

An Analysis of the Influencing Factors of the Birth Rate in the USA

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Abstract. This research aims to use a rigorous quantitative methodology in the form of regression analysis to explore the complex terrain of birth rate drivers in the United States. The primary data source for this study is the National Vital Statistics System (NVSS). It provides extensive and current data on natality and births in the United States from 2000 to 2020 and is processed by SPSS. After accounting for other characteristics, the study indicated that higher GDP per capita and higher urban population significantly negatively affect the birth rate in the United States. This study stresses the significance of considering the impact of money and urbanization on fertility behavior and preferences when designing interventions to help families and children.

Keywords: Birth rate; United State; GDP per capita.

1. Introduction

The birth rate, which refers to the number of live births per 1,000 individuals within a given population, is a significant metric in demographics and social science. The subject under consideration comprises various essential elements, including but not limited to fertility rates, mortality rates, migration patterns, age distribution, educational achievements, financial disparities, healthcare standards, cultural dynamics, and policy frameworks. The comprehension of the complex network of factors influencing the birth rate bears immense importance, as it can guide policymakers and practitioners in formulating efficacious interventions to address population dynamics and enhance social welfare.

It is hypothesized that three key factors negatively impact the birth rate in the United States: Gross Domestic Product (GDP) per Capita: As the GDP per capita rises, the fertility rate is anticipated to decrease. This can be attributed to lifestyle changes, family planning dynamics, and increasing economic pressures influencing family size decisions.

Percentage of Urban Population: The hypothesis suggests that an elevated percentage of the population residing in urban areas, such as cities and towns, is associated with a lower birth rate. Urban living often entails distinct lifestyle factors, such as career demands and greater access to family planning resources [1].

For the sake of clarity and consistency throughout this study, the following key terms and concepts are defined: Birth Rate, the birth rate refers to the annual count of live births per 1,000 individuals within a population. GDP per Capita, the GDP per capita is the total value of goods and services produced within a country, divided by population size, serving as an indicator of economic well-being per person.

These factors affecting birth rates in the United States and other nations have been the subject of extensive research, providing valuable insights into this complex issue. This review identifies key themes in the literature, discusses gaps, and critically evaluates the theoretical frameworks and models used in previous studies.

The correlation between prosperity and increased fertility is common in academic studies. Birth rates tend to decrease with increasing levels of education, affluence, and urbanization [2]. Because of variables such as higher opportunity costs of parenting, greater female empowerment, and shifting attitudes toward family size, birth rates tend to fall as a country's economy develops. Economic development can favour birth rates by increasing access to healthcare, decreasing infant mortality,

and bolstering social security [3]. Economic growth and birth rates may not have a direct, linear relationship. Cultural, religious, policy and contextual factors can all moderate this link.

Demographic aspects such as age distribution, death rates, migration patterns, and marital status are other common topic in the relevant research. These factors have been studied using various demographic models and approaches. It has been observed, for instance, that changes in the age distribution account for a sizable fraction of the variability in birth rates across time [4]. The effects of mortality and migration on birth rates have also been studied and found to be generally negative for mortality and positive for migration. Moreover, shifting societal norms, legal reforms, economic incentives, and advancements in contraceptive technologies have all been implicated in the recent uptick in births outside of marriage [5].

The literature also examines how social and cultural factors, such as religion, ethnicity, gender roles, family values, and peer pressure, affect birth rates. How these variables affect reproductive behaviour and outcomes has been studied [6]. For instance, some research has compared religious makeup and reproduction rates, finding that various religious groups frequently exhibit diverse fertility trends due to their practices, traditions, and beliefs. Similar studies have examined how outside influences like gambling sponsorships affect birth rates, demonstrating how these sponsorships might encourage excitement and risk-taking in particular communities [7].

While the literature affords a few beneficial records, it is also essential to understand its boundaries and gaps. The dearth of uniform and complete information throughout several nations and periods hinders cross-country and longitudinal analyses. Many studies have overlooked the potential for interaction and reciprocal linkages amongst those components by specializing in studying individual elements in isolation [8]. In addition, it is usual for studies to expect homogeneity in population responses without accounting for differences that may develop because of demographic factors.

This research aims to use a rigorous quantitative methodology in the form of regression analysis to explore the complex terrain of birth rate drivers in the United States. The study's primary goals are three parts. First, we aim to identify the predominant determinants exerting substantial influence on the birth rate in the United States. Then, quantifying the magnitude of the effects wielded by these determinants on the birth rate. Finally, we evaluate the hypothesis supporting a negative correlation between the US birth rate and parameters such as GDP per capita, birth rate, and urban population %.

2. Model Formulation

This section summarizes the methodology employed in this study to analyze and make clear the relationship between the birth rate in the United States and its influencing elements. This section aims to offer a more thorough knowledge of the research technique by detailing the research layout, information assets, pattern size, records analysis methods, units, and moral concerns.

This study takes a quantitative and explanatory methodological tack. The primary goal of this research was to analyze and clarify the relationship between the beginning charge within the United States and the various elements that affect it. To do so, the examiner applies a studies approach primarily using secondary statistics and statistical analysis.

2.1. Data Sources

The primary data source for this study is the National Vital Statistics System (NVSS). It provides extensive and current data on natality and births in the United States from 2000 to 2020 [9]. Birth rate, maternal age, marital status, educational attainment, racial and cultural background, utilization of prenatal care, cesarean delivery rates, and frequency of low birth weight are just few of the demographic and socioeconomic factors included in the NVSS dataset. Additional factors, such as GDP per capita, urban population, death rate, and migration rate, are accounted for by the incorporation of supplemental data from the World Bank and the US Census Bureau.

2.2. Data Analysis Methods and Tools

SPSS is used for analysis since it is a tool for managing, manipulating, and analyzing data. Multiple linear regression analysis is the main statistical technique used. The birth rate is the dependent variable, and the GDP per capita and urban population are the independent variables in this regression model. To guarantee the robustness of the study, descriptive statistics, correlation analysis, and diagnostic tests are utilized to evaluate the assumptions and conditions of the regression model [10].

Ethical issues are also addressed meticulously in this study. This involves respecting the privacy and confidentiality of data sources, properly acknowledging the original authors and contributors, and steadfastly avoiding plagiarism or data falsification. Ethical considerations are of utmost importance to maintain the integrity and credibility of the research.

3. Results And Findings

3.1. Descriptive Statistics

Table 1. Descriptive Statistics

	Mean	Std.Deviation	N
Birth rate (per 1,000 population)	13.1024	0.97267	21
GDP Per Capita (US \$)	50087.76	8834.935	21
Urban population (percentage of total population)	81.1	1.2409674	21

For the 21 years (2000-2020), the average birthrate is 13.1024 per 1,000 people, with a standard deviation of 0.97267. This equates to an average birth rate of 13.1024 per 1,000 persons in the United States, with a range of only 0.97.

Over the 21 years, the average GDP per capita was 50087.76 USD, with a variance of USD 8834.935. This indicates that the average income in the USA was 50087.76 USD during this period, with a range of roughly USD 8834.935.

The average percentage of the population living in urban areas for the past 21 years is 81.1%, with a standard deviation of 1.2409674. This means that 81.1% of the US population resided in urban regions on average, with a range of 1.24 percentage points.

3.2. Correlation

A significant negative association exists between birth rate and GDP per capita ($r = -0.912$, $p < 0.001$, $N = 21$). As GDP per capita rises, the birth rate falls, and vice versa. Statistically significant correlations are unlikely to be random. A significant negative association exists between birth rate and urban population ($r = -0.946$, $p < 0.001$, $N = 21$). So, the urban population increases, the birth rate lowers, and vice versa. Statistically significant correlations are unlikely to be random. A substantial positive association exists between urban population and GDP per capita ($r = 0.990$, $p < 0.001$, $N = 21$). This means the urban population rises with GDP per capita and vice versa. The correlation is statistically significant, indicating a low chance.

Table 2. Correlation results

		Correlations		
		Birth rate (per 1,000 population)	GDP Per Capita (US \$)	Urban population (percentage of total population)
Pearson Correlation	Birth rate (per 1,000 population)	1.000	-0.912	-0.946
	GDP Per Capita (US \$)	-0.912	1.000	-0.990
	Urban population (percentage of total population)	-0.946	0.990	1.000
Sig.(1-tailed)	Birth rate (per 1,000 population)		0.000	0.000
	GDP Per Capita (US \$)	0.000		0.000
	Urban population (percentage of total population)	0.000	0.000	

3.3. Regression

Performance measures assess the model's fit comprehensively. The high correlation coefficient (R-value) of 0.962 indicates a good fit between expected and observed birth rates. The R square value of 0.926 shows that GDP per capita and urban population explain 92.6% of birth rate variation, confirming the model's explanatory capacity. This figure remains robust even after the corrected R square at 0.918 adjusts for the model's complexity and penalizes superfluous variables, indicating a very effective model. The model's low standard error (0.27864) shows its high fit with the data and ability to closely approximate observed values.

The change statistics also highlight the model's value. Including GDP per capita and urban population greatly improves the model's capacity for explanation, as seen by the sizeable R square change (0.926). By assessing the importance of the model improvement, the F change statistic (112.851) supports this. It confirms the significant improvement brought about by these predictors with a very low p-value of 0.000. Together, these measurements demonstrate how robust the model is and how well it can account for fluctuations in the birth rate.

Table 3. Model summary^b

Model	R	R Square	Adjusted R Square	Std, Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	0.962a	0.926	0.918	0.27864	0.926	112.851	2
Model		Change Statistics			Sig, F Change		
1		18a			0.000		

a, Predictors: (Constant), Urban population (percentage of total population), GDP Per Capita (US \$)

b. Dependent Variable: Birth rate (per 1,000 population)

Table 4. Coefficient result

	Coefficients	Standard Error	T Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	146.751452	26.79081	5.47768	3.34E-05	90.46606	203.0368	90.46606	203.0368
GDP Per Capita (US \$)	0.000140944	5.08E-05	2.776856	0.012438	3.43E-05	0.000248	3.43E-05	0.000248
Urban population (percentage of total population)	-1.735001756	0.361357	-4.80135	0.000143	-2.49418	-0.97582	-2.49418	-0.97582

3.4. Regression model

where y is the birth rate, x1 is GDP per capita, and x2 is urban population %.

The intercept predicts 146.751452 births per 1,000 people when GDP per capita and urban population are zero. Keeping the urban population unchanged, the expected birth rate increases by 0.000140944 per 1,000 for every unit increase in GDP per capita. This shows that GDP per capita positively affects the birth rate. Keeping GDP per capita constant, the expected birth rate reduces by 1.735001756 per 1,000 urban population for every unit rise in urban population percentage. This shows that the urban population negatively impacts birth rates significantly. The histogram of residuals shows a broadly symmetric distribution with a mean of zero, suggesting that normality assumptions have been met. However, left-tail outliers indicate the presence of extreme values that detract from the model's accuracy. Most points in the normal probability plot lie on the diagonal reference line, but outliers, especially in the lower left corner, may indicate non-normality in the residual distribution. Collectively, these data indicate a likely violation of the normalcy assumption and call for more investigation into model fit and any outliers [11].

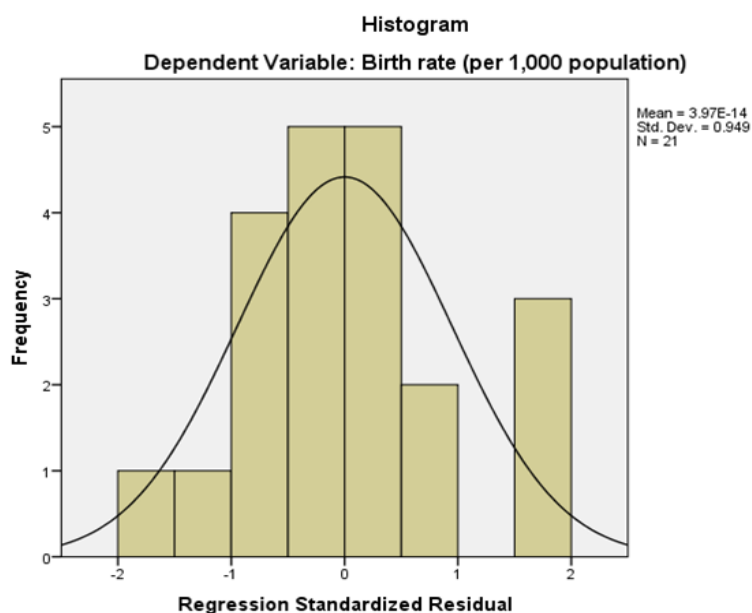


Fig 1. Histogram

4. Conclusion

The main findings and implications of the study are as follows:

After accounting for other characteristics, the study indicated that higher GDP per capita and higher urban population significantly negatively affect the birth rate in the United States. In other words, the birth rate falls when the average income and the percentage of the population living in cities rise. Additionally, the study discovered that the two independent variables very well explain the birth rate.

The study's findings suggest that the declining birth rate in the United States is related to economic and social reasons and that this trend may continue as the country modernizes and urbanizes. This could affect the US workforce, social security system, and public services, as well as the growth, age, and composition of the US population. In order to address population dynamics and improve social welfare, the study's authors recommend that policymakers and practitioners think about the issues listed above [12].

The birth rate in the United States was thoroughly analyzed in this study using regression analysis with GDP per capita and urban population as independent variables. The results showed that both factors significantly impacted the birth rate negatively, accounting for over 92% of the variation. The analysis also highlighted probable breaches of assumptions regarding the normality and homoscedasticity of the residuals, which may have been introduced by outliers in the dataset. By empirically clarifying the economic and social factors of the birth rate in the USA, this study makes a substantial contribution to population dynamics and social welfare. Policymakers, practitioners, and researchers may all learn from the study's findings, which stress the significance of considering the impact of money and urbanization on fertility behaviour and preferences when designing interventions to help families and children.

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