Mini Project

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Introduction

Vietnam’s growth has lowered birth rates in cities but left rural areas with higher fertility and weaker education. This study uses 2015–2024 provincial data to examine how income and education shape fertility trends and Vietnam’s demographic future.

Data and Methodology:

Data: Crude Birth Rate (per 1,000 population), Average Monthly Income per Employee, Kindergarten Enrollment, University Students (by province) from the National Statistics of Vietnam website.

Methodology:

Data Preparation: Cleaned, standardized, and merged four provincial datasets into a panel (2015–2024).

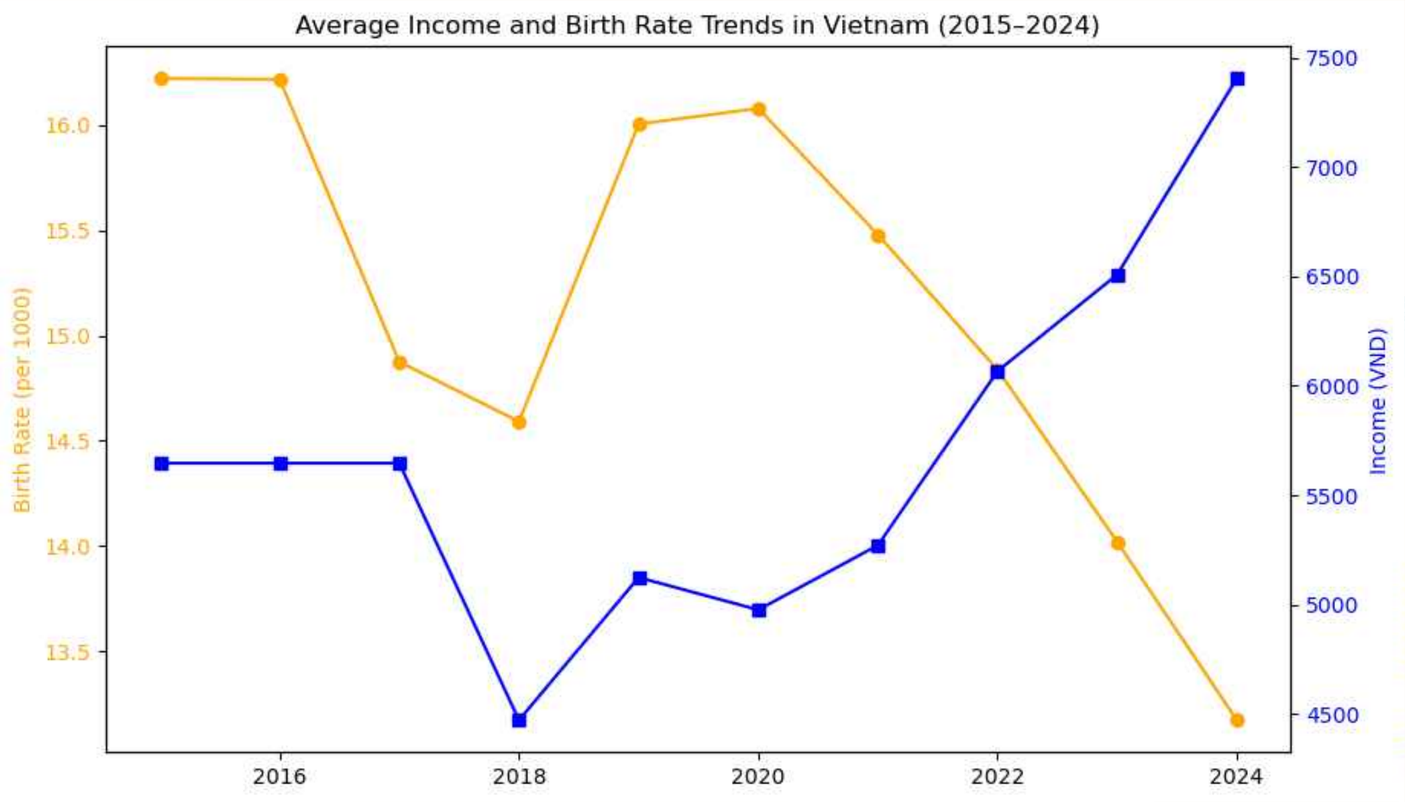
Exploratory Analysis (EDA): Trends in income, birth rates, and education across provinces and over time.

Comparative Analysis:

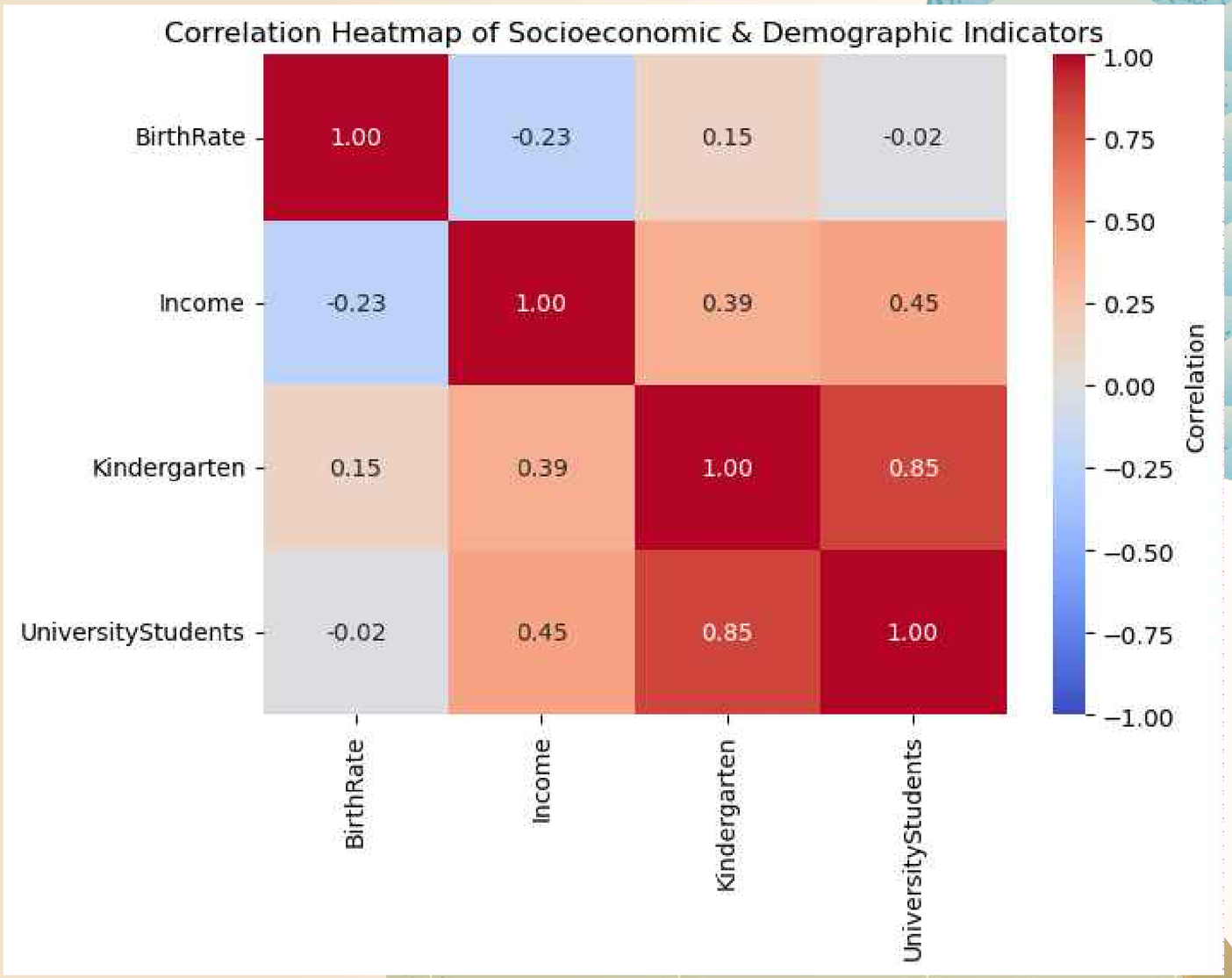
- Top 10 richest vs poorest provinces (income vs birth rate).
- Top 10 highest vs lowest birth rate provinces (birth rate vs kindergarten access).

Statistical Tools: Correlation analysis, bar/line charts, scatter plots, and heatmaps to explore relationships.

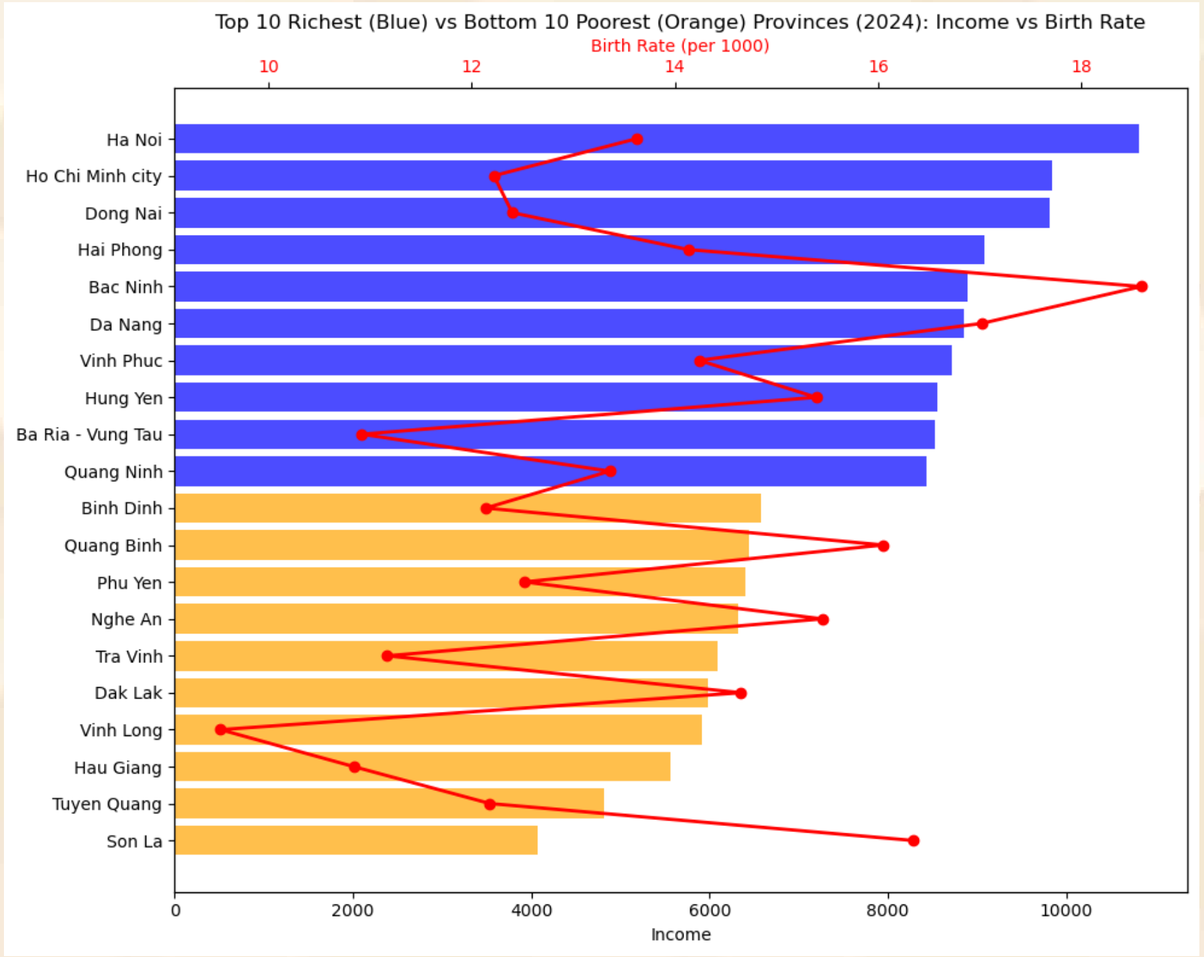
Visualizations

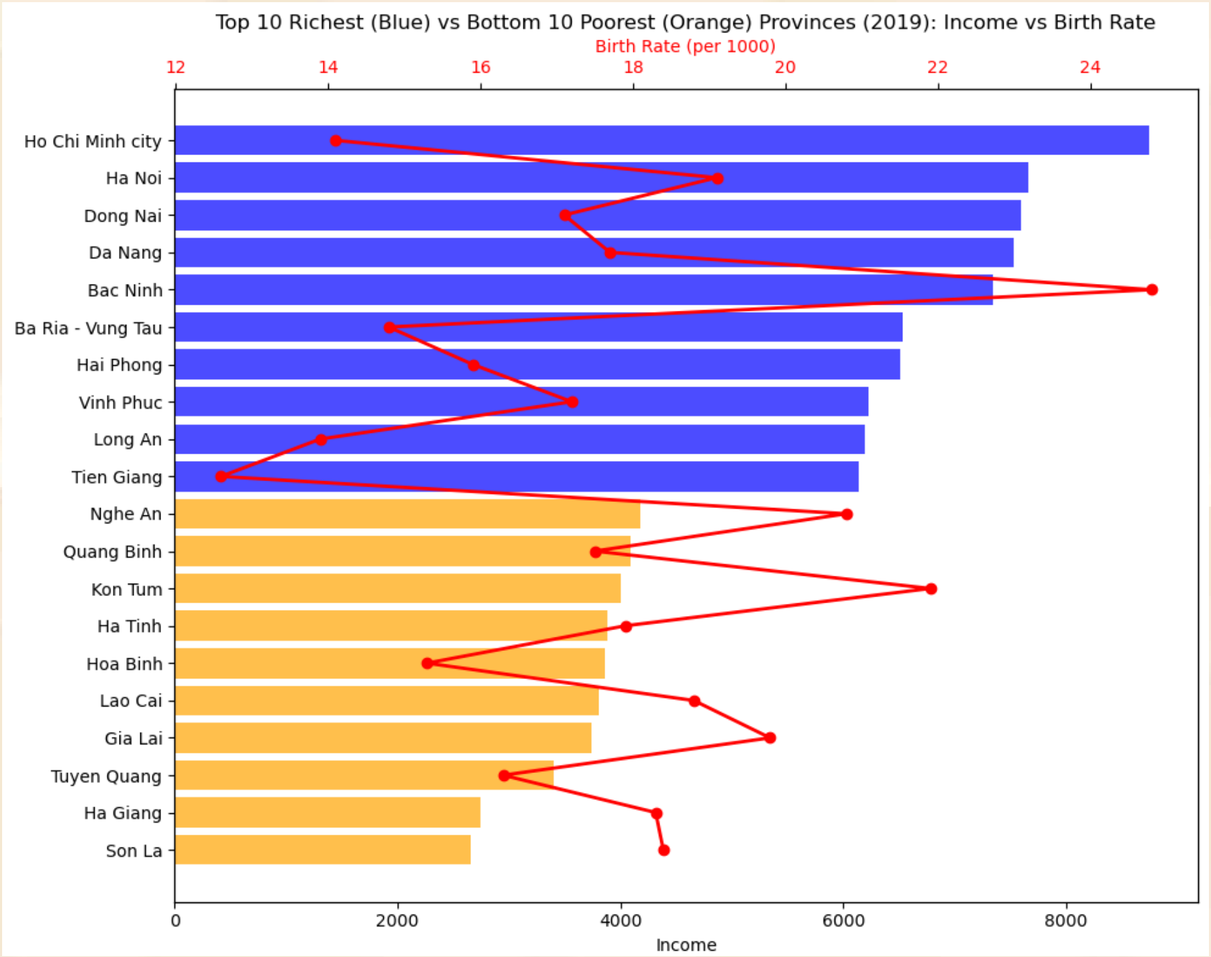


- From 2015 to 2024, income steadily rises, while birth rates show a declining trend.
- The divergence becomes sharper after 2020, reflecting post-COVID recovery and continued urbanization.
- This confirms the long-term demographic transition: as economic growth accelerates, fertility rates fall.

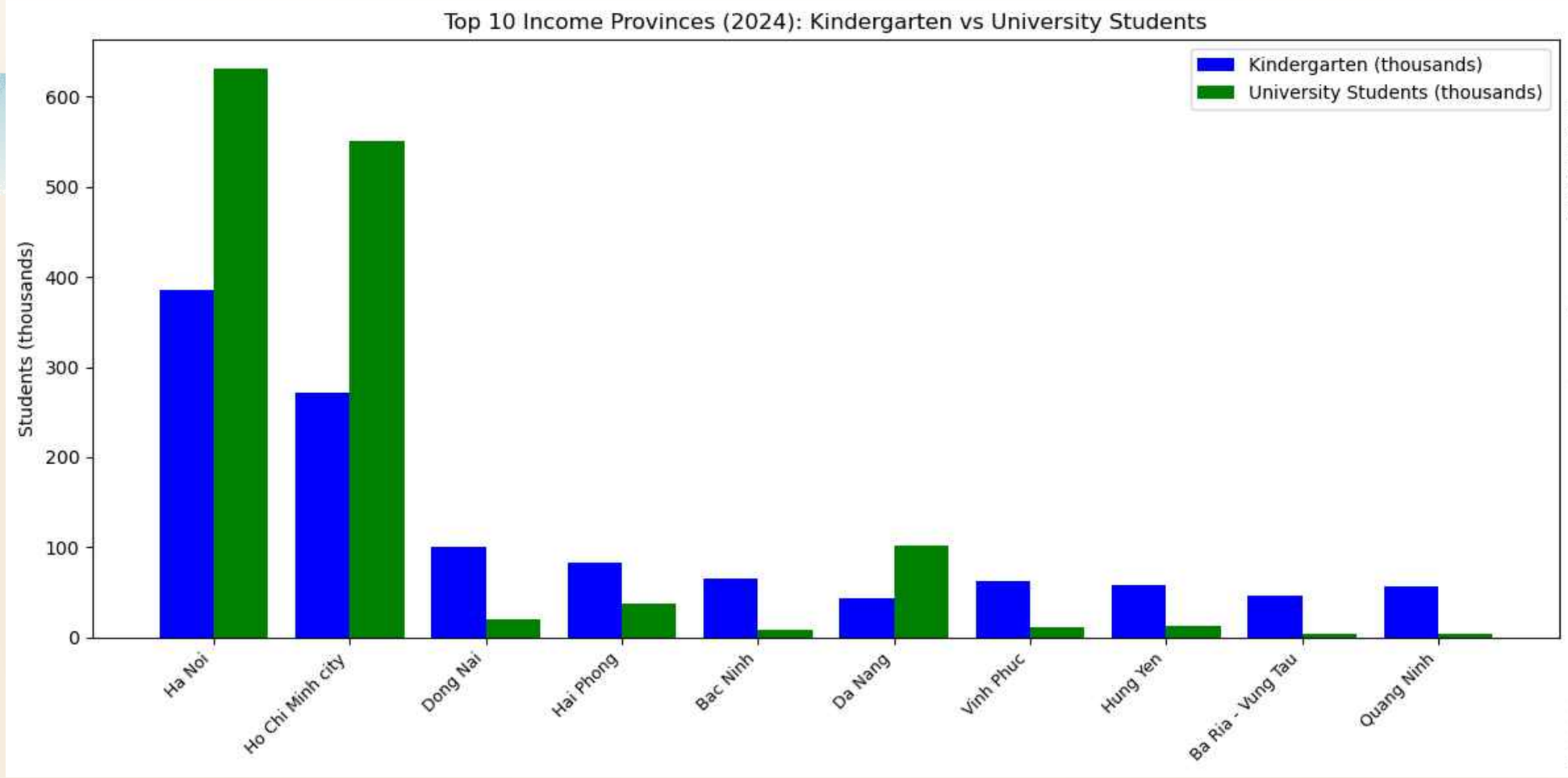


- Birth Rate is negatively correlated with Income (-0.23), confirming the inverse relationship.
- Kindergarten and University Students are strongly correlated (0.85), showing that provinces investing in early childhood education also have higher university participation rates later.
- Income correlates positively with both education measures (0.39 with Kindergarten, 0.45 with University Students), highlighting how wealthier provinces invest more in education at all levels.





- The bar + line charts (2019, 2024) clearly show a negative relationship between income and birth rates.
- Richer provinces (e.g., Hanoi, Ho Chi Minh City, Dong Nai) consistently report lower birth rates despite higher income levels.
- Poorer provinces (e.g., Son La, Ha Giang, Tuyen Quang) show higher birth rates, aligning with demographic transition theory where fertility declines as income and development rise.
- This suggests that economic prosperity accelerates fertility decline, consistent with Vietnam's rapid urbanization.



- Hanoi and Ho Chi Minh City dominate both kindergarten and university populations, reflecting their role as educational hubs.
- The large gap between higher education vs kindergarten enrollment in high-income areas suggests increasing human capital investment.
- Mid-income provinces (Da Nang) show smaller but still balanced growth in both levels.
- In other provinces, although the income is high, the number of pupils in kindergarten is higher than that in universities because they do not invest in universities.

Bigger Picture Insights

- Demographic Transition
  - Vietnam is shifting from high fertility/low income to low fertility/higher income.
  - Urbanization accelerates this, mirroring East Asian patterns of aging and labor shortages.
- Urban–Rural Divide
  - Rich provinces: lower fertility, higher income, stronger education.
  - Poor provinces: higher fertility, weaker education, poverty trap risk.
- Education as a Lever
  - Strong link between kindergarten and university enrollment.
  - Early education investment drives long-term human capital.
- Future Challenge: Aging
  - Declining fertility may cause labor shortages and rising dependency ratios.
  - Healthcare and pension pressures will intensify.
- Policy Trade-offs
  - Urban areas: family support to sustain fertility.
  - Rural areas: invest in education to reduce inequality.


Thank you!