase in the number of inhabitants. Population is an endogenous variable which is under the influence of culture, values, political processes and industrial structure.

Keywords: population, economic growth, United Nations, fertility, policy**JEL Classification:** Q56, J13, J18, L38.

Introduction

Population growth and its consequences have a long-standing position at the center of the scientific debate, with the primary goal of predicting trends and creating policies that reflect specific socio-economic conditions. Many economists have dealt with the importance of the population variable, but mainstream literature rarely highlights this historical streamline of thoughts. Even Adam Smith, in *The Wealth of Nations*, emphasized the importance of population, but he was not the only and especially not the first economist who arrived at that conclusion. The growth rate of the human population, which was almost zero during most of human history, increased substantially with the Industrial Revolution.

Human capital is a complex term that eschews a simple definition and measurement and is a concept that has been investigated from a variety of perspectives by social scientist

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(Savvides and Stengos, 2009). In the theories of economic growth, a set of different concepts are usually used for proximate determinant human capital. The conventional method measures human capital using educational attainment, but because of the shortcomings of this approach the other concepts were introduced in the theories of economic growth, such as: quality of formal education, informal education, health and nutrition, the structure of the labour market, institutions, culture and geography. A historical review of the concept of human capital is provided by Savvides and Stengos (2009). All those fundamental determinants of human capital are discussed in the following sections. A particular focus is also given to the two key perspectives built in the models of economic growth: accumulation of human capital and stock of human capital as the source of economic growth.

The goal of this paper is to set the debate in a historical, empirical and institutional context, in order to explain the complexity of the population problem. The hypotheses are the following:

- Regardless of ambiguous empirical conclusions about the influence of population growth on economic growth, the political aspect is crucial
- The population effect should not be measured only in terms of population growth, measured by the increase in a number of inhabitants
- Population is an endogenous variable which is under the influence of culture, values, political processes and industrial structure.

This paper is organized in three parts. Introduction gives us a general picture of population growth trends and associated issues. Section two offers a discussion of a historical perspective and analyzes population issues from ancient thinkers' interpretations to today's scientific and professional papers and studies. In the third part, empirical research and models in population and economic growth causal relationship are presented. Within the same section, the importance of methodological issues that influence the final interpretation and conclusion, is also reviewed. The last part of this paper describes the population growth question in an institutional framework of policy measures that United Nations' countries implement to achieve socio-economic progress.

1. Historical population dynamics

The population growth rate explosion during and after the Industrial Revolution was a result of better living conditions achieved through better healthcare and housing conditions, economic structure diversification and technological progress. Some historical patterns started to change – fertility rose, mortality declined and life expectancy reached higher levels. According to Maddison (2006), the average life expectancy in Western Europe in 1820 was 36 years and in 1999 it was 78 years on average. In the United States, it was 39 in 1820 versus 77 in 1999, and the Asian average (excluding Japan) was 24 in 1820 versus 66 in 1999. There was clear evidence while 18th and 19th century the human population grew significantly in number, which raised the question of consequences for available resources. What effect will the growing number of inhabitants have – can we expect the country to develop or shall we bear the adverse consequences? That question was in the center of historical discussions among economists, demographers, philosophers, and sociologists.

In the 20th century, the growing population trend was supplemented by the trend of demographic transition. Mortality rates dropped, but fertility rates also started to decrease, while longevity was a rather pronounced phenomenon. The United Nations began to plan a mutual global framework for better anticipation and planning of demographic changes and policies. The first conference was held in Cairo in 1994, during which global participants jointly stated "development is the best contraceptive" (Weil, 2013). The joint conclusion is that adverse and coercive policies are not acceptable on a global level and that development (achieved through human capital, science, and technology enhancement) can affect demographic trends. The central question is whether population growth affects economic growth or vice versa, whether economic growth in terms of better living and working conditions encourages population growth. An additional, very important momentum in scientific debates is the nature of the population variable, i.e. whether it is an endogenous or exogenous variable in growth models. As Cohen (2003) in his famous Science article stated "it is a convenient but potentially dangerous fiction to treat population projections as exogenous inputs to economic, environmental, cultural, and political scenarios, as if population processes were autonomous." In their report in 2014, the United Nations once again confirmed their viewpoint regarding the endogeneity of the population variable, stating that "demographic change will continue to affect and be shaped by other equally important social, economic, environmental and political changes." (p. 30). (table no. 1)

Table no. 1: Population growth rate from year 0 until year 1998 (average annual compound rate)

Country/Region	0-1000	1000-1820	1820-1998
Western Europe	0.00	0.20	0.60
Western Offshoots*	0.05	0.21	1.91
Japan	0.09	0.17	0.79
Latin America	0.07	0.08	1.80
Eastern Europe and former USSR	0.05	0.23	0.85
Asia (excluding Japan)	0.00	0.17	0.91
Africa	0.07	0.10	1.32

Source: Maddison, 2006, p. 30

Note: * Western Offshoots include the United States, Canada, Australia and New Zealand.

The global demographic picture of modern times is versatile and has many extremes. There are some mutual global patterns that can be recognized, such as declining mortality rates, frequent and large migration flows, aging and urbanization. Still, birth distribution and fertility rates patterns show some differences. Developed countries have fertility rates below replacement level while the less and least developed areas show fertility rates above replacement level, and their share of births worldwide increases (table no. 2, figure no. 1). Nonetheless, looking at the global average, we see that there is a trend of declining fertility rates.

According to UN's report (2014, p. 2) "at the beginning of 2014, the world's population was estimated at 7.2 billion, with approximately 82 million being added every year and roughly a quarter of this growth occurring in the least developed countries. On its current trajectory, the world's population is expected to reach 8.1 billion in 2025 and 9.6 billion in 2050", which according to Cohen's (2003) thoughts "poses formidable challenges of food, housing, education, health, employment, political organization and public order."

Table no. 2: Total fertility rates (1950-2010)

Year	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
World	4.97	4.91	5.02	4.85	4.44	3.85	3.60	3.45	3.04	2.73	2.60	2.53
More developed regions	2.83	2.81	2.68	2.39	2.15	1.92	1.84	1.81	1.67	1.56	1.58	1.66
Least developed regions	6.65	6.61	6.70	6.75	6.75	6.68	6.55	6.20	5.78	5.36	4.93	4.53
Less developed regions*	6.02	5.86	6.04	5.82	5.18	4.30	3.88	3.64	3.08	2.68	2.50	2.41

Source: United Nations, 2013c
 Note: *excl. Least developed regions

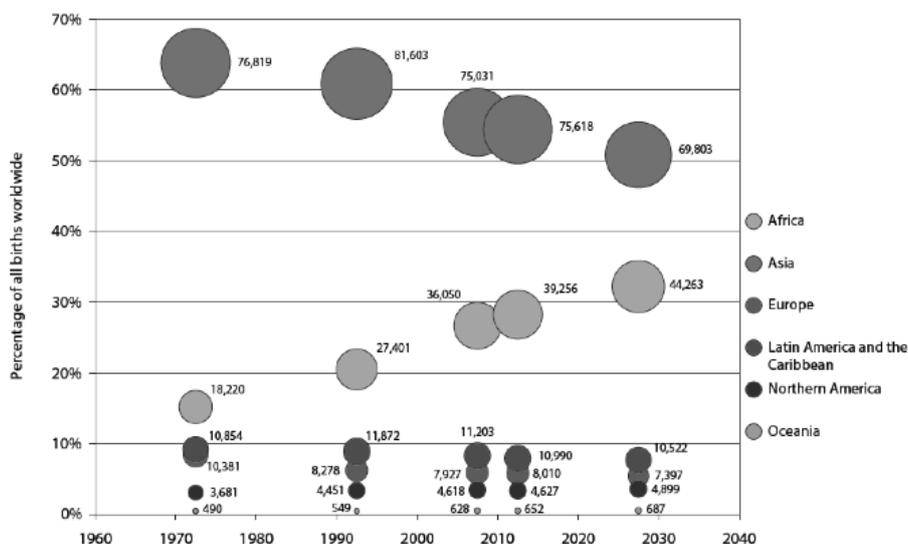


Figure no. 1: Distribution of births by major area
 Source: United Nations, 2013a

Among the negative consequences of population growth on economic growth are the following:

- Extensive use of resources, which results in ecological and food supply problems
- Higher levels of population density destroy living areas
- If population growth is more rapid than technological growth, there can be an adverse impact on income
- A higher share of dependent parts of the population (vulnerable groups, socially excluded, deprived) has a negative effect on saving rates.

Besides negative, there are positive externalities that arise from population growth such as:

- A higher number of consumers, investors, and new potential markets
- The macroeconomic multiplier rises; i.e. positive externalities are derived from the accelerated economic activity
- Higher savings rate and human capital investments.

By analyzing negative and positive potential consequences of population growth, we can determine that there are ambiguous and conflicting ultimate impacts. As Galor and Weil argue (2000) “Is there a unified framework of analysis that can account for this intricate evolution of population, technology, and growth throughout human history?”

2. Population as a factor of economic growth

The literature on the relationship between population and economic growth offers ambiguous conclusions regarding the size and also concerning the direction of the relationship. In order to assess the importance of the population variable, a historical perspective is critical, in order to notice different patterns of thinking, depending on the social and economic development level of the observed period. The debate on the population effect often starts from Malthus and his negativistic view of population impacts, but historical evidence clearly indicates that the population issue is as old as is society itself. Although, official statistics made its breakthrough in the 20th century for analysis and forecasting, valuable data on society were collected even in ancient times, mainly relating to population issues (for example population size, mortality. As Horn (1993) mentioned, “Social indicators, in this general sense, go back thousands of years. The early enumerations of population referred to in the Bible, the ancient registers of land titles, had a social element of ascertaining the population structure and military preparedness connected with the economic purpose of establishing a tax base.”

Some theoreticians claim that scientists before the late 19th and the 20th century did not have knowledge about the exact population size and its structure, historical sources show that governing structures were attentive to social statistics, which was the foundation for economic statistics and decision-making processes such as the collection of taxes and determining the amount of military expenditure.

More than 2,400 years ago, according to Škare (2013), Kautilya in his Arthashastra made a macro model of Indian society in which “farms were agricultural areas, with a minimum of one hundred families and a maximum of five hundred families with arable fields that can be ploughed by one, two or three ploughs.” For Kautilya and his contemporaries population was an important source for boosting productivity through labour input, and they created a welfare society, with the help of carefully planned economic and social activities, that were conducted by the King and his entire governing structure. “According to him, economic growth originates from the coordination of all economic activities within the State, which has an intelligent and fair King on the top and citizens that are well protected, respected and motivated” (Škare, 2013). Kautilya also contemplated on population density as an important variable that in the 20th century gained importance in assessing population impact on the society.

During ancient times, population was an important determinant of socio-economic development. In peaceful times, philosophers reflected on the ideal state/city characteristics, which also included an ideal population size (Kautilya, Aristotle, Plato), while in times of war, a large population was an important source for creating a strong military force. During the Medieval period, there was no space for discussion about possible population policies and ideal society since the Church and its religious beliefs were dominant. During the mercantilist period, the population was treated as a source of labor and production, which accordingly has a strong influence on poverty reduction. According to Brezis and Young (2014), mercantilists had a positive attitude towards population as an economic growth factor since it was a production generator and a source for eliminating poverty and idleness.

The first scientist that made a clear connection between population and economic growth and in today's understanding created a theoretical framework was David Hume (2011). As Brezis and Young (2014) stated, "Hume intuitively understood that population had increased from the "ancient" period to his era; second, Hume saw population increase as endogenous. It was the first work in which there was an endogenous approach to population; and, third, due to his intuition regarding the rise in population, he stressed that economic and population growth were not short-run business cycle facts, but part of a long-run growth dynamics". After Hume's assumptions, Adam Smith in his work *The Wealth of Nations* also put an emphasis on the population variable as a source for economic growth. He stated "the most decisive mark of the prosperity of any country is the increase of the number of its inhabitants." (Brezis, Young, 2014). Malthus was on the opposite paradigmatic side, as he saw population increase as a possible cause of famine, poverty, and economic deprivation. Since Malthus was often cited in the population debate, we will dedicate a whole section to his work that was and still is the foundation for the modern discussion, which focuses on the negative consequences of population increase.

In the first half of the 20th century, modern economic growth theory was grounded in the prolific work of scientists such as Ramsey, Fisher, Schumpeter, Harrod and Domar, who analyzed different economic growth regimes, in order to empirically and theoretically discover growth stimulating factors in various conditions. Solow and Swan are the founders of the neoclassical growth theory, through which the simple general equilibrium model was created. The fundamental assumptions of that model are "constant returns to scale, diminishing returns to each input, and some positive and smooth elasticity of substitution between the inputs." (Barro, Sala-i-Martin, 2004) Cass and Koopmans and later Romer, Lucas, Aghion, Howitt, Grossman and Helpman upgraded the neoclassical growth theory through inclusion of significant inputs such as technology, human capital, research and development, competition and, most importantly, the endogeneity and long-run frame of the growth process. Population growth is also an important growth determinant in long-run growth models. As Brezis and Young (2014) suggest: "the New Economic Growth Theory, whose goal is to explain long-run economic growth endogenously, has put an emphasis on demographic factors as an essential element in explaining the dynamics of growth. While in the work of Solow the focus was on the impact of capital on the development of the economy, the New Growth Theory has put back into focus population size, and, especially, the relationship between family size and formation of human capital."

2.1. Projections of Malthus and Neo-Malthusian's thoughts

Pessimistic views regarding population effects on economic growth arise from a traditionalist flux of ideas that was launched in the 18th century by Thomas Malthus (1798). In 1798, he published his influential work *An Essay on the Principle of Population*, in which he built a theoretical framework with explanations and predictions state of society. His main and most cited conclusion from his book is the difference between growth rates of population and other means for living. Malthus is "well known for his position that population tends to grow geometrically, while means of subsistence tend to increase arithmetically, and that population is thus limited by insufficient means of subsistence" (Yao, 2013). In case of a high population growth rate, according to Malthus, society will come to a point when there will not be enough food for every inhabitant, which will ultimately lead to misery, deprivation, and poverty. Malthus elaborated his view and proposed solutions that can be interpreted as a population policy framework. In his own words: "The power of population is so superior to the power of the earth to produce subsistence for man, that premature death must in some shape or another visit the human race". Although the Malthusian population perspective is often criticized, little is mentioned about recommendations that Malthus gave in order to elude the negative consequences of geometrical population growth.

Malthus divided potential solutions into two substantially different classifications. He proposed population checks - preventive and positive. Preventive check refers to moral constraint, while positive check indicates population decrease that can be reached through fertility limitations, which will result ultimately in a fertility rate decline, or through famine, war and disease, which is not an ethically and morally acceptable solution. Brezis and Young (2014) also accentuated this division and argued that "for Malthus, these checks can be also divided into three different "ideological" categories: the checks of vice, of misery, and of moral restraint. The positive checks are of two ideological groups, either of misery (war, epidemic) or of vice (abortion, infanticide, and birth control, since Malthus was opposed to it and saw birth control as a vice), while the preventive checks are either through vice or through moral restraint, that is, postponing marriage."

Before we further explain what is the more effective solution according to Malthus, one should bear in mind the context in which authors in that time wrote. They built a theoretical framework with no exact data and based their thoughts on subjective and narrative reasoning, often grounded only in moral affiliations. Malthus was under the influence of religious explanations that made a big impact on his work as a political economist and demographer. In his work, he argued that people, unlike animals, can restrain themselves from their emotional and sexual impulses and control their behavior, which includes making a rational decision on the number of children they can have. "Malthus' answer was that "moral restraint" in preventing births is the only way in which a society can raise its standard of living." (Weil, 2013) This form of the control supplemented by positive check in terms of declining fertility rates, represents the beginning of population control policies that were often used in future periods, mostly in the 20th century, among which were many controversial measures. Although this proposed solution by Malthus was in every aspect much less extreme than other forms of (quite adverse) positive check (disease and war), some experts debate whether it is ethical and moral for the government or the church to intervene in individual decision making processes regarding family planning, desires and general way of living.

Conclusions that arose from *An Essay on the Principle of Population* by Thomas Malthus are still controversial and often debated, even more than 200 years later. The book has clear, precise and profoundly disturbing postulates because modern trends can partly be interpreted in terms of Malthusian thinking, which makes it a timeless source. Many 20th-century thinkers and scientists followed the Malthusian paradigm. Paul Ehrlich's (1968, 2009) book *The Population Bomb*, and his saying "the stork passed the flow" once again raised the question of negative population growth consequences that were accentuated and interpreted in catastrophic announcements. Ehrlich did not act in solace, many thinkers followed the Malthusian logic. "In the twentieth century, Coale and Hoover (1958) emphasized the need to curb population explosions in developing countries because population growth and the subsistence burden hinder capital accumulation. Their work was followed by Meadows et al.'s (1972) systems dynamics approach, which observed that petroleum, coal, natural gas and other energy resources are the result of solar energy reaching the earth millions of years ago, that iron, copper, and other metallic elements are as old as the earth and that the earth's resources are thus limited. Increasing resource consumption through an exploding human population growing at a geometric rate as well as greater and greater pollution, the authors concluded, would eventually lead to serious food shortages and resource depletion, but atmospheric pollution and environmental destruction would be the ultimate causes of societal collapse. Sensational though they were, similar conclusions were drawn by Barney (1980)." (Yao, 2013).

The work of Meadows et al. arose for the first time in 1968 when The Club of Rome was founded as a non-profit organization consisted of thirty individuals from different scientific and professional backgrounds, in order to attract attention to the most relevant global problems, among which was also the issue of population growth. They published the book *The Limits to Growth*, in which they addressed the deteriorating situation that resulted from a significant population increase. Their recommendations regarding control of demographic pressure focused on general changes in human behavior. "We unequivocally support the contention that a brake imposed on world demographic and economic growth spirals must not lead to a freezing of the status quo of economic development of the world's nations. If such a proposal were advanced by the rich nations, it would be taken as a final act of neocolonialism. The achievement of a harmonious state of global economic, social: and ecological equilibrium must be a joint venture based on mutual conviction, with benefits for all. (...) We affirm finally that any deliberate attempt to reach a rational and enduring state of equilibrium by planned measures, rather than by chance or catastrophe, must ultimately be founded on a basic change of values and goals at individual, national, and world levels." (Meadows, 1972). Their work to some extent mitigated Ehrlich's projections, but the debate regarding population issues started to heat up.

Following the global concern about population growth projections, the United Nations began to play a more active role in evaluating and forecasting global demographic issues. With continuous analysis, data collection and the publishing of relevant documents, they organized a conference in Cairo in 1994 on population and development issues (ICPD), which generated the Programme of Action on future steps that each country should try to implement in order to reach a sustainable society. Their Programme of Action was upgraded and supplemented during ICDP 2014 with more recent facts that included the Millenium Development Goals. Regardless of cyclical economic trends and adverse periods of economic downturns, we witness remarkable population growth. We also notice that the number of people living in extreme poverty is in decline, global GDP levels are growing,

there is greater accessibility of healthcare and education infrastructure in poor and deprived areas, and at the same time the average global fertility rate is declining, which means that Malthusian projections of pauperism, famine, and moral restrictions have not been fulfilled.

2.2. The optimist and revisionist approach

Thomas Malthus and Neo-Malthusians focused on negative consequences stemming from a two-way relationship between population and economic growth. Even though the data show a significant relationship of the global population, which growth was followed by an even higher rate of economic growth, so the negative consequences, in term of the Malthusian vision, did not prevail. These trends encouraged scientists (Keynes, 1937; Kuznets, 1966, 1973, Birdsall, 1977, 1989, Kremer, 1993) to oppose Malthus and Neo-Malthusian predictions and confirm positive population growth impacts. Most influential work in this discussion was Kuznets's paper in 1973 which confirmed "that the impacts of economic development are positively correlated with population growth, concluding that the population remains the ultimate resource for economic development." (Yao, 2013) This causal relationship was interpreted in terms of positive externalities that population growth generates for the economy and the whole society. Optimists explained the failure of pessimistic predictions with other relevant inputs like technology, research and development, and human capital accumulation. These inputs represent an added value of fixed resources such as land. As Becker, Glaeser and Murphy explained (1999) "The net relation between greater population and per capita income depends on whether the inducements to human capital and expansion of knowledge are stronger than diminishing returns to natural resources". Even if we make an assumption that population growth rises by geometrical rate and other inputs by arithmetic rate, the difference can be surpassed by technological progress and an expansion of knowledge.

Galor and Weil differentiate three economic regimes according to a combination of population growth, output growth and technological progress. They distinguish the Malthusian, Post-Malthusian, and Modern Growth Regime, depending on the relationship between the variables above and how it affects the standard of living in terms of income per capita. The Malthusian period, which had imperceptible technological progress, is characterized by low economic and population growth rates but the relationship between income per capita and population growth was positive - rich countries had positive population growth rates. The Post-Malthusian period was determined by growth in all three aspects - economic, technological and demographic. The economic growth rate during that period was a result of two inputs - technology and population, where technology began to take precedence and had higher share among sources of economic growth. The Modern economic growth period arose due to the demographic transition (low fertility and mortality rates regardless of the rising population size). Even though we witness stable growth rates, the population growth rate started to decline. The relationship between population growth and income per capita has recently been negative; i.e. poor countries have high population growth rates in an economically underdeveloped environment while rich countries have zero or negative population growth. (figure no. 2)

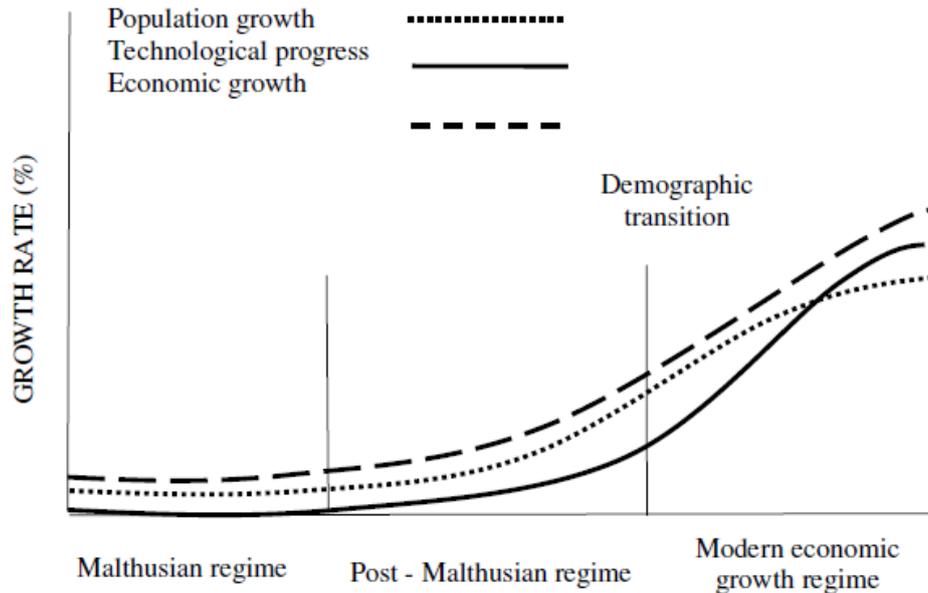


Figure no. 2: Population and economic growth regimes

Source: Authors' according to Galor and Weil, 2000, pp. 806-807.

The negative relationship between population and economic growth and other inputs (technology, knowledge, R&D) was the stimulus that provided alternative explanations in comparison to pessimists and optimists. Revisionists focused on technical aspects of that relationship and a sounder analysis. They included the endogeneous nature of the population variable in their economic growth models and a long-term analysis approach. New econometric techniques and computer software enabled the implementation of more exact models. Also, official statistics expanded its activities and methodology of collecting data which resulted ultimately in extensive data sets that were available. "Revisionists have downgraded the relative importance of population growth as a source of economic growth" (Kelley, Schmidt, 1996) by conducting empirical research which showed that there was no evidence of a bi-directional causal relationship between population and economic growth, but there was evidence of a unidirectional causal relationship, in which economic growth influences population growth. In order to explain the ambiguous evidence between three different groups of thinkers (Malthusian, optimists, and revisionists) one should analyze the methodology and the data that was used in modern empirical studies.

3. Empirical evidence - is there a robust causal connection?

After we analyzed Malthusian predictions and those of optimists and revisionists, who were more oriented towards mathematical reasoning, we will analyze the empirical literature on the relationship between population and economic growth, in order to ascertain the strength, direction and size of this relationship. Most of the empirical literature has been created during New Economic Growth regime (according to Galor and Weil 2000, see figure no. 2), in which there was real data evidence of a negative relationship. Developed and rich countries had zero or negative fertility and population growth rates while an

opposite reality existed in developing and underdeveloped areas. Future projections indicate declining demographic trends while at the world is on an upward economic trajectory. (figure no. 3)

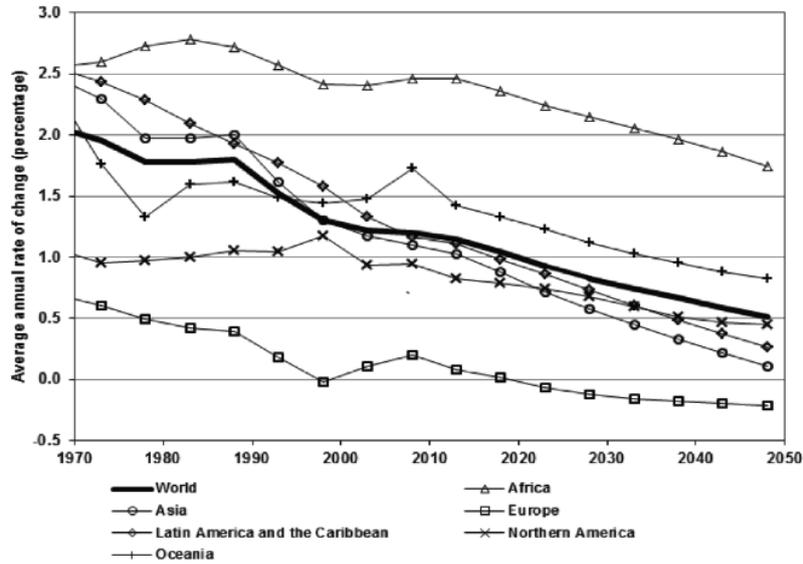


Figure no. 3: Average annual rate of population change, for the world and major areas, 1970-2050
 Source: UN, 2014, p. 4.

We can classify empirical evidence according to its methodology and data, i.e. type of model and size of dataset that were used. The type of model directly affects conclusions. Simplistic stationary time series models could contain methodological pitfalls (non-stationary series, need for a long-term framework) that more developed models for cointegration or dynamic panel data to some extent mitigate. In the table no. 3, we line up a few empirical works in order to draw attention to the diversity of conclusions depending on the methodology, unit of observation and period.

One could explain inconsistencies among empirical research through the methodological background that was used, and the general conclusion is that we cannot generalize about the direction and size of the population growth effect on economic growth on a set of heterogeneous countries. As Galor and Weil (2000) claim, "differences between countries in the determination of population growth or in the process of technological change (as a result of institutions and cultural factors, for example) would be reflected in their ability to escape the Malthusian trap and in the speed of their takeoff". Although most scientists would agree that underdeveloped countries would be better off in the case of lower population growth rates, there is still an ambiguous amount of evidence. Different economic and social conditions form a macroeconomic framework in which population is just one of the influential variables. Based on different theoretical and empirical models, we can agree with Tsen, who said that "Population growth could be beneficial or detrimental to economic growth and economic growth could have an impact on population growth" (p. 314), which means that population, as an endogenous economic factor, can be influenced

by other macroeconomic factors, and most of all, by policy measures. By taking optimal measures, we can balance between the desired level of population and economic growth. "Even if rapid population growth has negative overall consequences, economists have viewed those consequences as small and short-lived as societies develop compensating technology and institutions." (Birdsall, 2001).

Table no. 3: Empirical analysis review

Authors	Model	Data	Population growth affects economic growth	Additional comments
Kelley, Schmidt (1996)	Panel	135 countries, 1960-1990	Yes and No	Population growth effect on economic growth varies in regards to economic development level
Bloom, Williamson (1997)	Panel OLS	78 Asian and non-Asian countries, 1965-1990	Yes	Direction of relationship depends on the ratio of working-age population and population
Thornton (2001)	Time-series	Latin American countries, 1900-1994	No relationship	-
Tsen, Furoka (2005)	Cointegration	Japan, Philippines, Thailand, 1950-2000; China, 1952-2000; Korea, 1953-2000; Taiwan, 1951-1998; Hong Kong and Indonesia, 1960-2000; Singapore, 1960-1996	No relationship	Granger causation show in some cases, there is a causation, but because of unreliable methodology, we cannot take those results into account
Nakibullah (2010)	Time-series (VAR)	Bangladesh, 1962-1990	No	Economic growth affects population growth
Huang, Xie (2013)	GMM	90 countries, 1980-2007	Yes and No	In short-term population affects economic growth, in long-term there is no relationship; economic growth does not affect population growth no matter of timeframe
Yao, Kinugasa, Hamori (2013)	Time-series (VECM)	China 1952-2007	Negatively	Workforce structure positively impacts economic growth

4. Policy framework

During the 20th-century, many countries created a policy framework oriented towards population issues - whether to control its growth or encourage it. According to the United Nations' Department of Economic and Social Affairs, which primary role is to monitor and evaluate population and demographic trends, "in 2013, 37 percent of Governments worldwide had policies to lower the rate of population growth, whereas 20 percent had

policies to raise it. The remaining 43 percent of Governments had policies to maintain the current rate of population growth or did not intervene to influence it. Since 1996, the percentage of Governments with policies to lower the population growth rate has remained largely unchanged, but the percentage to raise it has increased steadily, from 13 percent in 1996 to 20 percent in 2013." (United Nations, 2013b) This increase in countries, which implement policies in order to raise the population growth is expected, considering existing negative demographic trends, regardless of the rising size of the global population, measured in absolute terms. . There is a difference between developed and fewer developed regions in their population policy framework. "Nearly half of the Governments in more developed areas had policies to raise their rate of population growth, and only 2 per cent had policies to lower it in 2013. In contrast, nearly half of the Governments in fewer developed regions had policies to lower the rate of population growth, and 10 percent had policies to raise it. The percentage of Governments having policies to lower the rate of population growth has increased steadily in Africa, from 60 percent in 1996 to 72 percent in 2013. In contrast, the percentage of Governments with policies aimed at raising the rate of population growth has doubled in Europe, from 26 percent in 1996 to 52 percent in 2013. (United Nations, 2013b, 5).

United Nations' Department of Economic and Social Affairs each year publishes a dataset on 48 variables in six thematic areas as follows:

- Population size and growth
- Population age structure
- Reproductive health and family planning
- Health and mortality
- Spatial distribution and internal migration and
- International migration.

For the purpose of this paper, we will analyze the first thematic area - Population size and growth – that has data from 1976. The observed variables in this category are View on growth, which "indicates how the Government perceives the rate of population growth in the country" (United Nations, 2013b, p. 19) and has three possible values – too low, satisfactory and too high, and Policy on growth, which "indicates Government's stated policy to influence the rate of population growth in the country" (United Nations, 2013b, p. 19) and has four possible values – no intervention, lower, maintain, raise. We extracted the data on growth policy variables by major regions, and made a comparison with the population and the GDP growth rate (at constant USD 2005 prices), in order to make a narrative conclusion on the purposefulness of conducted measures. (table no. 4)

Table no. 4: Share of countries conducting particular policy on population growth and primary indicators by major world regions, 1975-2013

AFRICA				
	Share of countries conducting particular policy on population growth (%)			
	Raise	Maintain	Lower	No intervention
1976 (48 countries total)	15	0	25	60
1986 (51 countries total)	8	6	39	47
1996 (53 countries total)	4	4	60	32
2005 (53 countries total)	2	11	66	21
2013 (54 countries total)	2	13	72	13
Percentage share change of countries conducting population policy indicator (1976-2013)	-13	+13	+47	-47
Average annual rate of population change (1975-2010)			2.58%	
Growth rate of GDP 1976-2012			3.3%	
ASIA				
	Share of countries conducting particular policy on population growth (%)			
	Raise	Maintain	Lower	No intervention
1976 (37 countries)	24	0	38	38
1986 (38 countries)	34	3	32	32
1996 (46 countries)	17	11	39	33
2005 (47 countries)	21	26	40	13
2013 (48 countries)	23	29	42	6
Percentage share change of countries conducting population policy indicator (1976-2013)	-1	+29	+4	-32
Average annual rate of population change (1975-2010)			1.59%	
Growth rate of GDP 1976-2012			4.5%	
EUROPE				
	Share of countries conducting particular policy on population growth (%)			
	Raise	Maintain	Lower	No intervention
1976 (29 countries)	28	0	0	72
1986 (29 countries)	28	21	0	52
1996 (43 countries)	26	14	2	58
2005 (43 countries)	37	19	0	44
2013 (44 countries)	52	16	2	30
Percentage share change of countries conducting population policy indicator (1976-2013)	+24	+16	+2	-42
Average annual rate of population change (1975-2010)			0.25%	
Growth rate of GDP 1976-2012			2.1%	

LATIN AMERICA AND THE CARRIBEAN

	Share of countries conducting particular policy on population growth (%)			
	Raise	Maintain	Lower	No intervention
1976 (27 countries)	11	0	33	56
1986 (33 countries)	0	0	45	55
1996 (33 countries)	3	6	39	52
2005 (33 countries)	0	15	24	61
2013 (33 countries)	6	30	21	42
Percentage share change of countries conducting population policy indicator (1976-2013)	-5	+30	-12	-14
Average annual rate of population change (1975-2010)			1.74%	
Growth rate of GDP 1976-2012			3.1%	

NORTHERN AMERICA

	Share of countries conducting particular policy on population growth (%)			
	Raise	Maintain	Lower	No intervention
1976 (2 countries)	0	0	0	100
1986 (2 countries)	0	50	0	50
1996 (2 countries)	0	0	0	100
2005 (2 countries)	0	0	0	100
2013 (2 countries)	0	0	0	100
Percentage share change of countries conducting population policy indicator (1976-2013)	-	-	-	-
Average annual rate of population change (1975-2010)			1.02%	
Growth rate of GDP 1976-2012			2.9%	

OCEANIA

	Share of countries conducting particular policy on population growth (%)			
	Raise	Maintain	Lower	No intervention
1976	14	0	57	29
1986	9	9	55	27
1996	19	6	44	31
2005	13	6	50	31
2013	19	19	38	31
Percentage share change of countries conducting population policy indicator (1976-2013)	+5	+19	-19	+2
Average annual rate of population change (1975-2010)			1.53%	
Growth rate of GDP 1976-2012			3.0%	

Source: United Nations, 2013b, p. 55; 2013c; 2013d

The most visible changes happened in Africa, where the share of countries that had a stated government policy to lower the rate of population growth increased by 47 percentage points. In 1976, out of 48 African countries only 25% of them had policy measures focused on lowering the rate of population growth, while that share in 2013 grew to 72% of the total number of African countries. In Africa, we witness changes that had the largest extent in relation to other regions - average growth rate of GDP was 3.3% while the mean annual rate

of population change was 2.58%. Only 2% of African countries conducted measures in order to increase the population size. In Northern America (which is divided into two geographical areas - United States of America and Canada) neither of two countries has population interventionist measures. The most modest indicators can be seen in Europe with 0.25% of average annual rate of population change between 1975 and 2010 and 2.1% of GDP growth rate between 1976 and 2012. Most of the European countries created their population policies in order to raise the size of their population. One can argue whether those population measures show an effective impact when we still witness negative demographic trends. As St. Pierre and Dariotis state (p. 244), "Oddly, pro-natalist policies in Western Europe have mostly failed to raise fertility".

According to UN's statistical division, out of 197 countries in 2013, only 22% of them had no intervention measures, while 20% of them had steps to increase the population growth rate, which means that institutions and governments accepted the endogenous nature of the population variable and they are making an effort of creating policies in order to achieve the desired socio-economic level of development.

Conclusion

According to UN's predictions, "by 2050, the world's population is likely to reach an unprecedented size between 8.3 billion and 10.9 billion people" (UN, 2013b, p. 47) which accentuates a centuries-old question of possible demographic consequences. Resources are finite, and growth is rapid so the question arises "What can we do in order to build a society that is intended for everyone to have a fulfilled and dignified life?" It is not possible to generalize and create a unified global framework of population policies since there are many socio-economic differences between countries. Also, empirical research conducted in modern economic growth theory shows many inconsistencies arising from methodological choices that scientists make.

Although empirical results show that population growth does not affect economic growth, but conversely, economic growth may affect population growth, we must be careful in our interpretations, which could be distorted by the methodological imprecision. "Economic growth is not an end in itself but a means to the larger objective of improved well-being" (Birdsall, 2001), so population structure is an important determinant of the overall socio-economic system. Further empirical research should be conducted with the aim of profound understanding of demographic changes and consequences that occur and affect human society. "As Amartya Sen has said many times, economic growth can and should mean an increase in the human ability to be freed from want in order to have the good life" (Szostak, p. 13), which generates the question of the nature of economic growth and its measurement. Change in the construct operationalization, for example, population and economic development, could improve our understanding of the complex ever-changing world around us.

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