

FERTILITY CHOICE AND ECONOMIC SYSTEMS

YASH RAPERIA* and AARJAV JAIN
Satyawati College (M) , University of Delhi

Abstract

This paper examines how different economic systems influence the parental preferences regarding the number of children they wish to have. Multiple studies have explored the factors affecting the choices that parents make. Gary Becker proposed a negative relationship between the number of children parents wish and the cost of raising children. To find the relationship between the economic systems and the parental preferences, this paper develops a theoretical framework around the parental utility function, which incorporates both direct and indirect costs, and the number of children parents have. The direct cost includes the expenditure incurred on goods and services used in raising children. The indirect cost reflects opportunity cost, such as the income foregone and delays in career advancement. Solving the first-order condition gives the general formula for calculating the number of children parents wish to have in each economic system. Substituting the nominal and shadow prices for the respective economies in the general formula, the framework shows that in a command economy, parents have the highest number of children. In a market economy, the number of children is the lowest. Lastly, the number of children in a mixed economy lies between the number of children in the market and the command economy. The empirical evidence from the United States during the post-war period supports these findings. The federal government's intervention through the Federal Housing Administration and the Veterans Administration in the housing and education sectors shifted the classic market-driven American economy towards a kind of mixed economic system. These actions reduced the cost and made it easy for young Americans and start a family.

JEL Classification: D13, H31, J13, P51

Keywords: Economic Systems; Fertility Choice; Parental Preferences; Baby Boom

1. INTRODUCTION

Scarcity is the core problem of economics. Human wants are endless, whereas the quantity of resources is limited. The way in which society addresses this core problem shapes its economic system. The contemporary resource allocation mechanisms or economic systems can be grouped into three main types: (i) Market-based, (ii) Commanded, and (iii) Mixed. The latter incorporates the features of the first two. Their relative influence may vary across countries. Each of these systems profoundly impacts both the macroeconomic and microeconomic variables.

The question of how parents decide the number of children they wish to have has been addressed in a number of studies. Various factors influence the decision-making process of parents. However, the relationship between different economic systems and

their respective influence on the number of children parents wish to have remains unexplored. In this background, this paper investigates how the three economic systems mentioned above affect the decision of parents regarding family planning.

The paper presents a hypothesis that in the command and mixed economies, the price of goods and services is centrally controlled to mask inflation. This reduces the direct and indirect costs of raising children relative to the market-based economies, where price is determined by the interaction between demand and supply sides. The result is that the cost of raising children in the command and mixed economies is lower than in the market-based economies. These cost variations result in differences in the number of children parents plan. The number of children should be highest in a command economy, lowest in a market economy. In a mixed economy, the number of children should lie between the command and

*Corresponding author's email address: raperiyash@gmail.com

market economy.

The direct cost is determined by various goods and services parents find helpful in raising children. These include housing, clothing, food and nutrition, education, healthcare, and many others. Listing and analysing all the goods and services is not possible and will complicate the analysis. To ensure clarity in the analysis, the framework considers only housing and education.

The paper is structured as follows. The literature review section covers the ideas of Malthus and Gary Becker and the features of economic systems. Sections 3 to 5 determine the nominal price and output levels for each system. Section 6 defines the utility function of parents. Section 7 maximises utility and derives the number of children parents plan in each system. Section 8 does the comparative analysis, and Section 9 provides the empirical evidence. Section 10 discusses the findings, their limitations, and implications. Lastly, Section 11 concludes the paper.

2. LITERATURE REVIEW

In 1798, Thomas Malthus, in his seminal work titled “An Essay on the Principles of Population”, posited that the prolific nature of humans knows no bounds. When unchecked, the population grows at a geometric rate. Whereas the supply of food increases at an arithmetic rate. This fundamental imbalance implies that population growth would inevitably outstrip the means of subsistence. However, he identified two universal checks on the growth of the population. Positive checks include wars, famines, epidemics, and extreme poverty, and contribute to reducing the duration of human life. Secondly, for the preventative check, he mentioned, “is peculiar to man and arises from that distinctive superiority in his reasoning faculties, which enables him to calculate distant consequences” (Malthus 1798).

The inability of the Malthusian Population Theory to explain the sharp decline in birth rates in the 1930s, followed by a sharp rise in the post-war period, led to the conclusion that future rates could not be predicted by observing population composition alone. In this Background, Gary Becker, in his paper titled “An Economic Analysis of Fertility”, argued that children are durable consumer goods. Parents

pay full price for children, which is the sum of direct and indirect costs, to maximise their utility (Becker 1960).

Furthermore, these direct and indirect costs are largely influenced by the economic system in place. In a market economy, allocation of resources is guided by the prices of goods and services. The decentralised price mechanism guides resources to their most productive uses. Profits are to be booked whenever something can be sold at a price higher than it can be bought at. This quest for earning profits acts as an incentive to search for price discrepancies (Kirzner 2011).

Conversely, a command economy replaces the price mechanism with a centralised authority that directs the allocation of resources. Prices, wages, and exchange rates are generally controlled (Grossman 1987). Consumers have no choice but to either accept or reject the prices set by the authority. The suspension of price as the guiding mechanism results in over-utilisation of resources, leading to shortages (Roszkowski 2015). The purpose of control is to prevent a continuous increase in prices and wages. If prices are fixed, at minimum, this could cause some malfunctioning of the economy, and at most, it might lead to chaos (Galbraith 1952). Moreover, labour is the cheapest resource in all command economies. In Soviet Poland, the share of labour costs in the value of the product was about 10% to 11% in the 1970s and 80s, compared to 30% in highly developed market economies (Roszkowski 2015). Thus, the opportunity cost or indirect cost is also reduced.

The paper contributes to the existing literature by introducing a framework that connects a country's economic system to the number of children parents plan. First, it calculates the output and (combined) nominal price of housing and education to raise a child in a market economy. For command and mixed economies, the framework assumes distinct nominal prices below the market price. The command economy has the lowest nominal price. These prices are then plugged into the demand and supply functions, showing that these economies face a shortage of supply. Second, it captures parental preferences using a utility function that includes both direct and indirect costs. The direct costs are represented by the (combined) nominal price. While

the indirect costs are represented by the shadow price. Finally, the paper provides empirical evidence supporting the findings of the paper.

3. EQUILIBRIUM IN A MARKET ECONOMY

To determine the equilibrium nominal price and output in a market economy, it is important to formulate the demand and supply functions to capture both sides of the market. At equilibrium, the market clears itself, meaning that the quantity demanded is equal to the quantity supplied. The general demand function can be defined as:

$$D_i = \alpha_0 - \alpha_1 P_i \quad (1)$$

Here, 'P' is the nominal price of housing and education required for raising a child, and 'D' represents the quantity of housing and education demanded. The subscript 'i' denotes the economic system. The intercept parameter shows the quantity demanded if the price were zero. The slope coefficient reflects the change in quantity demanded if the nominal price increases by one unit.

The supply function can be defined as:

$$S_i = \beta_0 + \beta_1 P_i \quad (2)$$

The variable 'S' represents the quantity of housing and education supplied in the market. The intercept parameter reflects the quantity supplied if the nominal price were zero. The slope coefficient reflects the responsiveness of quantity supplied to a unit change in the nominal price level.

At equilibrium, the demand is equal to the supply. Thus, putting equations (1) and (2) equal yields:

$$D_i = S_i \quad (3)$$

$$\alpha_0 - \alpha_1 P_i = \beta_0 + \beta_1 P_i \quad (4)$$

Solving for the nominal price:

$$(\alpha_0 - \beta_0) = (\alpha_1 + \beta_1) P_i \quad (5)$$

$$P_m = \frac{\alpha_0 - \beta_0}{\alpha_1 + \beta_1} \quad (6)$$

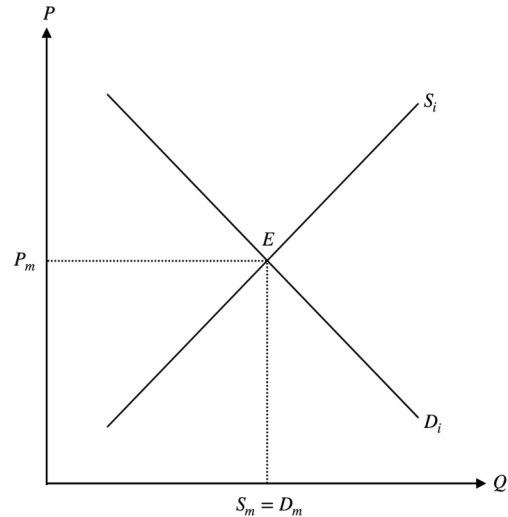
Observing equation (6), it is evident that the greater the difference between the intercepts of the demand and the supply functions, the greater would be the nominal price in a market economy. The greater the sum of slope parameters, the lower the nominal price. Substituting the nominal price calculated from equation (6) in the demand and supply functions gives the quantity demanded and quantity supplied at the equilibrium point 'E':

$$D_m = \alpha_0 - \alpha_1 P_m \quad (7)$$

$$S_m = \beta_0 + \beta_1 P_m \quad (8)$$

In Figure 3.1, it can be observed that in a market economy, there is no shortage of supply. Price serves as a signal that efficiently communicates market information to all economic agents.

Figure 3.1: Equilibrium in a Market Economy



Source: Author's Elaboration

4. DISEQUILIBRIUM IN A COMMAND ECONOMY

The command economy replaces the price mechanism with a centrally administered mechanism, which directs the allocation of resources. The intention behind controlling prices is to mask inflation. Since the nominal price in a command economy is set below the nominal price in a market economy, this often leads to chronic shortages in the market. The relationship between the nominal prices can be expressed as:

$$P_c < P_m \quad (9)$$

Substituting the nominal price in the equations in equations (1) and (2) gives the quantity of housing and education supplied and demanded at a given nominal price:

$$D_c = \alpha_0 - \alpha_1 P_c \quad (10)$$

$$S_c = \beta_0 + \beta_1 P_c \quad (11)$$

Figure 4.1 shows that in a command economy, the nominal price is below the nominal price in a market economy, which causes a shortage of supply:

$$D_c > S_c \quad (12)$$

The magnitude of shortages can be calculated by subtracting the quantity supplied from the quantity demanded:

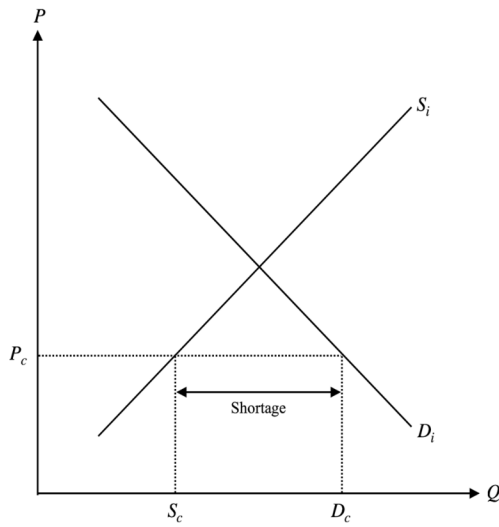
$$D_c - S_c \quad (13)$$

Substituting equations (10) and (11) into equation

(13) yields:

$$(\alpha_0 - \beta_0) - (\alpha_1 + \beta_1)P_c \quad (14)$$

Figure 4.1: Disequilibrium in a Command Economy



Source: Author's Elaboration

This section establishes that both market and command economies use nominal prices to guide the allocation of resources. However, it is only in the market economy that the nominal price does its job rightly.

5. DISEQUILIBRIUM IN A MIXED ECONOMY

The third economic system is mixed. A mixed economy is characterised by the presence of both public and private sectors. However, their relative contribution to the economy shall vary across countries.

To keep the framework simple, the framework assumes that the supply of housing and education is shared by both private and public sectors. There can be multiple ways in which the supply can be shared between the private and the public sectors. The nominal price in a mixed economy is the weighted average of the nominal price levels in the command and the market economy. The weights are the percentage of housing and education supplied by the public and the private sectors, respectively. Therefore, it can be said that the nominal price in a mixed economy lies between the nominal price in the market and the command economy:

$$P_c < P_x < P_m \quad (15)$$

Substituting the nominal price P_x in equations (1) and (2) yields the quantity demanded and supplied in a mixed economy:

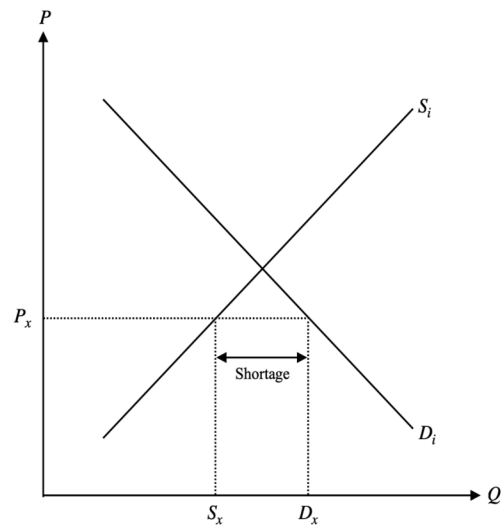
$$D_x = \alpha_0 - \alpha_1 P_x \quad (16)$$

$$S_x = \beta_0 + \beta_1 P_x \quad (17)$$

As visible in Figure 5.1, the shortage of housing and education is also present in a mixed economy:

$$D_x > S_x \quad (18)$$

Figure 5.1: Disequilibrium in a Mixed Economy



Source: Author's Elaboration

The magnitude of the shortage can be calculated by subtracting the quantity supplied from the quantity demanded:

$$D_x - S_x \quad (19)$$

Substituting equations (16) and (17) into equation (19) yields:

$$(\alpha_0 - \beta_0) - (\alpha_1 + \beta_1)P_x \quad (20)$$

6. THE UTILITY FUNCTION

Parents expect to maximise their utility from the various decisions they take. But since the paper is entirely focused on how many children parents plan, this section concentrates on capturing the impact of the number of children on parents' utility. There are both benefits and costs associated with having a certain number of children. The utility of parents is net of the associated costs:

$$U(N_i) = B(N_i) - C(N_i) \quad (21)$$

Economic theory points out that most goods are subject to diminishing marginal utility, and children are no exception to this rule. This implies that each additional child adds to the total utility; however, the additional utility gained from each subsequent child declines. To capture this reality, the benefit function can be formulated as a downward-opening parabola:

$$B(N_i) = \gamma_0 N_i - \gamma_1 N_i^2 \quad (22)$$

The coefficient γ_0 represents the initial marginal benefit derived from the first child, and the coefficient γ_1 determines the rate at which the

marginal benefits diminish as the number of children increases. This formulation ensures that as the number of children increases, total benefits rise initially, eventually reach a plateau, and then decline.

Raising children involves both direct and indirect costs to parents. Direct cost, which is proportional to the number of children, includes expenditure incurred on food, clothing, education, healthcare, and housing. Indirect costs include the income forgone, loss of leisure time, and delay in career advancement that result from the time that is invested in children rather than working. The indirect costs tend to rise with each additional child. Thus, the cost function can be specified as:

$$C(N_i) = N_i P_i + \mu_i N_i^2 \quad (23)$$

The shadow price is represented by μ_i . Substituting equations (22) and (23) in equation (21) yields:

$$U(N_i) = \gamma_0 N_i - \gamma_1 N_i^2 - N_i P_i - \mu_i N_i^2 \quad (24)$$

Simplifying the utility function further by combining the like terms:

$$U(N_i) = N_i(\gamma_0 - P_i) - N_i^2(\mu_i + \gamma_1) \quad (25)$$

The resulting equation communicates that the shape of the utility function is concave. This implies that as the number of children increases, the marginal utility of an additional child declines.

7. OPTIMISATION

This section finds the optimal number of children in each economic system by applying standard optimisation techniques to the utility function. The number of children can be calculated by solving the first-order condition of the utility function. The first order condition can be derived by differentiating the utility function with respect to the number of children and then setting it equal to zero:

$$\frac{dU_i}{dN_i} = MU_i = 0 \quad (26)$$

The marginal utility can be broken down into the difference between the marginal benefit and the marginal cost:

$$MB_i - MC_i = 0 \quad (27)$$

Differentiation of the benefit function with respect to the number of children yields:

$$MB_i = \gamma_0 - 2\gamma_1 N_i \quad (28)$$

The above expression confirms that the marginal benefit decreases linearly as the number of children increases. The initial marginal benefit is γ_0 , and each additional child reduces the marginal benefit by $2\gamma_1$.

Similarly, differentiating the cost function with respect to the number of children yields the marginal cost function:

$$MC_i = P_i + 2\mu_i N_i \quad (29)$$

The marginal cost function is also made up of two parts: nominal price and the expression $2\mu_i$, which reflects an increase in the marginal cost as the number of children increases.

Setting the marginal cost and marginal benefit functions equal:

$$MB_i = MC_i \quad (30)$$

Substituting equations (28) and (29) into equation (30) yields:

$$\gamma_0 - 2\gamma_1 N_i = P_i + 2\mu_i N_i \quad (31)$$

Solving for the number of children:

$$N_i = \frac{\gamma_0 - P_i}{2(\gamma_1 + \mu_i)} \quad (32)$$

The numerator represents the initial benefit derived net of the nominal price. The denominator captures the combined effect of diminishing marginal benefits and increasing marginal costs. The number of children parents plan in each economic system can be expressed as:

$$N_m = \frac{\gamma_0 - P_m}{2(\gamma_1 + \mu_m)} \quad (33)$$

$$N_x = \frac{\gamma_0 - P_x}{2(\gamma_1 + \mu_x)} \quad (34)$$

$$N_c = \frac{\gamma_0 - P_c}{2(\gamma_1 + \mu_c)} \quad (35)$$

8. COMPARATIVE ANALYSIS

This section compares the optimal number of children parents wish to have in each economic system with derived nominal prices. It also examines how the number of children changes as the shadow price varies in an economic system.

Previous sections derived the (combined) nominal price for each economic system. The nominal price is highest in a market economy and lowest in a command economy. In a mixed economy, the nominal price lies between the market and the command economy. The relationship between nominal price levels can be expressed as:

$$P_c < P_x < P_m \quad (36)$$

Furthermore, the shadow price levels also vary across economic systems. Similar to the nominal prices, the shadow price is also highest in a market economy

and lowest in a command economy. In a mixed economy, the shadow price level lies between the market and the command economy. The relationship can be expressed as:

$$\mu_c < \mu_x < \mu_m \quad (37)$$

Substituting these price relationships into the equations (33), (34), and (35) yields the following comparative result:

$$N_c > N_x > N_m \quad (38)$$

The number of children is highest in a command economy, followed by the mixed economy in the middle, and the market economy at the bottom. Furthermore, the shadow price may change over time due to changing opportunity costs.

For a market economy, the shadow may increase due to rising wages and better opportunities for skilled workers. This seems to explain the decline in fertility rates in OECD countries. Conversely, the shadow price may decrease due to flexible work arrangements and generous leave policies. In such a scenario, parents shall increase the number of children they plan. The shadow price shall also vary in a command economy. During periods of economic liberalisation, the shadow price declines. Alternatively, state-supported childcare and longer maternity leaves can increase already high fertility rates. Lastly, in a mixed economy, the outcome is jointly determined by the private and public sectors' policies.

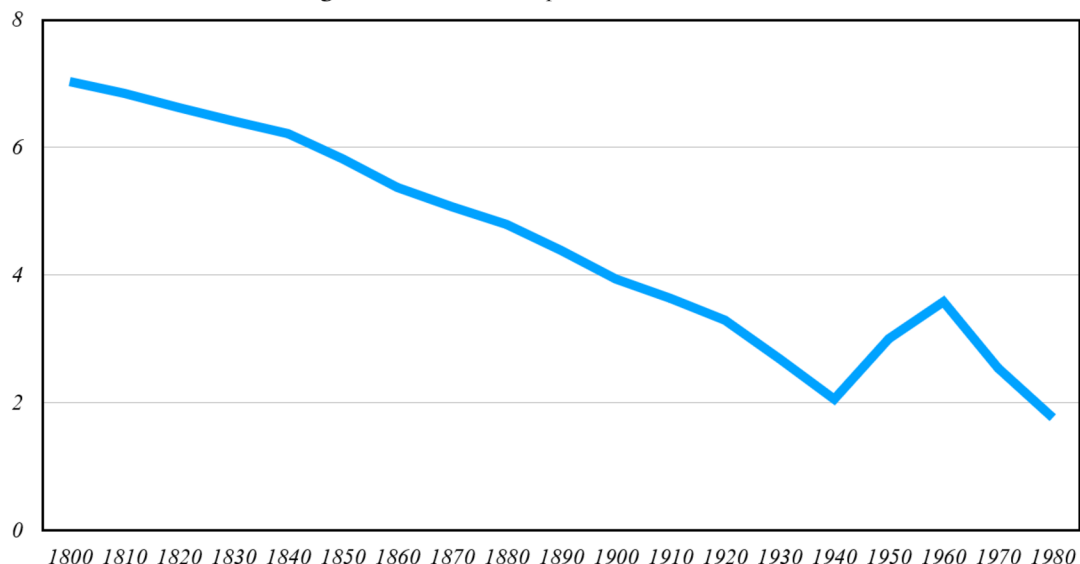
Comparing equations (14) and (20) reveals that the shortage of housing and education is greater in a command economy than in a mixed economy.

9. EMPIRICAL EVIDENCE

Prior to the Great Depression, the involvement of the federal government in providing housing in the United States was minimal. Things changed post-Great Depression. The National Housing Act of 1934 created the Federal Housing Administration (FHA) to provide a government guarantee for mortgages (Chambers, Garigga and Schlagenhauf 2012). Before 1934, most mortgages were short-term, about 5 to 7 years. The downpayment requirements were also exorbitant, roughly 50 to 60 percent. Since a significant share of mortgages were unamortised, they carried a high rate of interest. The FHA helped increase the maturity of mortgages to about 20 to 30 years. Lower interest was possible due to increased amortisation. To protect the capital of mortgage investors, the FHA created an insurance system. By 1952, the share of FHA and the VA (Veterans Administration) mortgages constituted about 43% of the total mortgages, compared to only 1.3% in 1936.

The first GI Bill was introduced in 1944. It transformed the nation of renters into a nation of homeowners and opened the doors of higher education for millions of young Americans. Almost 70 percent of the men who turned 21 between 1940 and 1955 were beneficiaries of free education under the GI bill. By 1960, about 18 percent of the college-educated males in the United States benefited from the GI Bill. In the beginning, no down payments were needed because lawmakers believed that neither the soldiers were

Figure 9.1: Total Fertility Rate in the United States



Source: Statista

paid enough, nor did they have an opportunity to establish a credit rating.

The combination of housing and education policies improved conditions for family planning after the war, as visible in Figure 9.1. The total fertility rate in the United States had declined throughout the 19th and early 20th century. In 1800, the TFR was seven, and by 1940, it had declined to only two. At the height of the baby boom in 1960, the total fertility rate reached three and a half. This growth in the fertility rates was paralleled by an increase in federal housing and education support.

The involvement of the FHA and VA in the housing market reduced the financial costs for homebuyers and allowed young couples to buy homes with small down payments and affordable installments. This residential stability offered the necessary space and security for raising larger families. At the same time, the educational benefits provided by the GI Bill helped create a skilled and financially secure middle class. It was possible for young couples to envision a future where homeownership, education, and having children could coexist. Thus, the baby boom in the United States was the result of intentionally crafted policies. It is also beneficial to give evidence from a single country that has experienced more than one economic system. This ensures that the coefficients in the demand and supply functions are the same across economic systems. A country like the United States, which promotes capitalism and has a small experience with a mixed-style economy, is best suited for providing empirical evidence.

10. DISCUSSION

The framework presented in this paper successfully links the economic system to the number of children parents wish. A market economy ensures that the complete cost of raising children is upon the parents. This results in parents having the fewest number of children when compared to command and mixed economies. Due to the involvement of the government in the command and mixed economies, these economies fail to transfer the complete costs of raising children to parents. However, a mixed economy is somewhat better at transferring costs than a command economy. The evidence from the United States supports the findings of the framework. The total fertility rate in

the United States increased from only 2 in 1940 to 3.5 in 1960; that is a 75 percent increase in just two decades. This was a huge reversal from the declining trend throughout the 19th and the early 20th centuries. The collective efforts of the Federal Housing Administration, the Veterans Administration, and the famous GI Bill were successful at substantially reducing the cost of housing and education for millions of young Americans. Between 1936 and 1952, the share of government-backed mortgages jumped from 1.3 percent to 43 percent. Thus, these policies made education and homeownership affordable for young couples, ensuring security and resources essential for supporting a larger family.

From the policy perspective, these findings are significant. Today, a great number of developed countries face a declining fertility rate, leading to a greater share of older people in the labour force. The evidence provided in Section 9 suggests that government intervention in the housing and education sectors can increase the fertility rates. The government shall provide housing subsidies, education grants, scholarships for students, and other benefits.

Nonetheless, there are certain limitations to the findings of the paper. The model assumes that parental preferences are shaped only by the cost of raising children. In reality, parental preferences are shaped not only by the associated costs but also by cultural, religious, spatial, and personal factors. The does not address how parents adapt to persistent shortages, leading to the emergence of a black market in mixed and commanded systems. Although the United States' data on the total fertility rate is comprehensive, caution is warranted when applying these results to other countries or contexts. Different institutions and cultural values could lead to different outcomes.

Future researchers shall explore the change in total fertility rate in transition economies to gain a deeper insight into the changes in parental preferences regarding family planning as their economy undergoes a reform. An investigation into the change in total fertility rates when parents face shortages and deal with black markets would also provide an understanding of how parents change their preferences.

11. CONCLUSION

The theoretical framework developed in this paper successfully establishes a connection between the number of children parents plan and the economic systems by examining their impact on the direct and indirect costs of raising children. The framework model suggests that the number of children is highest in a command economy, followed by the mixed economy in the middle, and finally, the market economy at the bottom.

The empirical evidence also suggests a strong correlation between the shift towards a mixed

economy and rapidly increasing total fertility rates from 1940. The shift towards a mixed economy reduced the cost of raising children, as shown in the model. Subsidised education allowed a great number of people to improve their skills. The net effect of these changes was to make it easier to start a family. The American experience proves that economic policies can greatly influence the total fertility rates.

Finally, this paper suggests that governments in countries like South Korea, Japan, etc., should intervene in the economy and subsidise the costs of raising children. The government should also focus on up-skilling its population.

REFERENCES

1. Becker, Gary S. 1960. "An Economic Analysis of Fertility." *Demographic and Economic Change in Developed Countries*: 209-240. <https://www.nber.org/books-and-chapters/demographic-and-economic-change-developed-countries/economic-analysis-fertility>.
2. Becker, Gary S. 1991. *A Treatise on the Family*. Harvard University Press. <https://doi.org/10.2307/j.ctv322v4rc>.
3. Chambers, Matthew, Carlos Garigga, and Don E. Schlagenhauf. 2012. "The New Deal, the GI Bill, and the Post-War Housing." *Meeting Papers (Vol. 1050)*, *Society for Economic Dynamics*. https://red-files-public.s3.amazonaws.com/meetpapers/2012/paper_1050.pdf.
4. Galbraith, John Kenneth. 1952. *A Theory of Price Control*. Harvard University Press. <http://tankona.free.fr/galbraith1952.pdf>.
5. Grigsby, William G. 1990. "Housing Finance and Subsidies in the United States." *Urban Studies* 27 (6): 831-845. <https://doi.org/10.1080/00420989020080871>.
6. Grossman, Gregory. 1987. "Command Economy." *The New Palgrave Dictionary of Economics*: 1-4. https://doi.org/10.1057/978-1-349-95121-5_170-1.
7. Kirzner, Israel M. 2011. *Market Theory and the Price System*, edited by Peter J. Boettke and Frédéric Sautet. Liberty Fund, Inc. <https://about.libertyfund.org/books/market-theory-and-the-price-system/>.
8. Kjellstrom, Erik Torsten Hjalmar, Gustave Henry Gluck, Per Jacobsson, and Ivan Wright. 1942. *Price Control: The War Against Inflation*. Rutgers University Press. https://fama.us.es/discovery/fulldisplay/alma99473901305256/34CUBA_US:VU1.
9. Malthus, Thomas Robert. 2018. *An Essay on the Principles of Population*, edited by Shannon C. Stimson. Yale University Press. <https://doi.org/10.12987/9780300231892>.
10. McCleary, G. F. 1953. *The Malthusian Population Theory*. Faber & Faber Ltd. <https://www.abebooks.com/Malthusian-Population-Theory-McCleary-G.F-Faber/32225671724/bd>.
11. Roszkowski, Wojciech. 2015. "Command Economies." In *East Central Europe: A Concise History*. Institute of Political Studies of the Polish Academy of Sciences. <https://politic.edu.pl/news/east-central-europe-a-concise-history/>.