

Income, Education, and Fertility in Vietnam: Provincial Analysis

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DATA 400

Research Question:

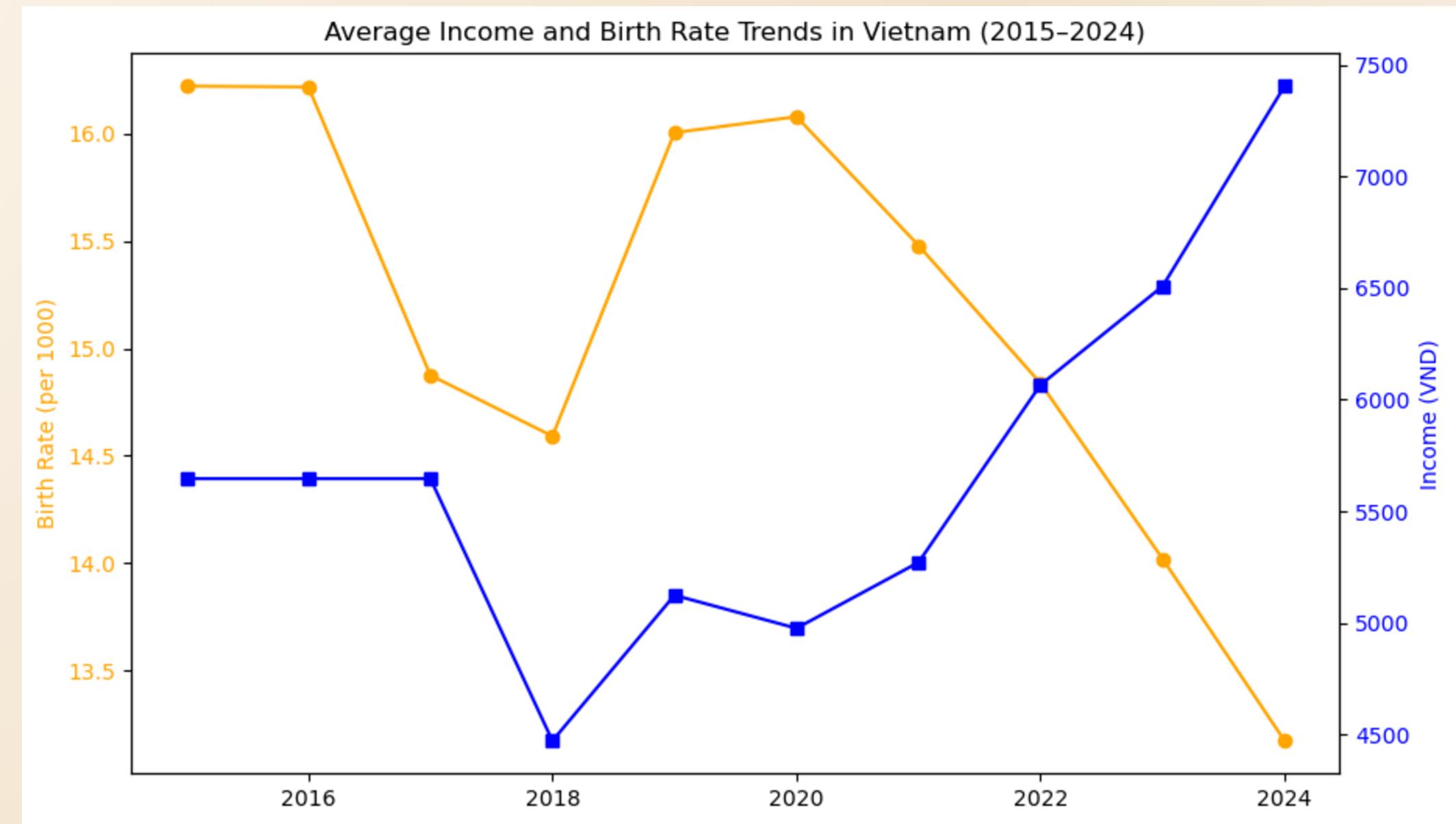
How do income and education levels influence birth rates across Vietnam's provinces, and what are the broader demographic, social, and policy implications of these patterns between 2015 and 2024?

Tractable Data and Data Retrieval :

- Provincial-level data (63 provinces) between 2015 and 2024
- Indicators: Birth Rate, Income, Kindergarten Pupils, University Students
- Structured, manageable, and relevant to Vietnam's demographic transition
- Sources: Vietnam General Statistics Office (GSO) official datasets
- Data merged into a single dataframe (Province, Year, indicators)
- Cleaning: handled missing values (mean & interpolation), unit conversion, unified column names

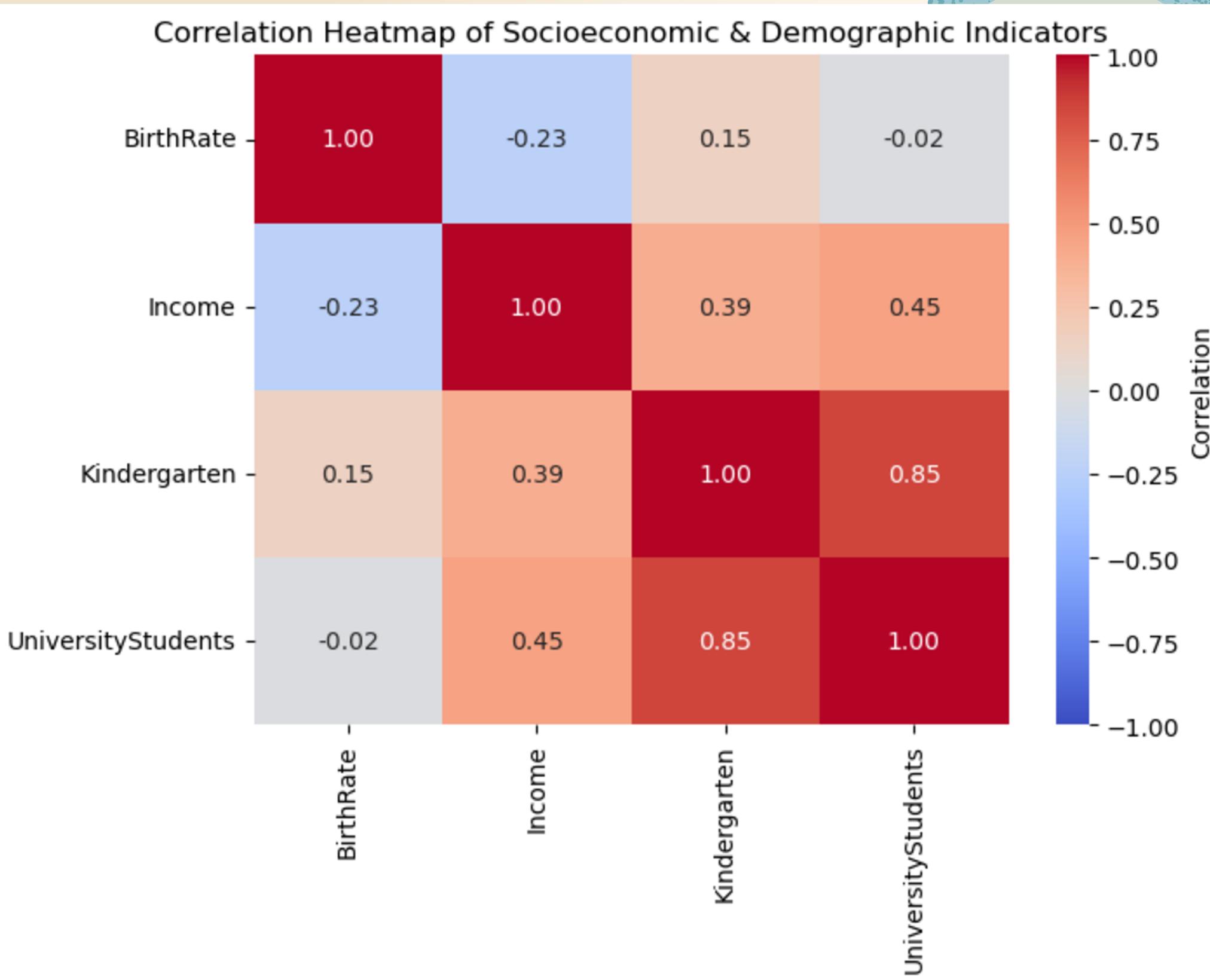
	Province	Year	BirthRate	Income	Kindergarten	UniversityStudents
567	Ha Noi	2015	16.30	8337.07	391.05	611608.0
568	Vinh Phuc	2015	17.70	6992.90	64.73	15675.0
569	Bac Ninh	2015	22.10	7647.47	66.51	6196.0
570	Quang Ninh	2015	15.40	6587.05	60.53	4588.0
571	Hai Duong	2015	14.50	6506.44	97.67	11533.0
...
1190	An Giang	2024	10.40	6897.92	54.58	9893.777778
1191	Kien Giang	2024	11.32	7985.36	40.20	3725.333333
1192	Can Tho	2024	10.78	7519.13	39.72	82813.888889
1193	Hau Giang	2024	10.84	5564.02	25.52	4201.555556
1195	Bac Lieu	2024	11.48	7077.77	25.01	2039.222222

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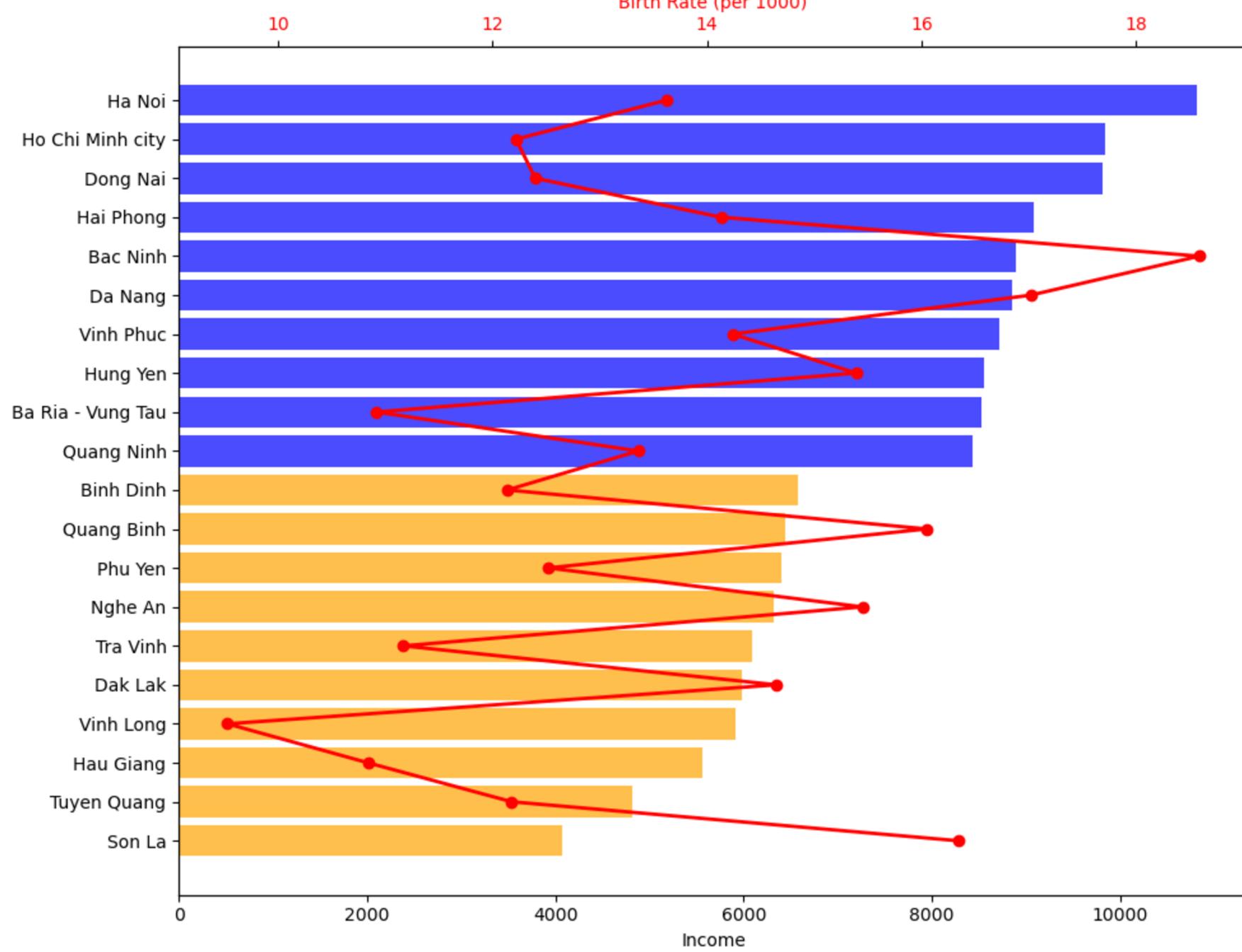
- 2015–2024: Income ↑ , Birth Rate ↓
- Post-2020: Divergence sharpens with urbanization & COVID recovery
- Confirms demographic transition leads to growth accelerates, fertility falls

Correlation Heatmap of Socioeconomic & Demographic Indicators

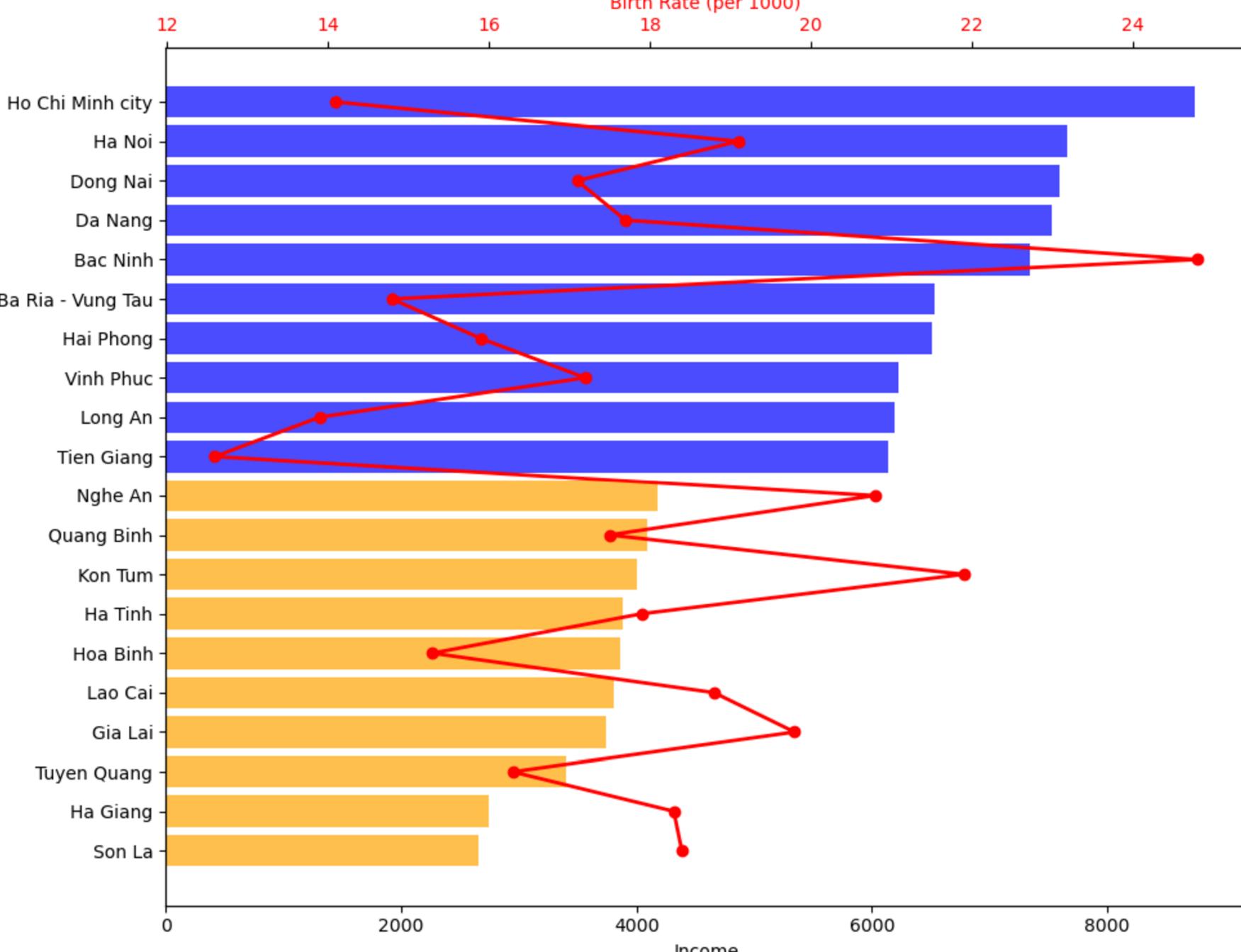


- Birth Rate vs Income: Negative correlation => higher income, lower fertility
- Kindergarten vs University Students: Strong positive correlation => early education linked to higher university participation
- Income vs Education: Positive correlation => wealthier provinces invest more in education

Top 10 Richest (Blue) vs Bottom 10 Poorest (Orange) Provinces (2024): Income vs Birth Rate

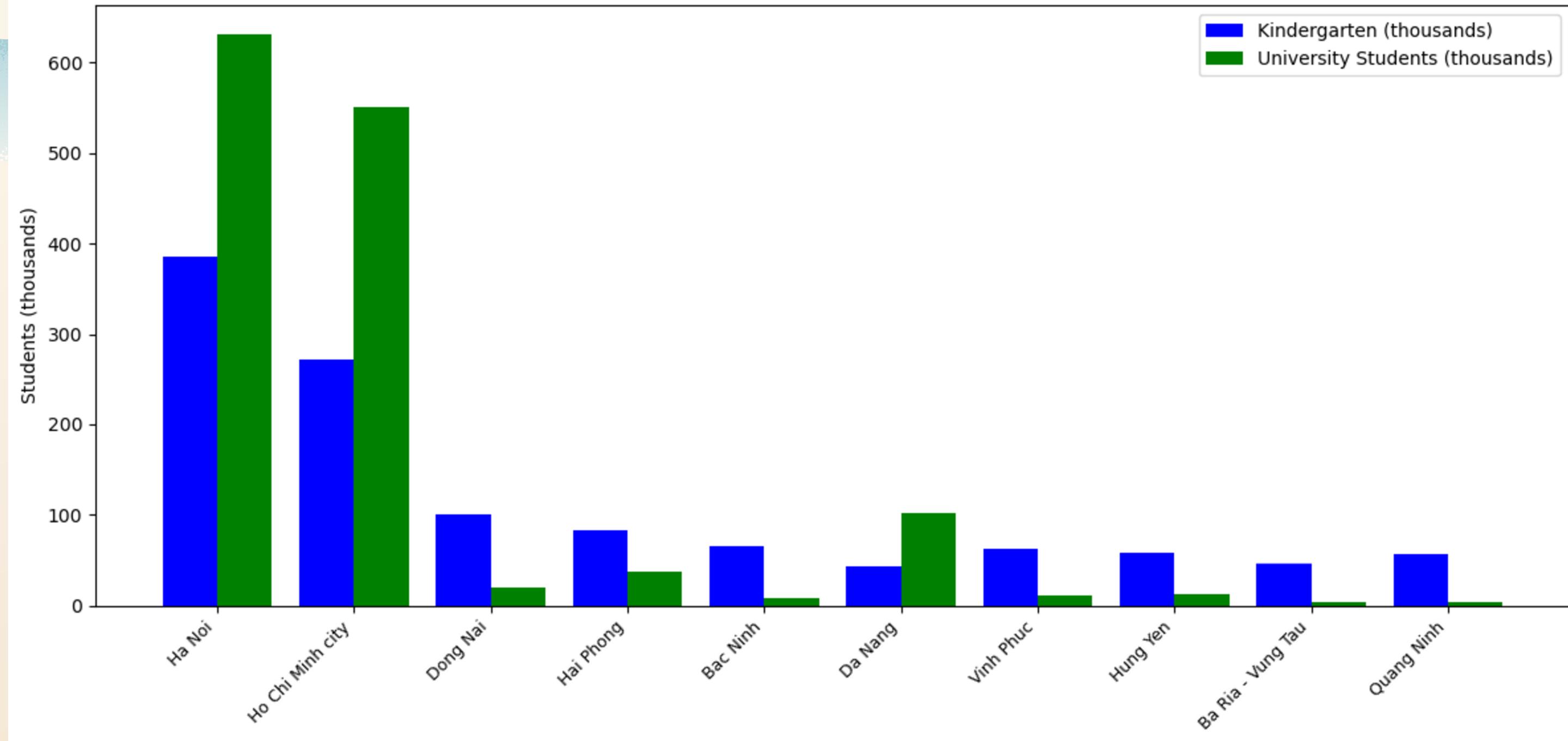


Top 10 Richest (Blue) vs Bottom 10 Poorest (Orange) Provinces (2019): Income vs Birth Rate



- Bar + line charts (2019, 2024): Income $\uparrow \Rightarrow$ Birth Rate \downarrow
- Rich provinces (Hanoi, HCMC, Dong Nai): High income, low fertility
- Poor provinces (Son La, Ha Giang, Tuyen Quang): Low income, high fertility
- Confirms demographic transition \Rightarrow prosperity accelerates fertility decline

Top 10 Income Provinces (2024): Kindergarten vs University Students



- Hanoi & HCMC dominate kindergarten and university => key educational hubs
- High-income provinces: Large gap => more investment in higher education (human capital focus)
- Mid-income (Da Nang): Balanced growth in both kindergarten & university
- Other wealthy provinces: High kindergarten, low university => less investment in higher education



Implications for Stakeholders

- Government: must balance investments across provinces; urban areas need family support & healthcare policies, rural areas need education & poverty reduction programs.
- Educational institutions: Hanoi & HCMC as educational hubs; mid-income provinces like Da Nang show balanced growth; poorer provinces risk falling into a poverty trap without expanded higher education.
- Businesses/Labor market: declining fertility in rich provinces → future labor shortages; rising demand for productivity, automation, and skilled workers.



Ethical, Legal, Societal Implications

- Ethical: fairness in education access to rural children is disadvantaged compared to their urban peers.
- Legal: The government is obligated under Vietnam's education and social protection law to distribute resources equitably across regions.
- Societal:
 - Urban–rural divide: prosperity fuels low fertility + aging in cities, while rural areas remain high fertility with weak education.
 - Future challenge: aging population → labor shortages, rising dependency ratios, healthcare and pension pressures.
 - Migration pressures: rural-to-urban migration is likely to intensify, deepening inequality unless balanced by regional development.



Thank you!