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The Impact of an Aging Population on Welfare and War

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Abstract

This paper underlines a long-term effect of an aging population in the 21st century that has not received sufficient attention: its role in reducing the probability of conflicts and war.

This paper emphasizes the relationship between aging, population growth, and conflict. I present a new framework in which an aging population, fertility rates and the probability of conflict are endogenously determined, leading to multiple equilibrium outcomes. The core idea is that high fertility rates increase the likelihood of conflict through the "youth bulge" effect. Conversely, war and conflict—by causing high mortality among young men—lead families to increase birth rates. This reciprocal dynamic generates multiple possible equilibria.

As a result, the world faces regional disparities in conflict, population growth, and aging. On the one hand, some countries are characterized by low fertility rates, an aging population, and high capital accumulation, with low probabilities of conflict. On the other hand, regions such as parts of Africa and the Middle East, with high fertility rates and young populations, remain more prone to conflict.

Keywords: aging population, war and conflicts, median age, fertility rates, youth bulge.
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I. Introduction

The aim of this paper is to analyze the effects of an aging population on long-term welfare and economic growth. This topic has been widely studied in the literature. Some research has focused on the impact of aging on innovation, others on its effect on capital accumulation, and still others on the implications for social support systems and intergenerational transfers.

Regarding the relationship between an aging population and the pace of innovation, the literature suggests that younger populations tend to generate more imaginative ideas and higher levels of innovation (see Ruiu et al., 2019, 2023; Frosch, 2011). However, it is important to consider that declining fertility rates enable greater investment in education, particularly in top-tier universities, which can enhance innovation through mechanisms such as separating equilibria. Moreover, theories of leapfrogging and the distinction between invention and innovation suggest that the overall effect of an aging population on innovation may not be entirely negative.[1]

Regarding capital accumulation, models in the Solow tradition clearly show that lower fertility rates, implying an aging population, lead to higher capital per capita, which in turn supports improvements in infrastructure, education, and productivity. However, an aging population also requires substantial resources for healthcare and social support, resulting in significant intergenerational transfers. As a result, it remains an empirical question whether population aging ultimately leads to higher capital per capita and sustained economic growth.[2]

However, one factor has been largely overlooked in the literature on economic growth and demography: the role of conflict and war. This paper underlines a long-term effect of an aging population in the 21st century that has not received sufficient attention: its role in reducing the factors that contribute to conflicts and war.

This paper emphasizes the relationship between aging, population growth, and conflict. I present a new framework in which fertility rates and the probability of conflict are endogenously determined, leading to multiple equilibrium outcomes. The core idea is that high fertility rates increase the likelihood of conflict through the "youth bulge" effect. Conversely, war and conflict—by causing high mortality among young men—lead families to increase birth rates. This reciprocal dynamic generates multiple possible equilibria.

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[1] see Brezis and Krugman, 1993, 1997; Ang and Madsen, 2015, and also Brezis and Rubin, 2023.

[2] Indeed, in countries with an aging population, some of the capital has to be redirected to health, but this would then increase the level of innovations in health care (see Blossfeld et al., 2011, and Goldstone, 2002). On the effects of transfers in an economy with low fertility rate, see Lee and Mason (2014) for a synthesis on this subject.

As a result, the world faces regional disparities in conflict, population growth, and aging. On the one hand, some countries are characterized by low fertility rates, an aging population, and high capital accumulation, with low probabilities of conflict. On the other hand, regions such as parts of Africa and the Middle East—with high fertility rates and young populations—remain more prone to conflict.

The core relationship in this research is that an aging population is the consequence of fertility decisions. A country with a high fertility rate will have a low median age and a small proportion of elderly people. Conversely, a low fertility rate leads to a higher median age and a growing aging population. Therefore, any demographic analysis of aging or median age is inherently a discussion about fertility rates.

The model relating aging and fertility rates to war and conflict is built on two key mechanisms. First, fertility rates are influenced by the presence of conflict. When families anticipate a high probability of losing children to violence, they tend to have more children, since mortality rates influence fertility decisions.

Second, high fertility rates, in turn, affect the probability of conflict. A high fertility rate lowers the median age of the population and increases the proportion of young people. The literature on the *youth bulge* phenomenon suggests that a large cohort of young adults contributes to the emergence and intensity of armed conflicts and insurgencies. Indeed, young men have been identified as a demographic group that is more easily mobilized for violence (see Urdal, 2006; Cincotta et al., 2003). Empirical data from this literature show a strong correlation between a high proportion of young people and the outbreak of political violence and warfare.

In addition to the youth bulge effect, older populations tend to prioritize stability and are less likely to engage in or support violent uprisings. Aging societies often adopt more conservative and risk-averse policies, as older voters typically favor stability over radical change. In consequence, low fertility rates and an aging population reduce the likelihood of internal conflicts and civil wars.[3]

As a result of these two mechanisms, we get that the probability of conflict is an increasing function of fertility rates, which, in turn, is influenced by the presence of conflict and war—leading to multiple equilibrium outcomes.

The first part of this paper presents empirical data illustrating the interconnectedness of these variables, while the second part explores the underlying mechanisms behind these correlations. I present a model in which the probability of

[3] On the other side there is a literature that claims that older population which leads to more stable governance, might also slow down necessary reforms, potentially leading to political gridlock (see Jackson and Howe, 2008; and Goldstone, 2010). Moreover, countries with rapidly aging populations might face challenges in maintaining their military capabilities. This could alter the balance of power regionally and globally, potentially leading to conflicts as power vacuums or shifts occur (see National Intelligence Council, 2012). However, advancements in AI and robotics will render this possibility largely irrelevant.

conflict increases with fertility rates, while fertility itself is influenced by the presence of conflict—resulting in multiple equilibrium outcomes.

The paper is structured as follows: Section II reviews the relevant literature, Section III presents empirical evidence, Section IV introduces the model, and Section V concludes.

II. Related Literature

The literature reviewed in this section is vast. Since an aging population is the result of low fertility rates, we focus on the literature related to fertility rates. We begin with studies that examine the impact of fertility rates on the economy and society. Next, we focus on research highlighting the relationship between fertility rates, violence, and conflicts. We start by reviewing the literature on the effects of fertility rates on households and economic growth.

A. Fertility Rates and the utility function - the sibship size effect

The standard economic model which introduces fertility rate in the utility function is based on Becker, (1960). Becker has included in the utility function an altruistic sentiment towards children, and therefore the number of children affects positively the utility of the family. This element is enough to find a positive relationship between conflicts and fertility rates, since war reduces the number of children alive.

However, there is also a whole literature which emphasizes that there are also negative effects to the number of children on the family's utility. Indeed, the medical literature points out the negative effects of family size on the formation of the sibling's human capital, and the effect of the number of siblings on the health and intellectual development of a child has been termed the "sibship size effect". There are two major components that can be distinguished. The first is deteriorating health, emphasized in the medical literature, while the second, retarding intellectual development, is mainly emphasized by the psychological literature.

Regarding the medical literature, it points out "the negative consequences for health due to crowding and greater exposure to diseases, such as measles, chicken pox and diarrhea" (Desai, 1995, p.198). For instance, Aaby (1988) and Aaby et al. (1984) have shown that in poor countries the addition of a sibling aged less than five years has a statistically negative impact on the child's height-for-age, which is a good proxy for children's overall health. Moreover, larger families appear "to increase the child's risk of contracting the infection and the severity of the infection among those who do

become ill". Thus, larger families appear to induce adverse long run effects on health and human capital.[4]

Another reason for such negative effects is mothers' sickness, indirectly hindering the development of children. Recent research has shown that ultra-orthodox Jewish women in Israel, England and the US, who have on average more than seven children, are more often sick, and cannot take care of their children as well as healthy women (Taha et.al, 2001; Strauss, 2007; Wright et. al, 2010).

Independently of this source of educational deficiency, a negative influence of family size on the emotional and intellectual development of the children has been pointed out by psychological literature, which focuses on the effects of family size on the emotive and intellectual development of children.

In other words, sibship size leads to "resource dilution theory", negatively affecting the health and intellectual growth of children, and in consequence big families lead to lower intellectual performance. The literature also stresses that there are scale diseconomies in housekeeping, so that the time left for education is a decreasing function of sibship size. In consequence, while the standard theory of the family emphasizes only the positive effect of the number of children on the well-being of the family, the medical and psychological literatures show that through the 'sibship size effect', size of a family negatively affects the well-being of the whole family.

B. The various theories relating poverty, war and conflicts to fertility rates

There is a vast literature that explores the relationship between higher fertility rates and the probability of conflicts and war. First, I start by presenting the 'youth bulge theory'. Then, I present also the Malthusian pressures and resource competition, since high fertility rates can lead to rapid population growth, which in turn increases resource scarcity leading to competition on resources such as land, water, and food, which might contribute to conflict. The third element relating fertility rates to violence and conflicts is that as predicted by the Solow model, higher fertility rates lead to lower capital, lower infrastructure leading to weakened state capacity. We start with the Youth Bulge theory.

B1. The Youth Bulge theory of conflicts

Youth bulges are typically defined as large cohorts of individuals aged 15–29 relative to the total adult population (15+).[5] As fertility rates rise, the proportion of the aging population declines, while the share of young people aged 15–29 increases.

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[4] Guo and VanWey (1999) also show that an increasing number of siblings lowers intellectual performance. They do so by testing the effects of sibship size on cognitive abilities of children, and show that increasing the number of siblings lowers intellectual performance on reading achievement and mathematics tests.

In sociology, extensive literature links youth bulges to crime and conflict. Indeed, Urdal (2006) emphasizes that a youth-heavy population can contribute to political instability, social unrest, and violent conflict.

Urdal also conducted econometric analyses on the impact of youth bulges on political violence, finding significant results: youth bulges increase the risk of armed conflict and terrorism. Similarly, empirical research by Brooks et al. (2018) shows that countries with a high proportion of young people are more likely to engage in interstate conflicts than those with smaller youth populations. The work of Cincotta et al. (2003) show similar results. Moreover, Cincotta and Weber, 2021, shows that as the median age decreases, the probability of war and conflict increases.

In consequence, their findings indicate that aging societies are the least likely to initiate international conflicts, whereas youth-dominated populations have been linked to civil wars, terrorism, and revolutions, particularly in regions such as Sub-Saharan Africa and the Middle East.

What are the key factors highlighted in the literature that explain this relationship? The first set of factors relates to biological and physical attributes, particularly hormones and physical strength. Research suggests that young men are more prone to aggression due to high hormone levels (Goldstein, 2004). At this age, they are also more inclined toward combat. Studies have consistently shown that young males are the primary perpetrators of criminal violence (Neumayer, 2003) as well as political violence (Mesquida & Wiener, 1996).

The second set of factors is socioeconomic in nature. In many countries with high fertility rates, inadequate infrastructure - including the lack of sports and recreational facilities—is a common issue. As emphasized by the Solow model, high fertility rates contribute to lower capital stock, resulting in resource scarcity, poverty, low wages, and high unemployment. This economic hardship makes young populations more vulnerable to frustration and increases their susceptibility to recruitment by militant groups or participation in civil unrest.

Additionally, large youth cohorts facing institutional bottlenecks and unemployment tend to concentrate in urban centers, heightening the risk of political violence (Choucri, 1974). When young people are left with few opportunities beyond poverty and joblessness, joining a rebellion or militant movement can become an attractive alternative source of income.[6] Collier (2000) argues that higher levels of

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[5] Some studies define the *youth bulge* as the proportion of individuals aged 15–24 relative to the adult population, rather than the 15–29 age range used in other analyses.

[6] Choucri (1974) claims that the more heavily urbanized, the more such countries are likely to experience Dickensian poverty and anarchic violence. In good times, a thriving economy might keep urban residents employed and governments flush with sufficient resources to meet their needs. More often, however, sprawling and impoverished cities are vulnerable to crime lords, gangs, and petty rebellions.

education among men help reduce the risk of political violence by increasing the opportunity cost of rebellion for educated individuals.

The *youth bulge* phenomenon is not unique to the modern world. Goldstone (1991, 2002) shows that youth have played a significant role in political violence throughout history, from the English Revolution to the Revolutions of 1848. He highlights that the presence of a *youth bulge* has historically been linked to periods of political crisis. Similarly, Möller (1968) attributes the economic depression in Germany to the emergence of large unemployed youth cohorts, which contributed to the rise of Nazism (pp. 240–244).

Urdal emphasizes that the *youth bulge* has become a widely accepted explanation for political instability in the Arab world. He cites Zakaria (2001, 2003), who suggests that the *youth bulge* was one of the underlying causes of both the September 11, 2001 attacks and the Arab Spring. The high proportion of unemployed young people played a crucial role in fueling uprisings across the Middle East and North Africa.

There is an ongoing debate regarding the nature of this relationship between youth bulge and conflicts—whether it follows a concave or convex pattern. Scholars such as Heinsohn (2003) and Huntington (1996) argue that when the youth bulge exceeds 40% of the total population, the likelihood of conflict follows a convex trajectory, increasing at an accelerating rate. In my model, reasonable assumptions lead to a convex, and then concave pattern.

B2. Fertility rates and war – The Malthusian and Marxian views

Malthus views on population derive from the assumption that human behavior is driven by nature, and men will have as many children as nature gives them the possibility of sustaining. Malthus maintained that "There is no reason whatever to suppose that anything besides the difficulty of procuring in adequate plenty the necessaries of life should either indispose this greater number of persons to marry early or disable them from rearing in health the largest families" (Malthus, 1970, p. 243). His theory on population is related to the checks as presented by Flew (1970, p. 47): "Population will always grow until there is enough misery or enough vice or more likely a sufficient mixture of both to achieve equilibrium."

In other words, since population, if not "checked", will increase by more than food production, disequilibrium will arise. When the population of a nation reaches the limit of its food production possibilities, there are only two ways to maintain equilibrium: positive checks or preventive checks, or both. The positive checks are moral restraints, while the preventive checks are war and epidemic.[7] So for Malthus, high fertility rates can lead to war and conflicts through lack of resources.

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[7] As Malthus put it: "Moral restraint is the only mode of keeping population on a level with the means of subsistence which is perfectly consistent with virtue and happiness" (Malthus, 1970, p. 250).

Marx was concerned with the Malthusian view on population growth. He wrote that: Malthus's "general laws of nature" as a "sell-out" to the bourgeois. As he put it: "This baboon [Malthus] thereby implies that the *increase of humanity* is a purely natural process, which requires *external restraints, checks* to prevent it from proceeding in geometrical progression" (Marx, 1973, p. 606).

For Marx, man *controls* nature: "Man therefore is able to control nature consciously and make his own history. It is this ability that allows him to produce beyond subsistence, and which guarantees that he will not have subjected to the dilemma that Malthus has described" (Wiltgen, 1981, p. 109).

So why would families have so many children leading to a sibship size effect and to conflicts?

For Marx, children were considered a necessity for survival; they were a *production* good. More precisely, the Marxian view suggests that the proletarianization of the workforce brings on a fertility increase, since the working masses attempt to accumulate the one factor of production over which they do have control: labor power. Marx claimed that family size is inversely related to real wages. As he wrote, "In fact…the absolute size of the families stands in inverse proportion to the height of wages" (Marx, 1976, pp. 796-7), and claimed: "In order that the family may live, four people must now not only labour, but expend surplus labor for the capitalist…Previously, the workman sold his own labor power, which he disposed of nominally as a free agent. Now he sells wife and child. He has become a slave dealer" (Marx, 1967, p. 395).

Child labor is essential for understanding Marx view on fertility rates, wages and conflicts, and child labor in the nineteenth century amounted to a significant part of the workforce. It is also a phenomenon which appears in countries where fertility rates are high. It leads gangs to have power over young children from a low age.

III. The Facts

There are four key demographic variables relevant to this analysis, and they are presented in Table 1.

The first is the *fertility rate*, which represents the average number of children per woman and ranges from 0 to 8. At the lower end, we find countries such as China and South Korea with a fertility rate of 1.1, and Japan at 1.2. In Europe, Italy and Greece stand at 1.3. At the higher end, Niger and Somalia have a fertility rate of 6.1, while Gaza had a fertility rate of 6.2 from 1990 to 2010.

The second variable is the *median age* of the population. This ranges from as low as 15-18 in high-fertility countries such as Niger, Nigeria, Somalia, Yemen and Gaza, to as high as 50 in countries like Italy and Japan.

The third variable is the *birth rate*, measured as the number of births per 1,000 people. This varies from 45 in Niger to just 7 in Italy, China, and Japan. The fourth variable is the *youth bulge*, defined as the proportion of the population aged 15–29 relative to the total adult population (15+). This percentage varies significantly, from 50% to just 15-20% in many European nations.

Demographic patterns vary widely between countries. However, the various variables are highly correlated. Most countries either exhibit a high youth bulge, high fertility rates, high birth rates, and a low median age, while others display the opposite trend—low youth bulge, low fertility rates, low birth rates, and a high median age, and high percent of aging population.

Table 2 explores the relationship between these demographic variables and the likelihood of conflict. It summarizes findings from Cincotta and other political demographers, showing that countries with younger populations are particularly prone to civil unrest.

In the following section, we present a model that explores the relationship between demography and conflict. The central idea is that there are two primary equilibrium outcomes: one characterized by low fertility rates, high median age and a low probability of conflict, and the other by high fertility rates, low median age, and a high probability of conflict. While some countries fall in between these two extremes, they are typically on a transitional path—either moving toward higher fertility and increased instability, or toward lower fertility and greater stability, as has been observed in many countries over recent decades.

IV. The multiple equilibria model

The multiple equilibria model is based on two equations that define the relationship between the two endogenous variables, and their dynamics interactions. [8] In this paper, the two variables are: the probability of war, $\pi \leq 1$ and n, the number of children per family, also referred as the fertility rate.

We start by examining how the probability of war influences fertility rates.

A. Part 1: Fertility rates as a function of wars and conflicts

In the literature on economic growth and population dynamics, one can find many versions of the canonical model developed by Becker (1960). I present a simple model based on Baland (1999) and Brezis (2001, 2010), which makes it easy to add assumption on the effects of war on fertility rates.

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[8] The idea of multiple equilibria was developed by Murphy et al. (1989, followed by Krugman (1991), and see also Brezis and Krugman (1996) and Benassy and Brezis (2013).

The framework of the model is dynamic in the sense that there is a continuity of generations; each generation of individuals lives two periods: first as children and second as adults. When agents are adults, they work, consume, and raise children.

In the first period of life, agents are children who first live with their parents, work, and consume. They do not take decisions while children. Then, in the next period they get their own income.

The utility function of the parent, W_p is a function of its own consumption, C_p and the utility function of each child, *W*.

$$W_p = U(C_p) + n(1-\pi)\delta W(C_c)\,. \tag{1}$$

where *U* and *W* are both twice continuously differentiable, strictly increasing and strictly concave. $\delta < 1$ is a parameter measuring the extent to which parents are altruistic, and *n* is the number of children parents have raised. Children when young adults can then be affected by war. So, while the parents raise n children, the number of children which stayed alive as adults is not n, but $n(1-\pi)$, when π is the probability of war. In other words, the children staying alive are represented by the variable: $n(1-\pi)$.

The budget constraint of the parent is:

$$C_p = A + nwl_c - \sigma n\,. \tag{2}$$

where A is the income earned by the parents; σ is the cost per child; w are the wages earned by children; l_c is the number of hours children are working, and $1-l_c$ is the time children invest into increasing their human capital.[9] An increase in human capital leads to higher productivity in the next period.

Children live two periods as individuals. In the first period, they get σ from their parents, and in the second period, when the child is already an adult, he is independent and gets to keep all his salaries, so that consumption is determined by his income.[10] The income of the child being now an adult is, among other elements, a function of how much his health has been deteriorated during his childhood.

Based on the literature, we assume that health deterioration is due to three elements: number of working hours, the size of the family, i.e., the sibship effect discussed above, and conflicts. Therefore, income is a positive function of the number of children, n and a non-linear function of hours worked, l_c, and consumption equals income, so we get:

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[9] In most models, A is exogenous, since it is based on past decisions.

[10] To keep this framework simple, I assume σ to be exogenous, and not included in total consumption. Moreover, for matter of simplicity, w is constant, and I omit the human capital function.

$$C_c = I - \lambda n l_c^2 . \tag{3}$$

where λ is an exogenous parameter emphasizing cultural and social elements, as conflicts that could influence health deterioration, and is not linked properly to the parameters endogenous to the family. To make the model simple, we do not include the element of conflict in this equation.

Parents choose the number of children they will raise, n, and the amount of child labor, l_c which maximize the utility function in equation (4):

$$W_p = U(A + nwl_c - \sigma n) + \delta n(1-\pi)W(I - \lambda n l_c^2) . \tag{4}$$

The two first-order conditions with respect to l_c and n respectively are:

$$U'(C_p)w = 2n\delta\lambda l_c W'(C_c) . \tag{5}$$

and

$$U'(C_p)[wl_c - \sigma] + \delta(1-\pi)W(C_c) = n(1-\pi)\delta\lambda l_c^2 W'(C_c) . \tag{6}$$

How an increase in the probability of war, π is affecting the optimal number of children in a family?

From equation (6), and assuming for simplicity, that utility functions are linear, we get that: [11]

$$n = \frac{\Omega}{(1-\pi)\delta\Lambda} + \frac{I}{\Lambda} . \tag{7}$$

where

$$\Omega = wl_c - \sigma \qquad and \quad \Lambda = 2\lambda l_c^2 . \tag{8}$$

So:

$$dn/d\pi = \frac{\Omega}{(1-\pi)^2\delta\Lambda} > 0 \quad \text{and} \quad d^2n/d\pi^2 > 0 \quad \text{since} \quad 0 \le \pi \le 1 \tag{9}$$

Proposition 1

As the probability of war increases, families tend to have more children, and this effect becomes stronger as the probability of war continues to rise.

[11] In case they are not linear, taking the total derivative, we get the same results on the sign of the derivative.

Figure 1 illustrates the effects of the probability of war and conflict (π) on fertility rates, n. From equation (9), this relationship is convex, so that if we had plot the probability of conflict (π) on the x-axis and the fertility rate (n) on the y-axis, the curve would appear convex. However, we present the figure with the axes reversed—fertility rates on the x-axis and the probability of conflict on the y-axis—resulting in a concave curve.

We now turn to the reverse relationship in the model, analyzing how fertility rates influence the likelihood of war and conflict.

B. Part II: Conflicts as a function of fertility rates

The literature and data presented in Sections II and III highlight several key facts that I incorporate into the model. This framework builds on Becker's model of crime (Becker, 1968), and what follows is a specific version of that structure tailored to our context.

Let us focus on young people, those who make up the *youth bulge*. The size of this group is denoted by y, and is determined by fertility rates approximately 15 years earlier. Therefore, we assume that the number of young people, y, is a linear function of the fertility rate, n.

$$y = \beta n \,. \tag{10}$$

We assume that individuals face a choice between two options: engaging in regular employment, where they earn a wage w,[12] or joining a gang, mafia, or terrorist organization, where they obtain income through violent activities.

Income derived from crime and conflict is uncertain. There is a probability of success, in which individuals earn more through illicit activity than through regular work. However, there is also a risk of failure, including the possibility of being caught and arrested.

The probability of success, denoted by p, depends on three key factors. First, it is influenced by the size of the youth group, y - the larger the group, the greater the likelihood of success.

Second, it is affected by the age of the group. Younger individuals, due to higher hormone levels and lower risk aversion, are more likely to engage in violent behavior. As a result, a group composed of younger individuals tends to be more aggressive and effective in conflict than one composed of older individuals (e.g., age 40 and above).

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[12] The salary w, is low, due to lack of capital, and infrastructure. This is an important effect of high fertility rates: lack of capital, and human capital, so that wages are low, and unemployment is high.

Third, the probability of success is negatively influenced by the strength of the repressive forces, denoted by *R*, which tends to increase in response to rising crime rates.

The first two factors—group size and age—are directly tied to the youth bulge. Therefore, the probability of success is modeled as an increasing function of *y*, specifically proportional to y^2, while being inversely related to *R*. This relationship is formalized in Equation (11).

$$p = G - fR = \xi y^2 - fR \tag{11}$$

What factors influence the level of repression, *R*? Higher levels of crime and greater success in criminal activity (*p*) typically lead to an increase in policing and enforcement efforts, aimed at curbing violence and restoring order. In his analysis of the costs of apprehension, Becker (1968) posits that the level of repression, *R*, is also an increasing function of the size of the criminal group, *y*. Larger gangs or violent groups require more substantial enforcement responses, leading to higher levels of repression.

Taking these elements into account, we model the repressive forces *R* as a function of both the size of the youth group (*y*) So, the repressive forces, R are expressed in the following equation:

$$R = tGy = t(\xi y^2)y = t\xi y^3 . \tag{12}$$

In consequence we get that the probability of success, p, takes the form:

$$p = \xi y^2 - fR == \xi y^2 - ft\xi y^3 . \tag{13}$$

Moreover, the probability of conflict is directly related to the probability of success (*p*). This relationship is intuitive: individuals are more likely to join gangs or militant groups when the expected gains—i.e., their share of the spoils—are high. As the likelihood of success increases, so does the incentive to participate in violent activities, thereby raising the overall probability of conflict. So, the probability of conflicts is a function of the probability of success:

$$\pi = \gamma p . \tag{14}$$

Taking into consideration equation (10), we then get that the probability of conflict, as a function of fertility rates take the form:

$$\pi = \gamma\xi(\beta n)^2 - \gamma ft\xi(\beta n)^3 = an^2 - bn^3 . \tag{15}$$

Equation (15) shows that an increase in fertility rates leads to a higher probability of war. This effect intensifies as fertility rates rise, resulting in a convex relationship. However, when fertility rates become extremely high and the probability of conflict reaches elevated levels, repressive forces respond by increasing significantly. This heightened repression dampens the effect, causing the relationship to shift from convex to concave. Figure 2 illustrates this dynamic, showing the relationship between fertility rates and the probability of war and conflict as described by Equation (15).[13]

C. Part III: The Multiple Equilibria model

In part I, we have shown how the probability of war, π affects the fertility rates, n. as shown by the red curve in Figure 1. In Part II, we explored the reverse relationship: how the probability of war, π, depends on fertility rates, n represented by the purple-black curve in Figure 2. We now bring these two relationships together into a unified framework.

Figure 3 displays both curves simultaneously, revealing the existence of three equilibrium points: marked in green, black, and red. Let us show that the green equilibrium, with low fertility rates and low probability of conflict is stable, as is the black equilibrium, with high fertility rates and high conflict probability. The red equilibrium is unstable.

To understand the model's dynamics, consider a point just above the green equilibrium in Figure 3. At a conflict probability of π_o, the red curve indicates that individuals choose to have n_0 children. However, at n_0, the corresponding probability of conflict according to the black curve, is only π_2. which is lower than π_o. As a result, fertility rates continue to decline, and the system moves leftward, to the green equilibrium - leading to lower fertility rates and reduced conflict probability.

Now, consider a point just to the left of the black equilibrium. At π_3, the red curve suggests that individuals will opt for n_3 children. However, at n_3, the corresponding probability of war rises to π_4, which is higher than π_3. Consequently, the system moves rightward, towards the black equilibrium - leading to increasing fertility rates and a rising probability of war.

Thus, the model predicts two stable equilibria (green and black) and one unstable equilibrium (red). Over time, each country gravitates toward one of the two stable equilibria: either a state of low fertility rates and low conflict probability or a state of high fertility rates and high conflict probability.

This leads to the following proposition:

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[13] For instance, a function depicted in Figure 2 can be based on the following form: 0.18x^2-0.03x^3.

Proposition 2

The model predicts distinct regional patterns in population growth and conflict. Some countries will exhibit high aging population, low fertility rates and a low probability of conflict, while others will experience low aging population, high fertility rates alongside a high likelihood of conflict.

The world appears to be divided into distinct regions: parts of Africa and the Middle East are stuck in the unfavorable "black" equilibrium, characterized by high fertility rates, a low aging population, and frequent conflicts. In these countries, capital per capita is low. In contrast, Europe and certain Asian countries have reached the "green" equilibrium, marked by low fertility rates, an aging population, and a low probability of war. The other countries are on their path to one of these equilibria.

V. Conclusion

Historically, demographic perspectives have generally viewed population growth as a positive force. The first blessing given to Abraham was: *"Go forth and multiply."* Similarly, Malthus argued that humans would have as many children as nature allowed them to sustain.

While larger populations have traditionally been associated with economic strength and expansion, the neo-classical growth models have emphasized the negative effects of population growth due to the quantity-quality tradeoff, and to the necessity of high capital per capita. Indeed, capital accumulation is essential for development, and rapid population growth can dilute both physical and human capital. As a result, population growth negatively impacts economic growth by reducing capital per capita and limiting investments in education.[14]

Yet, this conclusion overlooks a crucial factor that has been largely ignored in the economic growth literature: war and conflict. This paper emphasizes that high fertility rates are not only economically challenging but also significantly increase the likelihood of violent conflict. In contrast, low fertility rates and an aging population are strongly associated with greater political stability and a reduced risk of conflict.

Empirical data support this relationship. Countries with high fertility rates, defined as more than five children per woman, which correspond to a median age lower than 20, have a 75% probability of experiencing conflict. In contrast, countries with fertility rates below two children per woman (and median age above 45) exhibit a conflict probability of less than 8%.

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[14] However, the new growth theory highlights the importance of population size (and not population growth), in driving innovation. As noted in most economic growth textbooks, sustained economic growth is primarily generated through technological progress, which depends on a larger pool of researchers—requiring a sizable global population.

This study explores the bidirectional relationship between demography and conflict. It introduces a new framework in which fertility rates and the probability of conflict are endogenously determined, resulting in multiple equilibrium outcomes. The central idea is that high fertility rates increase the likelihood of conflict due to the "youth bulge" phenomenon. In turn, war and conflict—by causing high mortality among young men—can lead families to raise their birth rates as a form of demographic compensation. This self-reinforcing dynamic gives rise to two distinct equilibria: one characterized by high aging population, low fertility and low conflict, and another by high fertility, low aging population and high conflict.

The existence of multiple equilibria in this model implies that policy interventions can help shift a country from one equilibrium to another. Specifically, appropriate policies could transition a nation from a cycle of high fertility, high crime, low capital accumulation, and poor infrastructure toward a stable state of low fertility, reduced conflict, and increased investment in education and development.

In this paper, I excluded policy variables, such as social norms and religious influences, to focus exclusively on the two core endogenous variables: fertility rate and conflict probability. However, incorporating these additional factors into the model is feasible, and it would enable the identification of concrete policy levers that influence the system's dynamics and long-term equilibrium.

I will conclude this paper by raising some questions about past history. Moller, (1968), claimed that economic depression in Germany led to unemployed youth cohorts which contributed to the rise of Nazism in Germany. Could the same be said of the French revolution?

It is well-documented that the revolution was a revolt of the poor against the wealth of the nobility and religious elite. But have we overlooked the role of the youth bulge in fueling this upheaval? We know that the *gilded youth* (*jeunesse dorée*) played a significant role in the counter-revolution. Perhaps history has erased the demographic pressures behind the political turmoil of the 18th and 19th centuries.

As a final thought, I conclude with a last question. After reading this paper, would any scholar still lament an aging population, characterized by highly educated and healthy children, and no conflicts, and instead advocate for societies with youth bulges, low education, and a high probability of war?

TABLES and FIGURES

TABLE 1
Demographic Variables on various countries

	Median Age	Fertility Rate	Birth rate (/1000)	Youth Bulge (%)
Burkina Faso	17.7	4.2	35	55
Gaza	16	5.2	40	49
Mali	15.7	5.6	42	51
Niger	15.6	6.1	45	36
Nigeria	18.1	4.5	37	51
Yemen	18.4	4.6	30	48
Somalia	15.6	6.1	44	51
Greece	46.8	1.3	8	14
Italy	50.0	1.3	7	17
Israel	29.2	2.9	20	30
Japan	49.8	1.2	7	18
US	38.5	1.6	11	20
China	40.1	1.1	7	20
South Korea	44.5	1.1	5	15
France	42.3	1.7	11	21

Sources: World Bank and Statista.

TABLE 2

FERTILITY RATES, BIRTH RATES AND PROBABILITY OF CONFLICTS

Birth Rates 1985-1990	Probability of conflict 1971-1980	Probability of conflict 1981-1990	Probability of conflict 1991-2000
45.0 or more	40%	45%	53%
35.0 to 44.9	29%	33%	34%
25.0 to 34.9.	22%	31%	24%
15.0 to 24.9	15%	10%	16%
Less than 15.0	2%	2%	5%

Fertility Rates 2001-2010	2001-2010	# conflicts world	# countries world
5 and more	75%	24	32
4 to 5	45%	10	22
3 to 4	24%	7	29
2 to 3	18%	13	71
0 to 2	8%	6	99
Total		62	253

Sources: Cincotta et al., 2003.and Amir Rubin's calculations

Figure 1: The effects of war on fertility rates

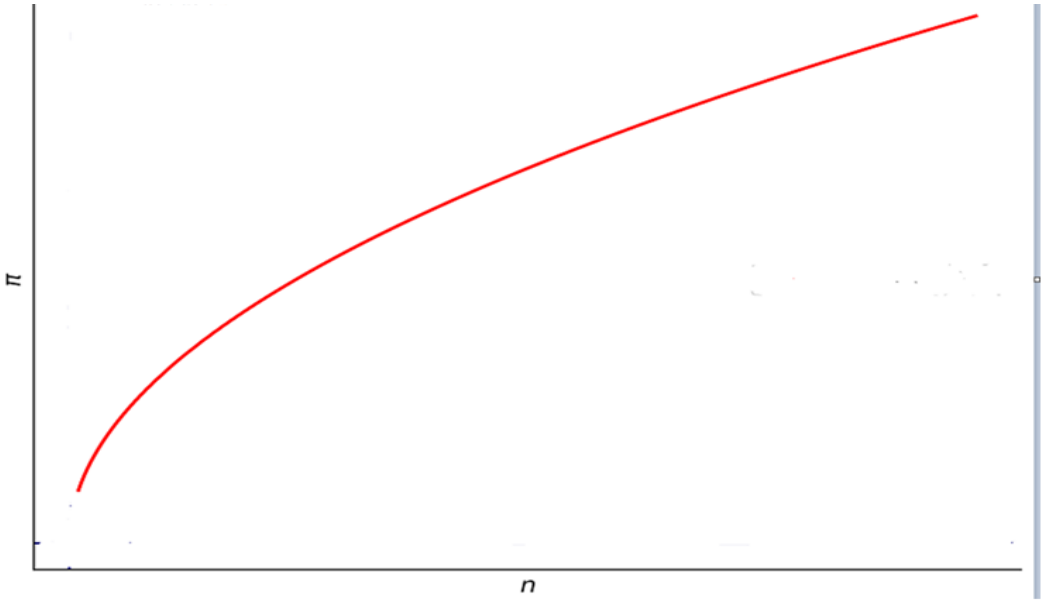


Figure 2: The Effects of fertility rates on the probability of war

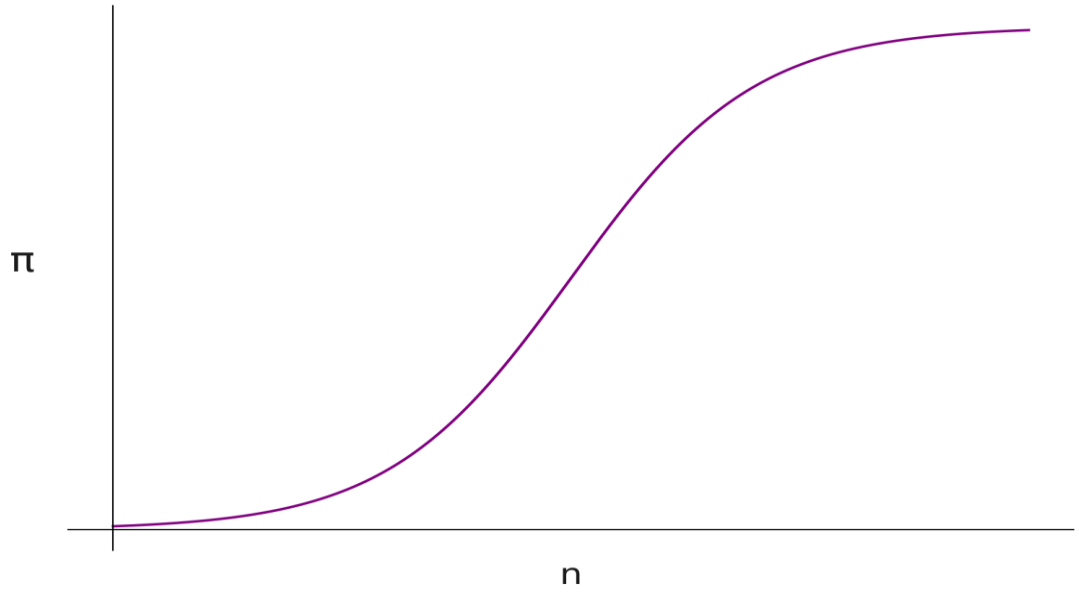
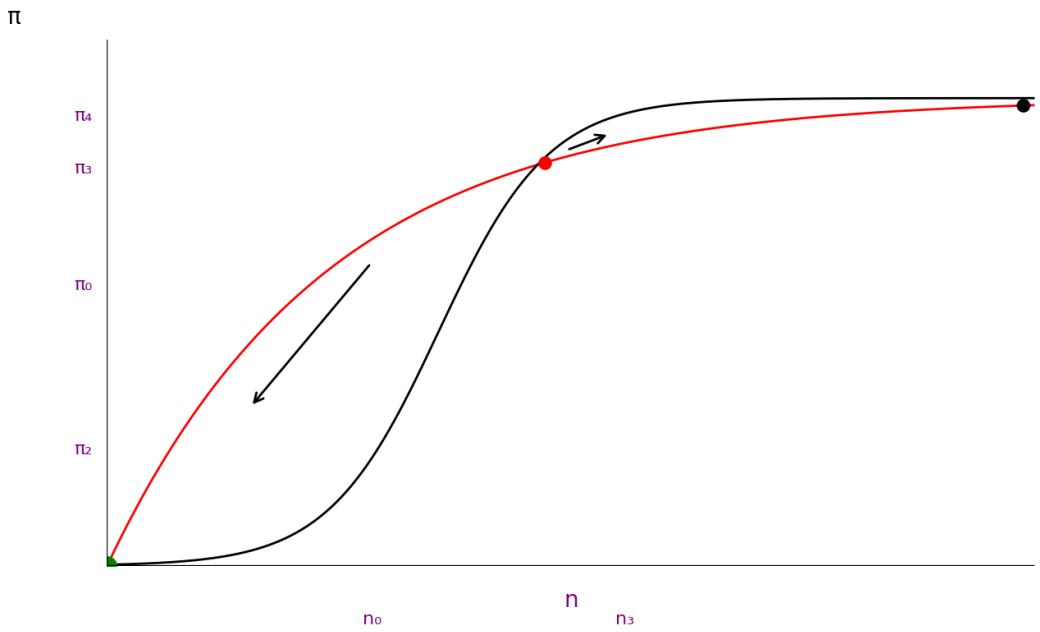


Figure 3: The three equilibria and dynamics towards an equilibrium



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