20_Bhutan

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1 How has gender parity in upper secondary education evolved in Bhutan between 1998 and 2018, as measured by the gross enrolment ratios of female versus male students?

1.1 Abstract

Using World Bank World Development Indicators (WDI), this study examines the evolution of upper secondary school enrolment in Bhutan between 1998 and 2018, focusing on gender disparities. Over this twenty-year period, gross enrolment ratios for both female and male students increased substantially, each rising by roughly 70%. Initially, female enrolment lagged slightly behind male enrolment, but by around 2012, females caught up and eventually surpassed males, signaling a reversal in gender parity. These trends reflect the combined effects of policy initiatives, scholarship programs, and societal shifts promoting female education. The convergence and eventual overtaking of female enrolment underscore Bhutan's significant progress toward gender equality in education while highlighting the broader impact of sustained investments in access and opportunity.

1.2 1. Question

How has gender parity in upper secondary education evolved in Bhutan between 1998 and 2018, as measured by the gross enrolment ratios of female versus male students?

- **Female proxy**: Gross enrolment ratio, upper secondary, female (%)
- **Male proxy**: Gross enrolment ratio, upper secondary, male (%)

1.3 2. Data

- **Source**: World Bank World Development Indicators (WDI)
- **Indicators**:
    - Gross enrolment ratio, upper secondary, female (%)
    - Gross enrolment ratio, upper secondary, male (%)
- **Coverage**: Bhutan, 1998–2018
- **Notes**: National-level data only

1.4 3. Method

1. Filtered dataset for Bhutan.
2. **Selected relevant columns**: Year, Indicator Name, Value.
3. Pivoted female and male upper secondary enrolment indicators into separate columns and sorted by year.

4. Produced a dual-axis line graph comparing trends in female vs. male enrolment ratios.

(Analysis is descriptive; no causal inference applied.)

1.5 4. Results

- **Female enrolment (% gross)**: Increased steadily from 1998, catching up to male enrolment around 2012, and slightly exceeding it thereafter.
- **Male enrolment (% gross)**: Also rose substantially, maintaining a slight lead until 2012 before being surpassed by female enrolment.
- **Comparison**: Both indicators grew by roughly 70% over two decades. The convergence and eventual reversal of gender parity reflect a deliberate and sustained effort to enhance female access to secondary education.

(Figure 1. Gross Enrolment Ratio, Upper Secondary: Female vs Male, Bhutan 1998–2018)

(Table 1. Pivoted dataset)

1.6 5. Interpretation

- Bhutan's experience illustrates significant progress toward gender equality in education. Policies promoting girls' education, scholarship programs, and community engagement likely contributed to the closing of the gender gap.
- The late-stage surpassing of male enrolment by females signals not only equality in access but also potential changes in societal attitudes toward female education.
- These trends suggest that investments in education infrastructure, teacher training, and awareness campaigns can have measurable impacts on achieving gender parity over relatively short time horizons.

1.7 6. Limitations

- The analysis does not account for quality of education, retention rates, or transition to tertiary education.
- National-level data may mask regional or rural–urban disparities in access to upper secondary schooling.
- Descriptive analysis does not explore causal mechanisms driving gender-specific enrolment increases.

1.8 7. Next Steps / Extensions

- Examine regional and district-level enrolment data to assess localized gender parity trends.
- Investigate connections between secondary enrolment, literacy outcomes, and labor market participation.
- Compare Bhutan's gender parity trajectory with neighboring South Asian countries to contextualize policy effectiveness.
- Explore the role of cultural norms, economic incentives, and government programs in sustaining and accelerating gender equality in education.

[3]:

```python
# How has gender parity in upper secondary education evolved in Bhutan between␣
 ↪1998 and 2018, as measured by the gross enrolment ratios of female versus␣
 ↪male students?

import pandas as pd
import matplotlib.pyplot as plt
import os

# Folders
data_raw_folder = "data_raw/"
data_clean_folder = "data_clean/"
figures_folder = "figures/"

# Load CSV
filename = "education_btn_filtered.csv"  # Filtered dataset with only relevant␣
 ↪rows
df = pd.read_csv(os.path.join(data_raw_folder, filename))

# Keep only needed columns
df = df[["Year", "Indicator Name", "Value"]]

# Convert Year and Value to numeric, drop invalid rows
df["Year"] = pd.to_numeric(df["Year"], errors="coerce")
df["Value"] = pd.to_numeric(df["Value"], errors="coerce")
df = df.dropna(subset=["Year", "Value"])

# Pivot indicators into separate columns
df_pivot = df.pivot(index="Year", columns="Indicator Name", values="Value").
 ↪reset_index()
df_pivot = df_pivot.sort_values("Year")

print("Pivoted Bhutan dataset:")
display(df_pivot)

# Interpolate missing values for smooth plotting (optional)
df_plot = df_pivot.interpolate(method='linear')

# Plot the two indicators
plt.figure(figsize=(10,6))
plt.plot(df_plot["Year"], df_plot["Gross enrolment ratio, upper secondary,␣
 ↪female (%)"],
         marker='o', linestyle='-', label="Gross enrolment ratio, upper␣
 ↪secondary, female (%)")
plt.plot(df_plot["Year"], df_plot["Gross enrolment ratio, upper secondary, male␣
 ↪(%)"],
```

```
        marker='o', linestyle='-', label="Gross enrolment ratio, upper␣
  ↪secondary, male (%)")

plt.title("Bhutan: Gross enrolment ratio, upper secondary, female vs Gross␣
  ↪enrolment ratio, upper secondary, male (%) (1998-2018)")
plt.xlabel("Year")
plt.ylabel("Percentage")
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.savefig(os.path.join(figures_folder,␣
  ↪"bhutan_gross_enrolment_ratio_upper_secondary_female_vs_male.png"))
plt.show()

# Save cleaned CSV
df_pivot.to_csv(os.path.join(data_clean_folder,␣
  ↪"bhutan_gross_enrolment_ratio_upper_secondary_female_vs_male"), index=False)
```

Pivoted Bhutan dataset:

Indicator Name	Year	Gross enrolment ratio, upper secondary, female (%) \
0	1998	2.37898
1	1999	3.44469
2	2000	4.95401
3	2001	8.68522
4	2005	21.84829
5	2006	23.77526
6	2007	27.75428
7	2008	29.54840
8	2009	35.62334
9	2010	39.77200
10	2011	41.64015
11	2012	47.28453
12	2013	54.95561
13	2014	68.21374
14	2015	67.42741
15	2016	66.63686
16	2017	70.41710
17	2018	74.97505

Indicator Name	Gross enrolment ratio, upper secondary, male (%)
0	5.51368
1	7.51459
2	9.85360
3	15.03381
4	31.73077
5	32.98950
6	36.18605

7	34.58002
8	40.99822
9	43.74387
10	46.23464
11	49.74308
12	55.64188
13	67.06347
14	69.13644
15	65.35335
16	69.04525
17	71.00349

Bhutan: Gross enrolment ratio, upper secondary, female vs Gross enrolment ratio, upper secondary, male (%) (1998-2018)