Child as a (partly) positional good

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Abstract

One of the defining characteristics of modern societies is the negative relationship between fertility and income. While numerous factors contribute to this phenomenon, this study highlights the positional dimension of fertility, arguing that the utility parents derive from raising children depends, to a certain extent, on the status and success of their offspring within the community. This positional aspect can lead to reduced fertility, as parents may choose to limit the number of children to allocate sufficient time and financial resources to ensure their offspring achieve the desired social status. To examine this effect, we developed a formal model that demonstrates a negative relationship between income and fertility when households place high importance on positional considerations and believe that increased parental effort enhances their children's socio-economic status. The findings underscore that it is not merely the quality of the offspring that matters to parents but also how this quality translates into social status.

Fertility theory, positional goods, household behavior, resource allocation.

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1. Introduction

The decline in fertility is one of the defining and widespread characteristics of modernity: as human communities accumulate greater material income and wealth, they tend to have fewer children. This phenomenon is observable not only in time-series data, where it manifests over time, but also in cross-sectional data, indicating a negative correlation between income and fertility within societies. Given its prominence, the investigation of fertility decline has long been a central focus of social scientists, resulting in a substantial body of literature. However, despite significant progress, no comprehensive explanation has fully accounted for all aspects of the phenomenon.

Beyond its academic importance, this issue holds profound practical significance. Fertility trends and broader demographic dynamics fundamentally influence the structure of societies, the institutional landscapes - such as education and pension systems - the methods of production, the distribution of goods, and the pace of innovation (Turner, 2010).

This study aims to enhance existing fertility theories by introducing a novel explanatory factor. The central argument is that, from the perspective of parents, children can partially be regarded as positional goods. In other words, the benefits parents derive from having children—whether material or immaterial—are influenced by the social context, particularly the achieved social status of their children. To formalize this perspective, the study proposes the introduction of a "positional function", which enables the incorporation of positional considerations into a constrained optimization framework.

The remainder of the paper is organized as follows. The next section provides a concise review of the main theories addressing the relationship between fertility and income. This is followed by an introduction to the concept of positional goods, illustrated with a few brief examples. The proposed model is then presented and explained in detail. Finally, the concluding section summarizes the key arguments of the study and offers closing reflections.

2. The relationship between fertility and income - main theories

Theories seeking to explain the negative correlation between fertility and income have emerged primarily from three disciplinary perspectives: economics, evolutionary and behavioral sciences, and cultural evolution studies. This section presents the central ideas from these fields, concentrating on the most significant models and approaches given the extensive body of relevant literature. It is worth noting here that Doepke et al. (2023) highlight that within high-income countries, the negative relationship is no longer universally observable and, in some cases, has even turned positive. This underscores the issue's multicausal nature, as mentioned in the introduction, and suggests that the influence and magnitude of these determining factors may vary across different societies.

2.1 Economic models

The relationship between population and economic development has been a central concern in classical economics, with its conceptual framework largely attributed to Thomas Robert Malthus. Malthus sought to establish a link between agricultural land, its carrying capacity, and population growth. His central thesis posited that the amount of food produced serves as the upper limit for population size, with improvements in crop yields enabling larger populations. However, Malthus

argued that while food production could increase linearly at best, population growth could occur exponentially, potentially doubling every 25 years in the absence of food constraints. This discrepancy, according to Malthus, would ultimately tether consumption to subsistence levels, as any surplus in food production would be absorbed by faster population growth. Despite its insights, Malthus's theory failed to predict or explain the rapid population growth following the Industrial Revolution and the subsequent fertility decline (Ekelund & Hébert, 2014).

The economic and social transformations of the 19th century shifted focus from concerns about overpopulation to declining fertility and depopulation. Reflecting this shift, Arséne Dumont, a French economist, argued that the social mobility enabled by the transition from feudalism to industrial society encouraged households to reduce fertility. By concentrating resources on fewer children, households sought to improve their socio-economic positions (Leridon, 2015).

Harvey Leibenstein's work put the analysis of fertility on a microeconomic basis: according to his model, the demand for children and the factors affecting it can be analyzed in a similar way to the demand for consumer durables. The supply in this case is the theoretical maximum number of children that households would be able to have. According to Leibenstein, a demand market prevails, i.e., the supply always significantly exceeds the demand, so the former does not need to be examined separately. (Leridon 2014, De Bruijn 2006). From a macroeconomic perspective, the importance of the relationship between fertility and economic growth has been recognized at least since Malthus. More recent models can handle fertility as endogenous variable. For example, Tamura (1994) introduces an overlapping generations model, in which high fertility is associated with low income and zero economic growth, while low fertility is associated with high income positive economic growth. The model of Nishimura and Raut (2013) was able to generate fluctuations in the equilibrium path of capital labour ratio and fertility, suggesting a periodic pattern, in which periods with high household income are associated with higher fertility, but that leads to lower income and lower fertility, which in turn increases income and fertility.

After Leibenstein's work, the microeconomic approach and the rational actor model gained momentum with respect to the economic analysis of fertility. Starting with the pioneering work of Gary Becker (Becker, 1960 These models capture the costs and benefits of having children, enabling the derivation of an optimal number of offspring. Theories within this framework can be categorized by parental motivations: children may be viewed as by-products of other activities, as consumption goods, or as investment goods (Cochrane, 1975).

In the first case, children are incidental to sexual activity, implying zero utility from having children per se. With sufficiently low costs of contraception, this approach offers little insight into the income-fertility relationship and is thus of limited practical relevance. The concept of children as consumption goods raises the challenge of explaining the negative relationship between income and fertility without treating children as inferior goods (Jones et al., 2011). One explanation posits that as income rises, free time - a limited resource - becomes more valuable. Since child-rearing requires time, higher-income households face higher implicit costs of having children. However, this alone is insufficient, as wealthier households should still have more children unless the financial costs of child-rearing outweigh the time costs.

An alternative explanation suggests that preferences for family size influence labor-market choices. Households desiring more children may develop skills less valued in the labor market, resulting in lower incomes. This reverses the causality, with family preferences driving income

differences rather than the other way around (Francesconi, 2002; Del Boca & Sauer, 2009). Another influential theory, the quantity-quality trade-off, argues that as income rises, parents shift their focus from the number of children to their quality, investing more in each child's education and well-being (Becker, 1960; Lawson & Borgerhoff Mulder, 2016). If the costs of improving quality rise faster than income, fertility may decline even as income grows. Notably, this trade-off and similar models depend on restrictive assumptions to generate a negative income-fertility relationship (Jones et al., 2011).

De La Croix and Doepke (2009) further advanced the discussion by examining household decisions regarding public versus private education. They found that if private education offers significantly higher quality, wealthier households are more likely to choose it, leading to lower fertility among richer families.

Lastly, the investment-good perspective frames children as a means of securing income in old age, viewing fertility as an investment-allocation decision (Cigno 1993). With modernization, the nature of interactions between different generations has fundamentally changed: the market or the state can provide certain forms of income supplementation (to smooth out income over the life cycle) and services, thus reducing the need to have children (Boldrin et al. 2015). However, offsprings can still provide services that the market or the state cannot or can only partially replace, therefore the approach of child as an investment good may have place in modern societies as well (Werding 1994).

2.2 Evolutionary and cultural models

The theories of evolutionary and behavioral scientists share similarities with those of economists, as both conceptualize childbearing as a constrained optimization problem. However, while economists typically focus on utility maximization, evolutionary and behavioral scientists prioritize fitness, defined as an individual’s ability to increase their genetic representation in subsequent generations (Stulp & Barrett, 2016). Within this framework, it is theoretically plausible that households restrain fertility to allocate more resources to fewer offspring, thereby enhancing their offspring’s competitive advantage in resource acquisition. The more favorable relative position of the offspring or their offspring eventually manifests itself in the form of greater fertility, thereby maximizing fitness in the long term (over several generations) This trade-off between quality and quantity echoes economic models but aims to maximize long-term fitness across generations (Colleran, 2016; Lawson & Borgerhoff Mulder, 2016).

For example, Hill and Reeve’s (2005) game-theoretic model suggests that if investing in resource production significantly improves descendants' (essentially the entire lineage) survival, it may lead to reduced fertility. Such strategies are well-documented in the animal kingdom (Davies et al., 2012). However, in modern human societies, empirical evidence does not support the notion that reduced fertility leads to relatively more descendants over generations. Goodman et al. (2012), analyzing a Swedish cohort of 14,000 individuals, found that while low fertility improved the socio-economic status of offspring across three generations, it did not increase the total number of descendants. Similarly, Lawson and Borgerhoff Mulder (2016) observed that in pre-demographic transition human communities, limiting offspring and focusing resources on them could be evolutionarily advantageous, but this does not hold in modern societies.

From a cultural standpoint, fertility is viewed as a social phenomenon rather than a purely economic or evolutionary one. Cultural theories emphasize that fertility behaviors need not be adaptive or optimal in economic or evolutionary terms. Instead, norms and cultural variants regarding fertility can spread within a population, perpetuating even maladaptive behaviors (Colleran, 2016). Maladaptive behaviors, in this context, are those that reduce the likelihood of genetic representation in subsequent generations.

One mechanism driving such behaviors is social imitation. Individuals may adopt behaviors observed in their environment, either conforming to prevailing norms (conformism) or emulating successful individuals and families (prestige bias) (Richerson & Boyd, 2006; Laland & Hoppitt, 2013). For instance, if respected members of a community have fewer children, others might interpret this as a strategy for success, even if fertility itself played no role in achieving higher status. Such dynamics are often analyzed using diffusion models borrowed from population biology.

Empirical studies support these theoretical frameworks. Spolaore and Wacziarg (2022) found that fertility decline in Europe between 1830 and 1970 was closely linked to higher education, urbanization, and lower infant mortality. Notably, new norms of reduced fertility originated in French-speaking regions and spread more rapidly to areas culturally and linguistically closer to them. Blanc (2023) extended this analysis, concluding that secularization in France drove fertility decline as early as the pre-French Revolution era, roughly a century before similar trends emerged in other European countries.

Cultural and institutional changes that delay marriage or reduce resources available to parents also play a significant role in fertility decline. Henrich (2020) argues that medieval European norms, heavily influenced by the Catholic Church, introduced strict restrictions on marriage, including the prohibition of polygamy and consanguineous unions (e.g., marriages between cousins, even up to third cousins). These reforms disrupted tribal, kin-based social structures, fostering voluntary associations and neolocal residence patterns, where newlyweds lived independently of their families. These shifts delayed marriage and lowered fertility rates and for this reason, fertility rate was already lower in medieval Europe than in the Islamic world or China.

Newson et al. (2007) further highlighted that traditional societal norms aligned with reproductive success, but as the number of interactions between relatives decreased and kin ties weakened in modern societies, alternative fertility norms emerged, leading to reduced fertility.

The factors proposed by evolutionary, behavioral, and cultural theories are not mutually exclusive but coexist to varying degrees across time and space. For instance, the function of children as investment assets likely played a more significant role in medieval feudal societies than in post-industrial, developed economies. The relative importance of these factors depends on the specific historical, cultural, and socio-economic context, highlighting the complexity of fertility behavior.

3. Positional goods and fertility

3.1 Positional goods

In economics, positional goods are goods whose evaluation by the consumer depends in some way on the social context. The concept originates from Fred Hirsch (Hirsch 1976), its antecedents can be found earlier with Veblen and Galbraith (Vatiero 2008).

According to the basic idea, certain goods are socially scarce, their consumption depends negatively on the number of consumers, and they also cause external effects (Frank 2005). Social scarcity refers to the fact that the scarcity of certain goods does not occur due to physical resource constraints, but due to social factors. For example, the number of players on the field in a soccer team is determined by the rules and the coach selects the individuals who occupy those spots. Or, for another example, the number of leadership positions within a company or other organization is a consequence of the organizational structure (Vatiero 2008).

A classic example of a purely positional good is social status: a higher social status can only be possible if there are individuals who have lower status. While most goods are influenced to some degree by social context, positional goods are distinguished by the extent to which their perceived utility depends on the consumer's environment.[2] The key here is that it is not the absolute value of consumption that determines utility, but rather its relative quantity compared to other relevant members of the community (Frank 2011).

More specifically, positional goods can be characterized by two properties: consumption by one individual implies negative consumption and negative utility for another individual (zero-sum game in consumption). From a pricing point of view, the high price of the given positional good can indicate its social place, value, and social scarcity for the consumer, so the utility partly comes from the higher price. (Pagano 1999; Vatiero 2008)

Consider the following example: real estate located in a good neighborhood can be considered a positional good in part, because a good neighborhood can mean access to high-quality public services, low crime, favorable location, good infrastructure, etc. However, these factors can only be interpreted if there are less attractive neighborhoods with lower quality public services, higher crime, etc. So, the utility from consuming real estate in a good neighborhood has an immanent relative aspect. Such properties are also scarce in a social sense and individuals excluded from these areas experience negative utility due to their inability to access comparable benefits.

Social status operates similarly. An individual's utility from their status is influenced by the balance of positive utility derived from those ranked below and negative utility from those ranked higher. A promotion, for example, increases total utility by reducing negative utility from higher-ranked positions and increasing positive utility from lower-ranked positions. Importantly, marginal utility from status increases may not diminish and could even be positive, depending on the context.[3]

3.2 Positional considerations in fertility decisions

Drawing on the concept of positional goods, it is reasonable to hypothesize that fertility decisions may be influenced by positional considerations. Parents may derive part of their utility

[2] Solnick and Hemmenway (2005) examines the importance of positional aspects of different goods.

[3] Intra-elite competition is the rivalry between elite aspirants for the limited number of elite positions in the society (for example the top political leadership positions etc.). Following Goldstone (1991), Turchin (2016) argues that the intensification of this competition can contribute greatly to political instability in all societies. This suggest that the marginal utility of social rank can be even increasing.

from their children's relative performance—whether in academics, sports, arts, or other areas—and their eventual social status. As with other determinants of fertility, positional effects are contingent on the social context. In egalitarian, labor-intensive societies with limited specialization, opportunities for status competition among children or adults are minimal (Boehm, 2001). In contrast, in modern societies characterized by greater inequality and typically smaller family sizes (Morris, 2017), the demand for positional goods, including status-driven investments in children, is significantly higher.

This dynamic can lead to an "arms race" among parents, who intensify investments in their children's education and extracurricular activities to secure access to prestigious institutions and favorable outcomes (Deresiewicz, 2014). In the United States, for example, kindergartens increasingly assign homework to prepare children for school expectations. Affluent parents often finance additional activities, such as sports, arts, and volunteering, to give their children an advantage in university admissions. This competition has been linked to higher rates of depression and suicide among students at elite universities (Lukianoff & Haidt, 2019).

Similarly, in South Korea, a country with one of the highest global investments in education, private spending on education accounts for nearly 3% of GDP—three times the OECD average. From an early age, children are prepared for university entrance exams. Despite the high educational outcomes, the country's fertility rate has fallen below one, highlighting the trade-offs between intense parental investment and declining birth rates.The result of investment on children by the parents depends on the social context as well: that is, if a child is born in a community that does not provide equal opportunities to social mobility, the investment on children is relatively riskier. These institutional and social factors are not under the control of parents.

3.3 The role of social context in fertility and investment

The efficacy of parental investment in children also depends on social context. In societies with limited social mobility or high inequality, investments in children become riskier, as outcomes are shaped by institutional and societal factors beyond parental control. Thus, it is not quality alone that motivates parents but the translation of quality into social status.

This perspective suggests that traditional economic models of fertility could benefit from incorporating positional considerations. If a parent's utility is tied to their child's well-being and the child's well-being is partly determined by their socio-economic status, then the parent's utility indirectly depends on their child's social position. Such considerations may amplify the role of relative status in shaping fertility decisions and could explain observed variations in fertility rates across different socio-economic and institutional contexts.

The inclusion of positional considerations provides a richer framework for understanding fertility decisions, particularly in modern societies where status competition is more pronounced. In the next section, we formalize these ideas within an economic model, capturing the interplay between positional goods and fertility in a constrained optimization framework.

4. Modeling the positional effect

4.1 Benchmark model

This section introduces a benchmark model incorporating the main elements of the final positional model but does not generate the desired negative relationship between income and fertility. In general, modeling decisions regarding childbearing requires identifying the primary factors affecting utility and resource constraints.

Utility depends on consumption, leisure time, and the number of children. Meanwhile, decision-makers face two fundamental constraints: time and material resources. Earning income requires work, and raising children demands time, necessitating an allocation of available time among work, child-rearing, and leisure. Material constraints arise from the costs of consumption and child-rearing, which are covered by wages.

This situation can be formulated as a constrained maximization problem:

$$\max_{c,n,l} U(c,n,l) \tag{1}$$

$$\text{s.t.} \quad t_w + t_c\, n + l = 1$$

$$c + e_c\, n = w\, t_w$$

where c is consumption, n is the number of children, l is free time, t_w is time spent working, t_c is time for children, e_c is money spent on children, and w is wages. The first constraint captures the time allocation, while the second reflects material constraints.

Using the usual log utility function, the objective function is concave, the benchmark problem has the following form:

$$\max_{n,l,c} a_n \log n + a_c \log c + a_l \log l \tag{2}$$

$$\text{s.t.} \quad t_w + t_c \cdot n + l = 1$$

$$c + e_c \cdot n - w \cdot t_w = 0$$

Where parameters $a_n, a_c, a_l \geq 0$, substituting the expression $t_w = 1 - t_c \cdot n - l$ into the second constraint and solving for n, we get the following expression:

$$n^* = \frac{a_n \cdot w}{(a_c + a_l + a_n)(t_c\, w + e_c)} \tag{3}$$

Partially differentiating this with respect to w:

$$\frac{\partial n}{\partial w} = \frac{a_n \cdot e_c}{(t_c * w + e_c)^2 (a_c + a_l + a_n)} \tag{4}$$

Since $e_c, t_c, w, a_n, a_c, a_l \geq 0$, it shows that as income increases, the number of children also increases.

4.2 Augmented model

To incorporate positional considerations, we introduce a positional function that reflects how a child's "quality" places them in the social hierarchy. Quality, in turn, depends on parental investments in time and material resources.

What restrictions should be placed on the positional function? It is reasonable to expect that on the relevant domain it is monotonically increasing and has a decreasing slope. That is, higher quality results in higher status, but as quality increases (which can mean the acquisition of educational certifications, experience and other skills and qualifications etc.), the increase in status is getting smaller, and this embodies that the number of higher positions is scarcer. So, for example, financing and obtaining a first college degree causes a greater change in relative position compared to subsequent qualification obtained in higher education. Formally, let *f(x)* be the positional function, such that

f: $\mathbb{R}^+ \to \mathbb{R}^+$, $\frac{df(x)}{dx} > 0$, $\frac{d^2f(x)}{dx^2} < 0$ for all $x > 0$.

Quality itself depends on parental investment, with diminishing marginal returns. Formally,

q: $\mathbb{R}^+ \times \mathbb{R}^+ \to \mathbb{R}^+$, $\frac{\partial q}{\partial e_c}, \frac{\partial q}{\partial t_c} > 0$, $\frac{\partial^2 q}{\partial e_c^2}, \frac{\partial^2 q}{\partial t_c^2} < 0$ for all $x, y > 0$.

The augmented utility function becomes:

$$max\ a_c \log c + a_l \log l + \gamma(a_n \log n + a_p\ p) \tag{5}$$

$$s.t.\quad t_w + n\,t_c + l = 1$$

$$c + n\,e_c + k\,n = w\,t_w$$

$$p = f(q(t_c, e_c))$$

Where k is the fixed expenditure associated with having a child ($k \geq 0$), γ is a parameter representing the total importance attached to having children ($\gamma \geq 0$), p is the status achieved by the offspring (here we assume that the parents do not differentiate between their children, they dedicate the same amount of resources to each of them, so their achieved status will be similar). Based on the discussion presented in the previous section, we assume that the marginal utility of the status is constant ($MU_p = \gamma a_p$). It is important to emphasize that the above maximization problem tries to model the decisions of households, therefore the positional function *f(x)* should not primarily represent pattern and regularities related to social mobility and hierarchy, but the *expectations* of households regarding social mobility and hierarchy.

Let $f(q) = log(x)$, so the positional function meets the requirements, and let the function $q(t_c, e_c)$ determining the quality of the children be a Cobb - Douglas production function, i.e.

$$q = A e_c^{\alpha} t_c^{\beta} \tag{6}$$

From the time constraint, t_w can be expressed as follows, $t_w = 1 - tc \cdot n - l$, and we can substitute this back into the material constraint. The final model is thus the following:

$$\max_{c,l,n,e_c,t_c} \; a_c \log(c) + \; a_l \log(l) + \gamma\, a_n \log(n) + \gamma\, a_p \log(A) + \; \gamma\, a_p\, \alpha \log(e_c) + \gamma\, a_p\, \beta \log(t_c) \tag{7}$$

$$\text{s.t.} \qquad w \cdot tc \cdot n \; + \; k \cdot n \; + \; l \cdot w \; + \; ec \cdot n \; + \; c \; - \; w \; = 0$$

Solving this for *n:*

$$n^* = \frac{-\gamma(a_p\, \alpha + a_p\, \beta - a_n)w}{(\gamma a_c + a_l + a_p)k} \tag{8}$$

and taking the partial derivative of (8) with respect to *w*, we arrive at the following expression:

$$\frac{\partial n}{\partial w} = \frac{-\gamma(a_p\, \alpha + a_p\, \beta - a_n)}{(\gamma a_n + a_l + a_c)k}. \tag{9}$$

Since $a_c, a_l, a_p, a_n, k, \gamma \; \geq \; 0$, it can be seen that the relative size of the parameters a_p and a_n determines the direction of the relationship between *w* and *n*. We can distinguish three cases:

$a_p > \frac{a_n}{\alpha+\beta}$ Higher income reduces fertility.

$a_p < \frac{a_n}{\alpha+\beta}$ Higher income increases fertility.

$a_p = \frac{a_n}{\alpha+\beta}$ Income has no direct effect on fertility.

The denominator of the expression on the right-hand side is the sum of the exponents of the production function that determines the quality of the offspring: $\alpha + \beta = 1$ means constant return to scale for the quality function of the child, so increasing the time and material expenditure results in a proportional improvement in quality.

Based on the model, we can therefore conclude that if households consider the positional aspects of childbearing to be sufficiently important (that is, the child's status, relative position, advancement among contemporaries, and soon in society as a whole), and they think that child's socio-economic status can also be improved by increasing parental effort, then with higher income, they intend to have fewer children.

On the other hand, if the institutional and cultural environment does not allow for social mobility, in other words quality does not necessarily translate into higher status (for example in feudal society) and/or the parental investment does not result in a significant increase in quality, then higher income leads to greater fertility.

5. Concluson

This study explores the relationship between income and fertility through the lens of positional considerations, offering a novel extension to traditional economic models. By incorporating a positional function that reflects the impact of social context on parental decisions, the augmented model demonstrates that fertility outcomes depend not only on income levels but also on the importance parents assign to their children's socio-economic status.

The analysis highlights that in environments where social mobility is achievable and status competition is intense, higher income tends to reduce fertility as households concentrate resources

on a smaller number of children to enhance their quality and relative standing. Conversely, in contexts with limited social mobility or where status considerations are less pronounced, higher income may lead to increased fertility.

These findings underscore the importance of accounting for cultural and institutional factors in fertility models and provide a theoretical foundation for understanding the variations in fertility behavior across societies and over time. Future research could further validate the model empirically and extend it to incorporate dynamic and policy-relevant factors, such as the impact of education systems or public investment in child-rearing.

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