15_Barbados

September 24, 2025

1 How has the relationship between urbanization and internet adoption evolved in Barbados between 1990 and 2020?

1.1 Abstract

Using World Bank World Development Indicators (WDI), this study examines the evolution of urbanization and internet adoption in Barbados between 1990 and 2020. Over this thirty-year period, the share of the population living in urban areas decreased slightly, while internet usage surged dramatically, reflecting the rapid digital transformation of society despite modest shifts in urban demographics. This divergence underscores that technological adoption can advance independently of population concentration in urban centers, highlighting the multidimensional and sometimes decoupled nature of development. By juxtaposing urbanization and internet adoption trajectories, the analysis demonstrates that social and technological progress can follow distinct paths, emphasizing the importance of integrating digital infrastructure strategies with broader urban and economic planning.

1.2 1. Question

How has the relationship between urbanization and internet adoption evolved in Barbados between 1990 and 2020?

- **Urbanization proxy**: Urban population (% of total population)
- **Internet adoption proxy**: Individuals using the Internet (% of population)

1.3 2. Data

- **Source**: World Bank World Development Indicators (WDI)
- **Indicators**:
  - Urban population (% of total population)
  - Individuals using the Internet (% of population)
- **Coverage**: Barbados, 1990–2020
- **Notes**: National-level data only

1.4 3. Method

1. Filtered dataset for Barbados.
2. **Selected relevant columns**: Year, Indicator Name, Value.
3. Pivoted urban population and internet usage indicators into separate columns and sorted by year.

4. Produced a dual-axis line graph comparing urbanization and internet adoption trends over time.

(Analysis is descriptive; no causal inference applied.)

1.5 4. Results

- **Urban population (% of total)**: Decreased slightly over the period, indicating modest demographic shifts away from urban concentration.
- **Internet usage (% of population)**: Increased sharply, reflecting rapid digital adoption and technological integration.
- **Comparison**: The diverging trends illustrate that digital connectivity can expand independently of urban density, emphasizing the distinct trajectories of social and technological development.

(Figure 1. Urban Population vs Internet Adoption in Barbados, 1990–2020)

(Table 1. Pivoted dataset)

1.6 5. Interpretation

- Barbados experienced significant progress in digital inclusion even as urbanization remained relatively stable.
- The decoupling of urbanization and internet adoption highlights that technological infrastructure and access can drive development independently of traditional population concentration metrics.
- Policies promoting digital literacy, internet accessibility, and ICT infrastructure are critical to ensuring equitable technological advancement across the population.

1.7 6. Limitations

- Only two indicators analyzed; other dimensions of digital and social development (e.g., broadband quality, education, regional disparities) are not captured.
- National-level data may obscure variations in internet adoption between urban and rural areas.
- Descriptive analysis only; causal mechanisms behind digital adoption and urbanization trends are not explored.

1.8 7. Next Steps / Extensions

- Investigate regional and socioeconomic variations in internet adoption to identify equity gaps.
- Compare Barbados with other Caribbean nations to understand relative digital transformation.
- Explore correlations between internet adoption and economic outcomes, education, or social mobility.
- Examine policy interventions or infrastructure investments that accelerated internet adoption despite modest urban population changes.

[1]:
```
# How has the relationship between urbanization and internet adoption evolved␣
↪in Barbados between 1990 and 2020?
```

```
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 = "barbados_combined.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 Barbados 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["Urban population (% of total population)"],
         marker='o', linestyle='-', label="Urban population (% of total␣
 ↪population)")
plt.plot(df_plot["Year"], df_plot["Individuals using the Internet (% of␣
 ↪population)"],
         marker='o', linestyle='-', label="Individuals using the Internet (% of␣
 ↪population)")

plt.title("Barbados: Urban Population vs Individuals Using the Internet (%)␣
 ↪(1990-2020)")
plt.xlabel("Year")
plt.ylabel("Percentage")
```

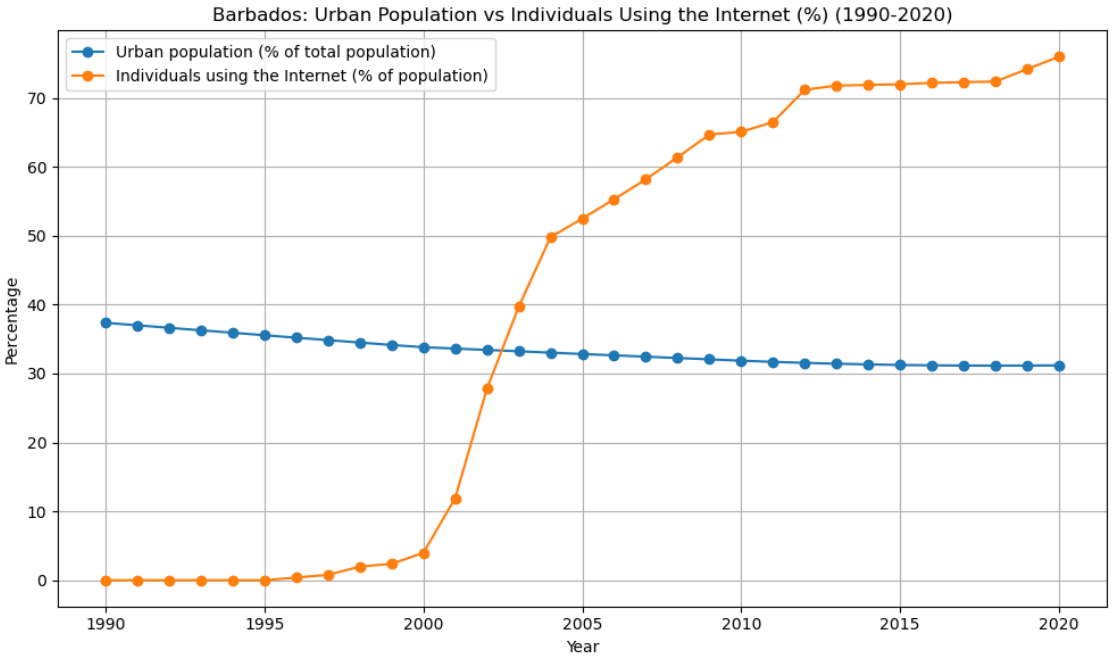
```
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.savefig(os.path.join(figures_folder,␣
  ↪"barbados_urban_pop_vs_individuals_using_internet.png"))
plt.show()

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

Pivoted Barbados dataset:

Indicator Name	Year	Individuals using the Internet (% of population)
0	1990	0.00000
1	1991	NaN
2	1992	NaN
3	1993	NaN
4	1994	NaN
5	1995	0.00775
6	1996	0.38900
7	1997	0.78300
8	1998	1.97000
9	1999	2.38000
10	2000	3.97000
11	2001	11.90000
12	2002	27.80000
13	2003	39.70000
14	2004	49.80000
15	2005	52.50000
16	2006	55.30000
17	2007	58.20000
18	2008	61.40000
19	2009	64.70000
20	2010	65.10000
21	2011	66.50000
22	2012	71.20000
23	2013	71.80000
24	2014	71.90000
25	2015	72.00000
26	2016	72.20000
27	2017	72.30000
28	2018	72.40000
29	2019	74.20000
30	2020	76.00000

Indicator Name	Urban population (% of total population)
0	37.370

1	37.006
2	36.643
3	36.283
4	35.924
5	35.566
6	35.210
7	34.856
8	34.503
9	34.152
10	33.827
11	33.629
12	33.431
13	33.234
14	33.037
15	32.841
16	32.646
17	32.451
18	32.256
19	32.063
20	31.870
21	31.700
22	31.553
23	31.429
24	31.328
25	31.249
26	31.193
27	31.159
28	31.147
29	31.158
30	31.191


Barbados: Urban Population vs Individuals Using the Internet (%) (1990-2020)
Urban population (% of total population)
Individuals using the Internet (% of population)
Percentage
Year
0
10
20
30
40
50
60
70
1990
1995
2000
2005
2010
2015
2020