The Population Decline in China and It's Affecting Factors

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Abstract

The global geopolitical tensions and economic uncertainties that have been affecting the world in recent years have posed major challenges to the social and economic well-being of a country. As one of the world's leading economic players, China has played an important role in supporting domestic and foreign economic growth by expanding its labor force and consumer markets. However, the country's population is expected to decline starting in 2022, raising the following socio-economic issues. These include declining fertility rates and family planning, as well as increasing life expectancy and educational levels, which are contributing to China's gradual population decline. Researchers are still studying how this will affect the long-term stability of key indicators representing labor supply, productivity, and the overall economy. Within the scope of the study's objectives, data from the World Development Indicators (WDI) database were used. This database is internationally reliable and widely used. The analysis focused on the causes and factors affecting China's population decline. The data were defined in the Stata program as an annual time series. GDP and population indicators were logarithmically transformed. Population growth has estimated as the annual change in population. The study concluded that population change in China is due to the development of social and economic structures, declining birth rates, migration, and increased life expectancy. China's population decline is not a temporary phenomenon, but a structural change driven by long-term economic and social development.

Keywords

China, population decline, socioeconomics, birth rates, family planning, labor supply.

The article "Population and Development" in the journal of "Economics: Theory and Practice" states that the relationship between population growth and the economy varies across a country's demographic transition. Many prominent economists and researchers have made important contributions to the study of this demographic issue, and their work emphasizes that population change is not only the result of biological factors but also the combined effect of economic, social, and institutional factors.

The population of China began to decline in 2022, and most researchers explain this trend as directly related to the demographic transition, i.e., the decline in the birth rate and the increase in life expectancy. In addition to affecting the stability of key indicators of labour supply, productivity, and the economy in the long term, the aging of the population risks increasing social security costs and altering the labour market structure, thereby limiting the potential for economic growth.

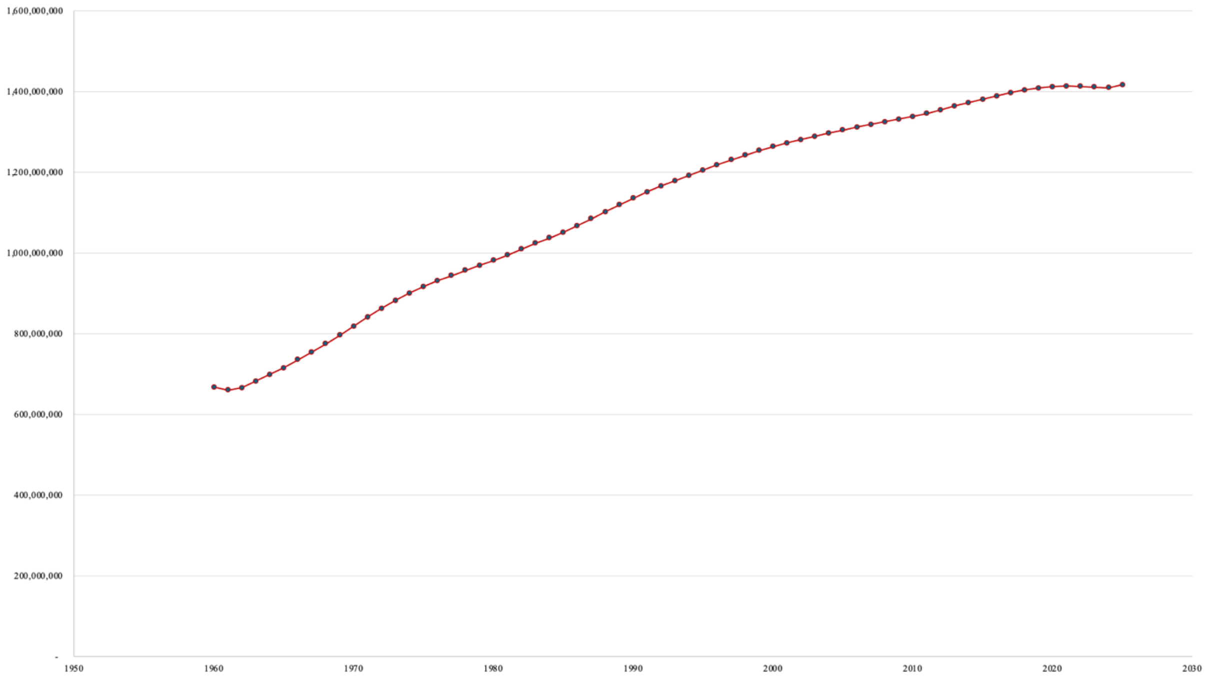

Figure 1. China's population 1960 – 2025

In this context, the long-term impact of China's "One Child Per Household" policy, implemented in 1979, is widely discussed. Although this policy was relaxed from "Two Children Per Household" in 2016 to "Three Children Per Household" in 2021, its long-term impact continues to shape family planning decisions and the demographic structure. In addition, the cost of living, urbanization, career priorities, and changes in attitudes toward marriage and childbearing are the main factors contributing to the decline in the total fertility rate.

The study of China's population decline and the factors influencing it is important not only for demographic research but also for predicting future economic and social trends. Therefore, this study aims to analyze the causes and factors influencing China's population decline. Demographic changes will directly affect the labor market, economic growth, pension systems, and long-term development strategies, so studying them will be important for overcoming potential future challenges.

Literature review

The number of scientific works investigating the causes and consequences of China's population decline has increased rapidly in recent years, and these studies mainly attribute it to fertility decline. In short, researchers have come to believe that China's population decline is caused by policy, socio-economic, and structural influences.

C. Cindy Fan, 2026, "Shrinking China: Policy, Social Changes, and Fertility Decline," in her study, "China's total fertility rate has declined to 1, which means that on average, a woman of reproductive age has only one child in her lifetime. The socio-economic and demographic changes since the 1950s have laid the foundation for the "late, sparse, few" policy, which has been identified as a major long-term factor shaping China's demographics. As a result, women's educational levels have increased significantly, and the emphasis on personal careers and the diversification of family structures, such as single-person households, have led to a decline in the tendency to marry or have children, contributing to a decline in the birth rate.

Zhang Xuliang, Zhou Simin, 2023, "Evolution of Regional Population Decline and Its Driving Factors at the Country Level in China" study, using data from the 6th and 7th National Population Censuses, calculated the changes in permanent residents and working-age populations, mapped the population decline by distribution, and formulated the determinants using the Durbin model. As a result, the permanent residents and total working-age populations of provinces decreased by a certain percentage between 2010 and 2020. The decline was concentrated in northeastern China and Shanxi provinces, while the increase was mainly observed in Zhejiang, Tibet, and Xinjiang. The analysis showed that the decline in provincial populations was mainly due to economic conditions, industrial structure, fertility rates, geographical location, education, and administrative organization.

Shilei Li, 2020, "China's Population and Economic Growth: The Role of Fertility in the Growth Process of the Last Two Decades," collected panel data from provinces in China and estimated regressions using a fixed-effects model (Hausman test) to analyze how fertility and population dynamics affect the economy. The results showed that a permanent decline in the fertility rate and population aging will reduce future GDP per capita growth, and the consequences of demographic policies are closely related to education, the labor market, and investment. The study concluded that China's demographic decline will further limit economic growth unless further reforms are implemented. The above studies analyze China's demographic decline and the factors affecting it.

1. Demographic transition theory – This theory explains that countries in the early stage of transition have very low social and economic development, which is a key factor in maintaining high birth and death rates. However, as the country's level of development increases, mortality and birth rates decrease, and it moves to the next stage of transition. In the final stage of transition, both birth and death rates reach very low levels.
2. Becker's fertility theory – as household income increases, parents substitute the number of children for quality (education and health), because households prefer to have fewer children.
3. Opportunity cost theory and human capital theory – especially for women, as education, income, and employment opportunities increase, the cost of time spent on childbearing and caregiving increases, resulting in a decrease in fertility.

In this study, based on previously studied theories, variables for the econometric model were selected and evaluated.

Methodology

1. Quantitative data used in this study
   The quantitative data used in the study were collected from the World Bank's open database and the World Development Indicators (WDI), a widely used international database, and processed in accordance with the research objectives.
2. Data processing and analysis
   This study is innovative for combining demographic and economic variables and for constructing a composite development index based on principal component analysis (PCA), which provides a more comprehensive assessment of how structural development relates to population change.
   Within the scope of the research objectives, in order to analyze the causes of China's population decline and the factors affecting it, the data were defined as a time series in Stata; variables measured in terms of money were transformed into logarithms; To reduce the risk of multicollinearity, i.e., the variables explaining each other, all explanatory variables were lagged by one year. As a result, since GDP, urbanization, and education indicators were highly correlated, Principal Component Analysis was conducted to address multicollinearity, and the first component (pc1) was used as a composite index of development.

This index has the advantage of combining multiple dimensions of economic development and improving the stability and explanatory power of the econometric model. At the same time, the use of lagged variables reduces the simultaneity problem, making the model evaluation more reliable and more representative of real relationships.

№	Variable	Meaning	Type	Measure
Independent variable (1960 – 2025)				
1	growth_rate	Population growth rate	Interval	Percent
Dependent variables (1960 – 2025)				
2	tfr	Total fertility rate	Interval	Births per woman
3	urban_pop	Urbanization	Interval	Percent
4	gdp_per_cap	GDP per capita	Interval	Dollar
5	life_exp	Average life expectance	Interval	Year
6	school_enroll	School enrollment	Interval	Percent
7	net_migration	Net migration	Interval	Unit

Table 1. Variables used in the analysis

The econometric model is defined as follows:

$$growth\_rate_t = \beta_0 + \beta_1 L\_tfr_t + \beta_2 L\_life_t + \beta_3 L\_pc1_t + \beta_4 L\_netmig_t + \varepsilon_t$$

Here, $growth\_rate_t$ - population growth rate in year t

L_tfr_t – (t-1) total fertility rate in year (t-1)

L_life_t – (t-1) life expectancy in year (t-1)

L_pc1_t – logarithmic value of GDP per capita in year (t-1), the first component (development index) consisting of urbanization and tertiary education enrollment

L_netmig_t – net migration in year (t-1)

ε_t – the error value

In the econometric model population growth is explained by one-year lagged tfr (birth rate); life_exp (life expectancy); pc1 (development index); and net migration, and the robustness of the model is assessed using Newey–West, and additionally VIF (multicollinearity); ADF (stationarity); and autocorrelation tests are used, and the following results are obtained.

Results

Variable	OLS model (robust)	Newey – West model (lag1)
L_tfr_t	0.0054*** (0.0007)	0.0054*** (0.0005)
L_life_t	0.0008*** (0.0002)	0.0008*** (0.0001)
L_pc1_t	-0.0036*** (0.0005)	-0.0036*** (0.0004)
L_netmig_t	1.87e-09*** (5.15e-10)	1.87e-09*** (5.57e-10)
_cons	-0.0617 (0.016)	-0.0617 (0.012)
R^2	0.93	–

***, **, * indicate the significance level of 1%, 5%, and 10%.

Table 2. Research results

The results show that both the OLS (robust) and Newey–West models exhibit a similar, stable trend, indicating that they are insensitive to the effects of autocorrelation correction. The lagged total fertility rate is positive, and when the total fertility rate increases by one unit, the annual population growth rate increases by approximately 0.54 percent. The lagged life expectancy is also positive, but the effect is smaller: a 1-year increase in life expectancy raises the population growth rate by approximately 0.08 percentage points.

However, the development index (pc1) has a negative coefficient, which confirms the demographic transition theory and the human capital theory, indicating that population growth decreases with increasing economic and social development. Net migration has a positive effect; when it increases by 100,000 people, the population growth rate rises by only 0.018 percent. The results show that all variables are statistically significant, especially the fertility rate, which remains the main driver of population growth. It also shows that individual development has a negative impact on population growth in the long run, suggesting that population decline is not a short-term fluctuation, but a long-term structural challenge, consistent with previous studies.

Conclusion

Population change will directly affect key indicators that determine a country's long-term development, including its social and economic structure, governance, technological progress, and investment strategies.

This study empirically analyzes China's population decline and the factors that affect it, using data from the World Development Indicators (WDI), a widely used international dataset. Population change is mainly due to the development of social and economic structure, the decline in fertility, migration, and the increase in life expectancy. In particular, the total fertility rate is the most important determinant of population growth, while the development index (GDP per capita, education, and urbanization growth) has a negative impact, which is consistent with the basic demographic transition theory, Becker's fertility theory, opportunity cost, and human capital theories.

The results of the study suggest that China's population decline is not a temporary phenomenon but a structural change driven by long-term economic and social development. In terms of policy, slowing population decline cannot be limited to policies aimed solely at increasing the birth rate; it also needs to consider and address fundamental issues such as the cost of raising children, work-life balance, and household economic pressures. In future studies, it is possible to conduct a more detailed analysis of this study using microdata or to examine regional differences in China.

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Appendix

1. Codes used in Stata program

```
sort year
tsset year, yearly
gen ln_gdp_per_cap = ln(gdp_per_cap)
gen lnpop = ln(population)
gen dlnpop = D.lnpop
gen L_tfr = L.tfr
gen L_life = L.life_exp
gen L_age = L.age_dep_ratio
gen L_school = L.school_enroll
gen L_urban = L.urban_pop
gen L_lngdp = L.ln_gdp_per_cap
gen L_netmig = L.net_migration
summarize gdp_per_cap
assert r(min) > 0
pca ln_gdp_per_cap urban_pop school_enroll
predict pc1, score
regress growth_rate L_tfr L_life pc1 L_netmig, robust
estimates store modelA
regress growth_rate L_tfr L_life L_lngdp L_netmig, robust
estimates store modelB
estat vif
estat bgodfrey, lags(1)
hettest
dfuller lnpop, regress
dfuller tfr, regress
dfuller ln_gdp_per_cap, regress
dfuller school_enroll, regress
regress dlnpop L_tfr L_life pc1 L_netmig, robust
estimates store modelA_dln
gen L2_tfr = L2.tfr
regress growth_rate L2_tfr L_life pc1 L_netmig, robust
estimates store modelA_L2
regress growth_rate F.tfr L_life pc1 L_netmig, robust
estimates store placebo
newey growth_rate L_tfr L_life pc1 L_netmig, lag(1)
display "Effect of 0.5 change in TFR (Model A) = " 0.5 * _b[L_tfr]
display "Effect of 100000 migrants (Model A) = " 100000 * _b[L_netmig]
```

2. Data

year	population	growth_rate	tfr	urban_pop	gdp_per_cap	life_exp	age_dep_ratio	school_enroll	net_migration
1960	667,070,000	-	4.5	0.20	90	33	0.80	0.00	(16,927)
1961	660,330,000	(0.01)	3.9	0.19	76	40	0.78	0.00	(25,578)
1962	665,770,000	0.01	6.1	0.17	71	51	0.78	0.00	(31,305)
1963	682,335,000	0.02	7.5	0.17	74	52	0.80	0.00	(31,383)
1964	698,355,000	0.02	6.7	0.18	86	52	0.81	0.00	(1,250,441)
1965	715,185,000	0.02	6.6	0.18	99	53	0.82	0.00	(130,900)
1966	735,400,000	0.03	6.3	0.18	105	54	0.82	0.00	4,165
1967	754,550,000	0.03	5.8	0.18	97	54	0.82	0.00	1,246,654
1968	774,510,000	0.03	6.5	0.18	92	55	0.81	0.00	(37,290)
1969	796,025,000	0.03	6.2	0.17	100	56	0.81	0.00	(72,836)
1970	818,315,000	0.03	6.1	0.17	113	57	0.80	0.00	(126,510)
1971	841,105,000	0.03	5.5	0.17	119	58	0.80	0.00	(180,153)
1972	862,030,000	0.02	5.1	0.17	132	59	0.79	0.00	(215,650)
1973	881,940,000	0.02	4.7	0.17	157	59	0.78	0.00	(214,997)
1974	900,350,000	0.02	4.2	0.17	160	60	0.79	0.00	(175,239)
1975	916,395,000	0.02	3.6	0.17	179	61	0.79	0.00	(115,173)
1976	930,685,000	0.02	3.2	0.17	166	61	0.80	0.01	(55,109)
1977	943,455,000	0.01	2.8	0.18	186	62	0.78	0.01	(15,323)
1978	956,165,000	0.01	2.7	0.18	157	63	0.75	0.01	(9,916)
1979	969,005,000	0.01	2.7	0.19	184	64	0.71	0.01	(13,704)
1980	981,235,000	0.01	2.7	0.19	195	64	0.68	0.01	(20,129)
1981	993,885,000	0.01	2.8	0.20	197	65	0.65	0.02	(28,016)
1982	1,008,630,000	0.01	3.0	0.21	204	65	0.63	0.00	(36,181)
1983	1,023,310,000	0.01	2.6	0.22	226	66	0.61	0.00	(43,756)
1984	1,036,825,000	0.01	2.6	0.23	251	66	0.59	0.02	(51,961)
1985	1,051,040,000	0.01	2.6	0.24	295	67	0.56	0.02	(60,929)
1986	1,066,790,000	0.01	2.7	0.25	282	67	0.55	0.03	(79,190)
1987	1,084,035,000	0.02	2.8	0.25	252	67	0.53	0.03	(169,170)
1988	1,101,630,000	0.02	2.5	0.26	284	68	0.53	0.03	(282,194)
1989	1,118,650,000	0.02	2.5	0.26	311	68	0.52	0.03	(313,476)
1990	1,135,185,000	0.01	2.5	0.26	319	68	0.52	0.03	(11,187)
1991	1,150,780,000	0.01	1.9	0.27	334	69	0.52	0.03	(544,650)
1992	1,164,970,000	0.01	1.8	0.27	368	69	0.51	0.03	(142,985)
1993	1,178,440,000	0.01	1.7	0.28	379	69	0.51	0.03	(373,316)
1994	1,191,835,000	0.01	1.6	0.29	476	70	0.51	0.04	(723,641)
1995	1,204,855,000	0.01	1.6	0.29	613	70	0.50	0.05	(365,986)
1996	1,217,550,000	0.01	1.6	0.30	713	71	0.50	0.05	(250,750)
1997	1,230,075,000	0.01	1.5	0.32	787	71	0.49	0.06	(279,251)
1998	1,241,935,000	0.01	1.5	0.33	835	72	0.48	0.06	(40,472)
1999	1,252,735,000	0.01	1.5	0.35	881	72	0.47	0.07	(96,102)
2000	1,262,645,000	0.01	1.6	0.36	969	72	0.46	0.08	(62,622)
2001	1,271,850,000	0.01	1.6	0.38	1,065	73	0.45	0.09	(176,419)
2002	1,280,400,000	0.01	1.6	0.39	1,164	73	0.44	0.12	(761,291)
2003	1,288,400,000	0.01	1.6	0.41	1,307	73	0.42	0.15	(613,223)
2004	1,296,075,000	0.01	1.6	0.42	1,531	74	0.41	0.17	(770,977)
2005	1,303,720,000	0.01	1.6	0.43	1,778	74	0.39	0.19	(103,701)
2006	1,311,020,000	0.01	1.6	0.44	2,129	74	0.38	0.21	(759,559)
2007	1,317,885,000	0.01	1.7	0.46	2,735	75	0.38	0.21	(1,042,019)
2008	1,324,655,000	0.01	1.7	0.47	3,523	75	0.37	0.22	(764,370)
2009	1,331,260,000	0.00	1.7	0.48	3,898	75	0.37	0.23	(177,135)
2010	1,337,705,000	0.00	1.7	0.49	4,629	76	0.37	0.25	(184,144)
2011	1,345,035,000	0.01	1.7	0.52	5,704	76	0.37	0.27	(416,189)
2012	1,354,190,000	0.01	1.8	0.53	6,405	76	0.38	0.29	(58,864)
2013	1,363,240,000	0.01	1.7	0.54	7,147	76	0.38	0.33	(188,951)
2014	1,371,860,000	0.01	1.8	0.56	7,781	77	0.39	0.44	(371,108)
2015	1,379,860,000	0.01	1.7	0.57	8,175	77	0.40	0.47	(646,941)
2016	1,387,790,000	0.01	1.8	0.59	8,255	77	0.40	0.49	(153,056)
2017	1,396,215,000	0.01	1.8	0.60	8,980	77	0.42	0.51	(94,625)
2018	1,402,760,000	0.00	1.5	0.62	10,086	78	0.43	0.53	(198,206)
2019	1,407,745,000	0.00	1.5	0.63	10,343	78	0.43	0.57	(656,091)
2020	1,411,100,000	0.00	1.2	0.64	10,627	78	0.44	0.62	(91,577)
2021	1,412,360,000	0.00	1.1	0.65	12,887	78	0.44	0.67	(379,749)
2022	1,412,175,000	(0.00)	1.0	0.65	12,971	78	0.45	0.72	(293,846)
2023	1,410,710,000	(0.00)	1.0	0.66	12,951	78	0.45	0.75	(567,724)
2024	1,408,975,000	(0.00)	1.0	0.66	13,303	79	0.44	0.77	(318,992)
2025	1,416,096,094	0.01	1.0	0.67	13,806	79	0.44	0.77	(268,126)