The Vicious Cycle between Demography and War

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Abstract

This paper highlights a vicious circle between demography and war. Countries face the choice between two possible equilibria. The first equilibrium is characterized by high fertility rates, a predominantly young population with a low median age, and a high risk of conflict.

In contrast, the second equilibrium is marked by low fertility rates, higher life expectancy, an aging population, and no *youth bulge* which increase the probability of conflict and war.

The data emphasize that countries with high fertility rates, above five children per woman, face a 75% likelihood of experiencing conflict. In contrast, countries with fertility rates below two exhibit less than an 8% probability of conflict.

This paper presents 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 due to the "youth bulge" phenomenon. Conversely, war and conflict—by causing high mortality among soldiers—motivate families to increase their birth rates. This reciprocal dynamic results in multiple possible equilibria.

As a result, the world faces regional disparities in conflict and population growth. On the one hand, there are countries characterized by low fertility rates, an aging population, and high capital stock, which experience low conflict probabilities. In contrast, there are regions such as parts of Africa and the Middle East, with high fertility rates and younger populations, which are more prone to conflict.

Keywords: aging population, war, conflicts, median age, fertility rates, youth bulge.
JEL classification: D64; D74; J13; J14; O40.

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I. Introduction

This paper analyzes the development and geopolitics of countries and highlights a vicious circle between demography and war. Countries face the choice between two distinct equilibrium paths.

The first equilibrium is characterized by high fertility rates, low levels of education and capital, a predominantly young population with a low median age, and a high risk of conflict.

In contrast, the second equilibrium is marked by low fertility rates, higher life expectancy, smaller, healthier, and better-educated families, significant investments in infrastructure, and an aging population. While an aging population is a natural consequence of low fertility rates, it mitigates the 'youth bulge' effect and in consequence reduces the probability of conflict and war and leads to development, peace and growth.

Empirical data from 1970 to the present, summarized in Table 1, emphasize that countries with high fertility rates, above five children per woman, face a 75% likelihood of experiencing conflict. These nations typically have large youth populations and low median ages. In contrast, countries with fertility rates below two face less than an 8% probability of conflict.

This paper seeks to explain the mechanisms behind this relationship. The findings underline the existence of a bidirectional relationship between demography and war: high fertility fuels conflict, and conflict, in turn, leads to high fertility rates. Building on models of multiple equilibria, I present a framework in which fertility rates and the probability of conflict are endogenously determined, leading to multiple equilibrium outcomes.

Let us begin by examining how high fertility rates can lead to war and conflict. High fertility rates result in a low median age and a high proportion of young adults aged 15–29, as observed in countries with high fertility rates (see Table 2). A large youth cohort—commonly referred to as a "youth bulge"—means a substantial segment of the population is in an age group associated with elevated hormone levels and physical vigor.

Sociological research has shown that young men are more prone to aggression due to these biological factors and are more likely to engage in violent behavior. Numerous studies have consistently demonstrated that young males are the primary perpetrators of criminal violence.

A second set of contributing factors is socioeconomic. In many countries with high fertility rates, infrastructure is often inadequate, which can exacerbate violent behavior. Furthermore, as highlighted by the Solow growth model, high fertility rates tend to reduce capital accumulation, leading to resource scarcity, poverty, low wages, and high

unemployment. These economic hardships increase frustration among the youth and heighten their vulnerability to recruitment by militant groups or involvement in civil unrest and armed conflict. Urdal (2006) and Cincotta et al. (2003, 2021) stress this effect on conflict. Based on these facts, we construct a small framework in which high fertility rates increase the probability of war, as illustrated in Figure 1.

The second part of this bidirectional relationship is that a high likelihood of war and conflict can, in turn, lead to high fertility rates. Armed conflict and violence result in high mortality among young men, prompting families to increase their birth rates as a form of demographic compensation. Additionally, when families are larger, the perceived cost of losing a child in conflict decreases. This relationship is depicted in Figure 2.

Combining these two parts, we get a dynamic interaction which generates multiple equilibria, as shown in Figure 3. Consequently, the model predicts distinct regions worldwide with varying levels of conflict and population growth. In some countries, low fertility rates and an aging population correspond with low conflict probability. In contrast, regions such as parts of the Middle East and Africa experience high fertility rates, a younger population, and a greater likelihood of conflict and war.

The model is built upon several interrelated layers and fields within economics, particularly those analyzing population dynamics and economic growth, as outlined in the related literature section.

The first layer is the neoclassical Solow model, which emphasizes that higher fertility rates reduce capital stock per capita, a key determinant of economic development and growth. Countries with low capital per capita tend to have low output per capita. As a result, high population growth - driven by high fertility rates - leads to slower economic growth and lower levels of development.[1]

The second layer of the framework concerns the relationship between individual economic decision-making and fertility behavior. This has been developed by Gary Becker in his model of altruism and the family, which endogenizes fertility decisions within individual utility-maximizing behavior.

The third component of the framework explores the effect of a youthful population on the incidence of political violence and warfare. The empirical basis for this link is found in the work of Urdal (2006) and Cincotta et al. (2003), who document the *youth*

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[1] It is important to distinguish between the effects of fertility rates and population growth versus the overall size of the population. While high fertility rates can strain resources and impede development, a larger population size can have positive effects, particularly in fostering innovation. New growth theory emphasizes that technological progress—the main driver of sustained economic growth—benefits from a large pool of researchers and a sizable global population. As widely noted in economic growth literature, innovation often scales with population size. Phelps (1968) captures this idea poignantly: *"One can hardly imagine, I think, how poor we would be today were it not for the rapid population growth of the past, to which we owe the enormous number of technological advances… If I could re-do the history of the world, halving population size each year, I would not do it for fear of losing Mozart in the process."* (pp. 511–12)

bulge effect. The theoretical framework that connects fertility rates to conflict draws upon Becker's model of crime, as described in the related literature section. The core idea is that high fertility rates lower the median age and increase the proportion of young people in a society—factors that elevate the risk of conflict.

In contrast, low fertility rates lead to an aging population. Older populations are more likely to prioritize stability and are generally less supportive of violent uprisings. In fact, aging societies may adopt more conservative and risk-averse policies, as older voters tend to favor continuity over radical change. As a result, an aging population can significantly reduce the likelihood of internal conflict and civil war. [2]

Building on these layers, Section IV presents a model in which the probability of 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 extensive. 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 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), which introduces in the utility function an altruistic sentiment towards children, and therefore the number of children affects positively the utility of the family. This elements is enough to find a negative relationship between conflicts and fertility rates, since war reduces the number of children alive.

However, I want to stress that there is also a whole literature which stresses that there are also negative effects of number of children on the family's utility. Indeed, the medical and sociological literature points out the negative effects of family size on the formation of the sibling's human capital, and more specifically on the level attained once the sibling has become an adult. This effect has been termed the "sibship size

[2] This can result in more stable governance but 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.

effect" (the sibship size effect is the effect of the number of siblings on the health and intellectual development of a child). There are two major components that can be distinguished. The first is deteriorating health, which is emphasized in the medical literature, while the second, retarding intellectual development, is mainly emphasized by the sociological literature.

Regarding the medical literature, health externalities constitute an important channel of influence of sibship size. This literature 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).

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.[3]

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 emotive and intellectual development of the children has been pointed out by the 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, psychological, and sociological literatures show that through the sibship size effect a size of the family has negative effects on the well-being of the whole family.

[3] 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.

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+).[4] As fertility rates rise, the proportion of the aging population declines, while the share of young people aged 15–29 increases.

In sociology, extensive literature links youth bulges to crime and conflict. One of the leading scholars in this field, Urdal (2006), emphasizes that a youth-heavy population can contribute to political instability, social unrest, and violent conflict.

Urdal 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).

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[4] 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.

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.[5] Collier (2000) argues that higher levels of 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, the German historian 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 Fareed Zakaria, 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 Gunnar Heinsohn and Samuel Huntington 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

[5] Choucri 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.

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.[6] So for Malthus, high fertility rates can lead to war and conflicts through lack of resources.

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. Indeed, child labor in the nineteenth century amounted to a significant part

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6 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).

of the workforce in some British industries. 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 2.

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.

Table 1 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 and a low probability of conflict, and the other by high fertility rates 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 vicious cycle model

The multiple equilibria model is based on two equations that define the relationship between the two endogenous variables, and their dynamics interactions.[7] 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), which makes it easy to add assumption on the effects of war on fertility rates.

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 adults can then be affected by war. So while the parents raise n children, the number of children which stayed alive as adult is not n, but $n(1-\pi)$, when π is the probability of war, and casualties. So the simplest way to define children staying alive is 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

[7] For models of multiple equilibria, see Krugman (1991), Murphy et al. (1989), Brezis and Krugman (1996) and Benassy and Brezis (2013).

time children invest into increasing their human capital.[8] 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.[9] 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.[10] 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:

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

where λ is an exogenous parameter emphasizing cultural and social elements, as conflicts that influence health deterioration, and is not linked properly to the parameters endogenous to the family. (In this version, 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?

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

[9] 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.

[10] See Brezis, 2006. In this version, conflicts are not leading to health deterioration.

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:

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

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.

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 plot the probability of conflict (π) on the x-axis and the fertility rate (n) on the y-axis, the curve appears 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 simplified version of that structure tailored to our context. [12]

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

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

[12] The appendix (next version) presents a structural model with four players, depicting a framework of insurrection as a strategic game between the government, young people, gangs, and the general public. This model builds on the work of Brezis and Verdier (2012), which originally framed insurrection as a game involving the government, insurgents, and the public. It is important to note that this adaptation is particularly well-suited to analyzing crime and internal violence driven by gangs, rather than traditional international conflicts. However, many contemporary international conflicts increasingly involve non-state actors such as terrorist groups and gangs, rather than being purely driven by nationalist agendas.

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,[13] 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).

Third, the probability of success is negatively influenced by the strength of the repressive forces, denoted by R, which tend 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:

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[13] The salary w, is low, due to lack of capital, and infrastructure.

$$R = tGy = t(\xi y^2)y = t\xi y^3 . \quad (12)$$

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

$$p = \xi y^2 - fR == \xi y^2 - ft\xi y^3 . \quad (13)$$

In the structural model involving all players, 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:

$$\pi = \gamma p . \quad (14)$$

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

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

Equation (15) shows that when fertility rates increases, there is an increase in the probability of war, and this effect becomes stronger as fertility rates increase and the relationship is convex. However, when fertility rate are very high, and the probability of conflict is very high, then the repressive forces increase so that the relationship moves from a convex one to a concave one. In Figure 2, we have drawn a graph of equation (15) which depicts the effects of fertility rates on the probability of war and conflicts.

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).[14]

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:

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

how the probability of war, π, depends on fertility rates, n represented by the 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:

Proposition 2

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

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 have a 75% probability of experiencing conflict. In contrast, countries with fertility rates below two children per woman exhibit a conflict probability of less than 8%.

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 low fertility and low conflict, and another by high fertility 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

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

TABLE 2
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.

Figure 1: The effects of war on fertility rates

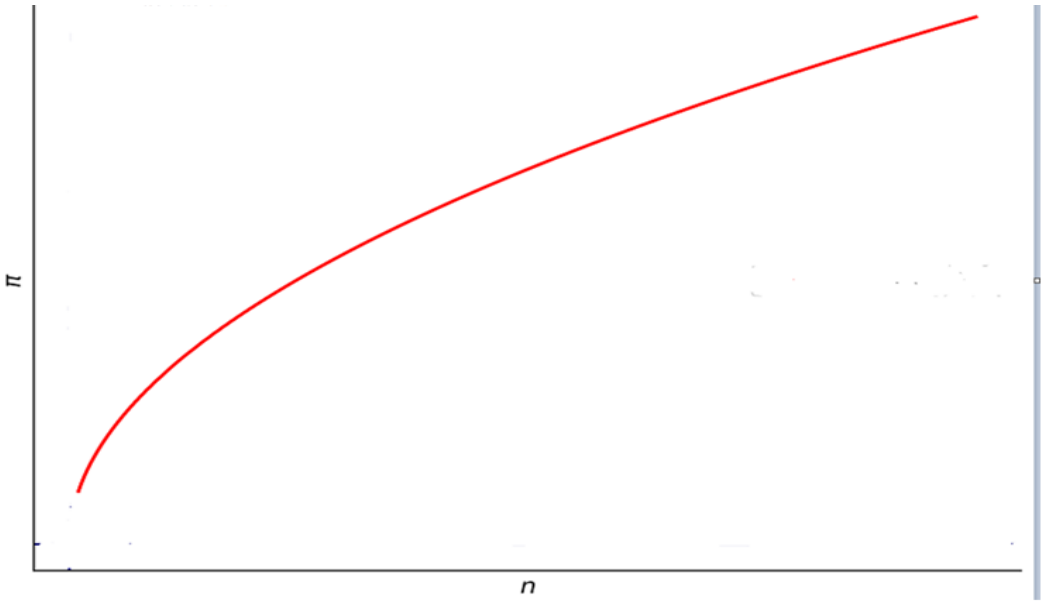


Figure 2: The Effects of fertility rates on the probability of war

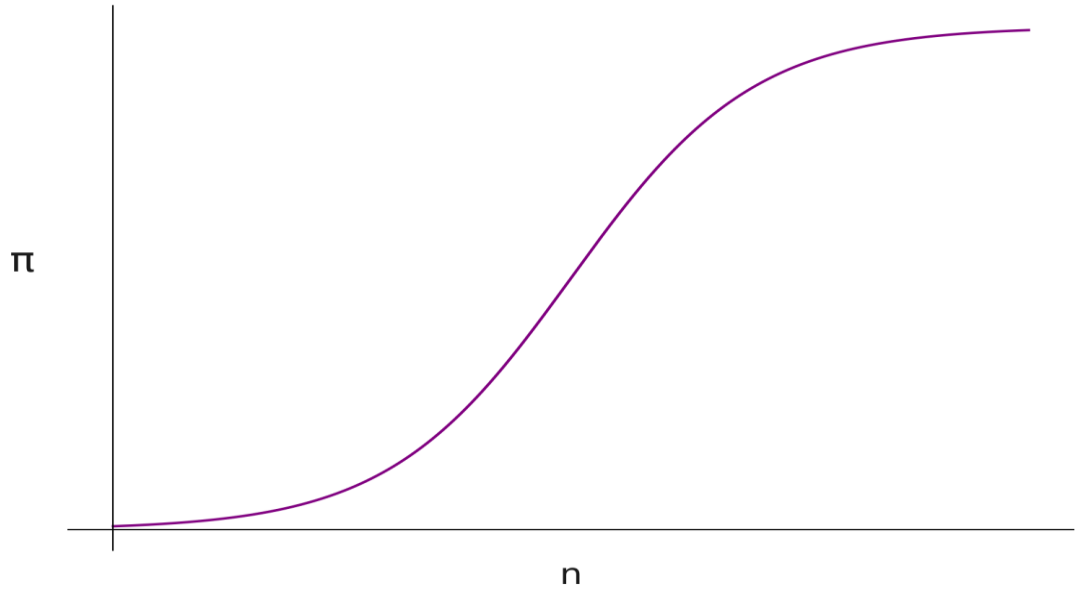
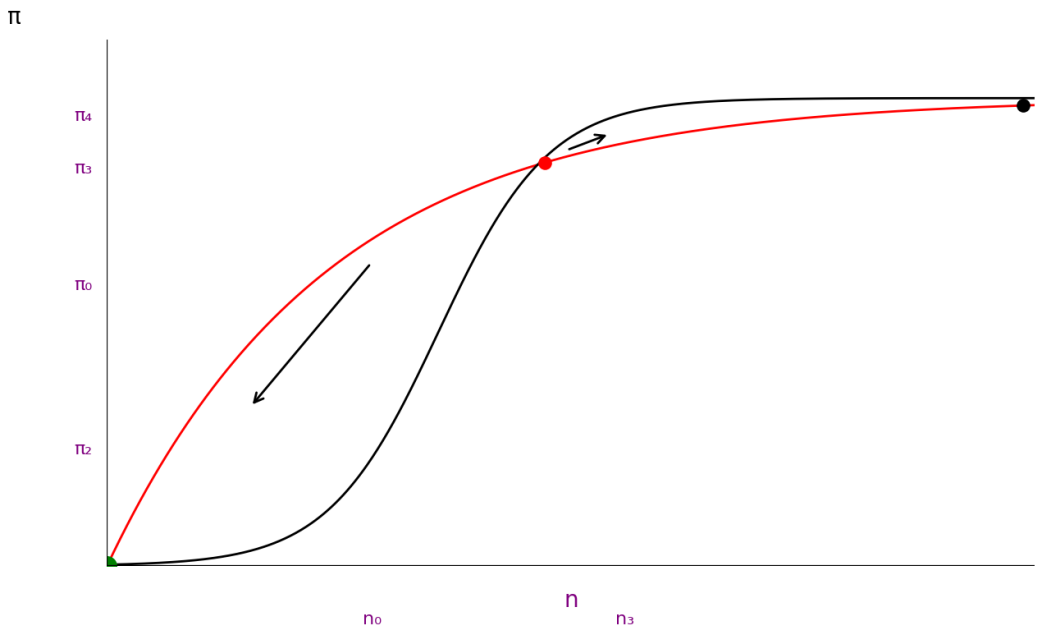


Figure 3: The three equilibria and Dynamics towards an equilibrium



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