Billionaires

A–Team

Daniel, Parishi, Garret, Ava

Topic + Motivation

Topic: We aim to evaluate that over the years of 1996, 2001, and 2014, how did the wealth origin, industry, gender and region affect the net worth of billionaires?

Motivation: We were curious in investigating the different factors that are in the control of, and outside the control of billionaires, and what role they play in determining net worth. In the age of new technologies and emerging industries, paired with underrepresented minorities working to break the glass ceiling, we believed it was important to evaluate which factors were influential. Our analysis has the potential to shape the expectations and hopes one should have when seeking out to achieve a certain level of wealth after the billionaire status.

Introduce the data

Source:

The data is sourced from Forbes World's Billionaires lists from 1996, 2001, and 2014. However, scholars Caroline Freund and Sarah Oliver from the Peterson Institute for International Economics added new variables including whether they were self-made or inherited their wealth.

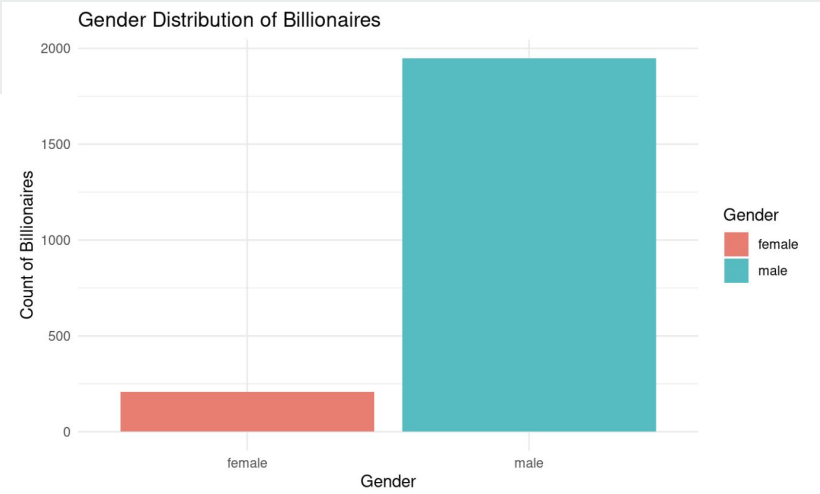
Details:

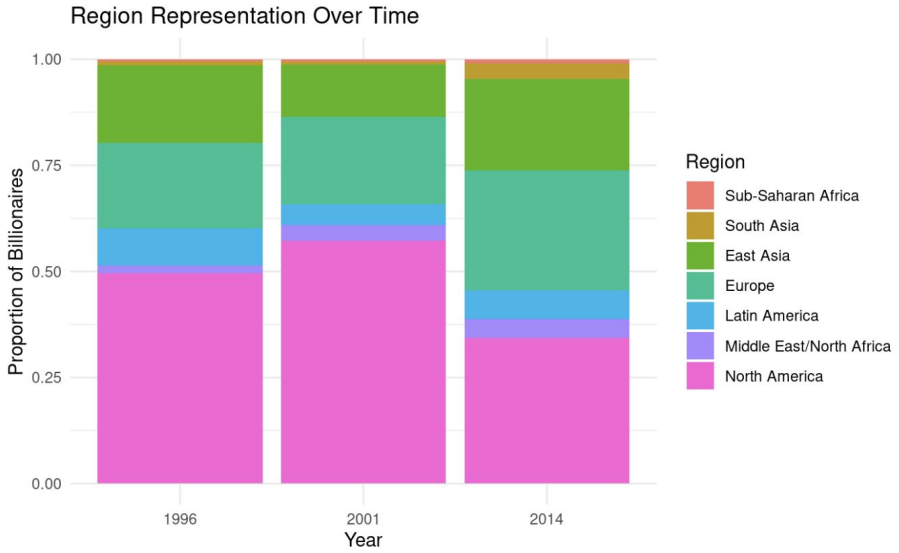
We primarily looked at gender, region, wealth type (inheritance), the industry, the year the data was collected, the net worth of billionaires.

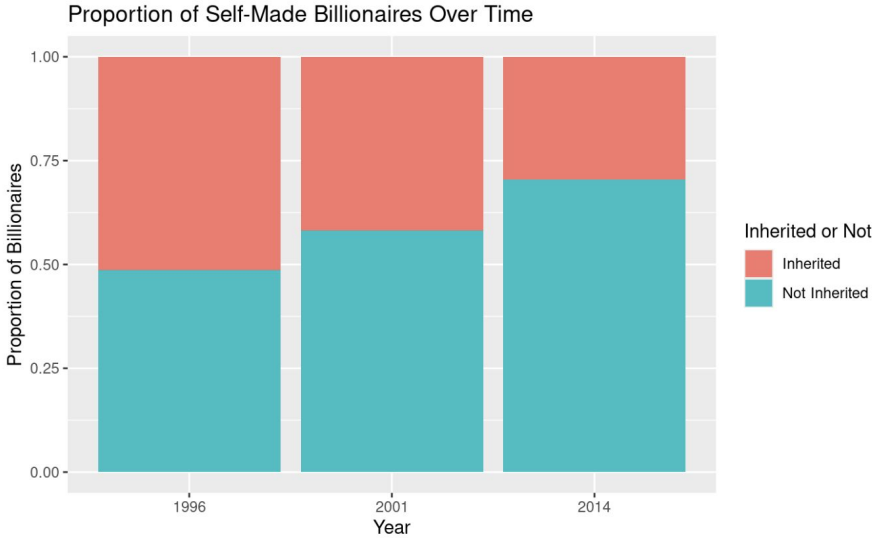
Cleaning up data!

```
mutate(broad_industry = case_when(
  wealth.how.industry %in% c(
    "Technology-Computer", "Technology-Medical", "Software",
    "IT Services", "Hardware", "Semiconductors"
    ) ~ "Technology",
  wealth.how.industry %in% c(
    "Banking", "Investment", "Private Equity",
    "Hedge Funds", "Money Management", "Diversified financial",
    "Private equity/leveraged buyout", "banking", "Venture Capital"
    ) ~ "Finance",
  wealth.how.industry %in% c(
    "Automotive", "Aerospace", "Industrial",
    "Non-consumer industrial"
    ) ~ "Manufacturing",
  wealth.how.industry %in% c(
    "E-commerce", "Retail", "Fashion", "Retail, Restaurant"
    ) ~ "Retail",
  wealth.how.industry %in% c(
    "Pharmaceuticals", "Healthcare Services", "Biotech"
    ) ~ "Healthcare",
  wealth.how.industry %in% c(
    "Real Estate", "Construction", "Constrution"
    ) ~ "Real Estate",
  wealth.how.industry %in% c(
    "Media", "Entertainment"
    ) ~ "Media & Entertainment",
  wealth.how.industry %in% c(
    "Food Processing", "Beverage"
    ) ~ "Food & Beverage",
  wealth.how.industry %in% c(
    "Agriculture", "Energy", "Mining", "Mining and metals"
    ) ~ "Natural Resources",
  wealth.how.industry == "Logistics" ~ "Logistics",
  # Temporary NA for ungrouped values
  wealth.how.industry %in% c("Other", "0", "services") ~ NA_character_,
  TRUE ~ wealth.how.industry
  )
) |>
mutate(broad_industry = case_when(
  (is.na(broad_industry) | broad_industry == "") & company.sector %in% c(
    "technology", "it services", "software", "internet", "online gaming"
    ) ~ "Technology",
  is.na(broad_industry) & company.sector %in% c(
    "finance", "banking", "investment", "hedge funds", "financial services"
    ) ~ "Finance",
  is.na(broad_industry) & company.sector %in% c(
    "automotive", "manufacturing", "aerospace", "industrial"
    ) ~ "Manufacturing",
  is.na(broad_industry) & company.sector %in% c(
    "e-commerce", "retail", "fashion", "luxury goods"
    ) ~ "Retail",
  is.na(broad_industry) & company.sector %in% c(
    "pharmaceuticals", "healthcare", "biotech", "medical"
    ) ~ "Healthcare",
  is.na(broad_industry) & company.sector %in% c(
    "real estate", "construction"
    ) ~ "Real Estate",
  is.na(broad_industry) & company.sector %in% c(
    "media", "entertainment", "publishing"
    ) ~ "Media & Entertainment",
  is.na(broad_industry) & company.sector %in% c(
    "food processing", "beverage", "groceries", "food"
    ) ~ "Food & Beverage",
  is.na(broad_industry) & company.sector %in% c(
    "agriculture", "energy", "mining", "oil", "natural resources"
    ) ~ "Natural Resources",
  # Retain any pre-assigned broad_industry values
  is.na(broad_industry) & company.sector == "logistics" ~ "Logistics",
  TRUE ~ broad_industry
  )
) |>
```

Highlights from EDA







Model of Net Worth

- Estimates net worth of a billionaire based on industry, gender, inheritance, region, and year
- Intercept of 2.257 billion estimates the wealth of a female billionaire from East Asia in 1996, who profited from the consumer industry and inherited wealth.
- later years, being male, working in media/entertainment, technology, retail, and being from a more Western country tend to have a higher net worth on average.

Equation 1: Linear Model

$$\begin{aligned}\widehat{net\ worth\ in\ billions} = 2.257 \\ &+ 0.7744 * Year\ 2001 \\ &+ 1.5977 * Year\ 2014 \\ &- 0.5227 * Not\ Inherited \\ &- 0.2932 * Industry\ Finance \\ &- 2.180 * Industry\ Healthcare \\ &- 0.6792 * Industry\ Hedge\ Fund \\ &- 0.5390 * Industry\ Manufacturing \\ &+ 0.3687 * Industry\ Media\ \&\ Entertainment \\ &- 0.6457 * Industry\ Natural\ Resources \\ &- 0.9609 * Industry\ Real\ Estate \\ &+ 0.4642 * Industry\ Retail \\ &+ 0.4898 * Industry\ Technology \\ &+ 0.07849 * Gender\ Male \\ &+ 0.7298 * Region\ Europe \\ &+ 0.4167 * Region\ Latin\ America \\ &- 0.2838 * Region\ Middle\ East/North\ Africa \\ &+ 1.086 * Region\ North\ America \\ &- 0.03024 * Region\ South\ Asia \\ &+ 0.9804 * Region\ Sub-Saharan\ Africa\end{aligned} \quad (1)$$

Bootstrap Confidence Intervals

- Conducted bootstrapping to account for variability in data
- Assessed reliability and precision of regression coefficients
- Predictors like year2001 had significant effects as their confidence intervals excluded zero
- Predictors like broad_industryFinance showed uncertainty with confidence intervals including zero.

Term	Estimate	Lower CI	Upper CI
intercept	2.256590	1.177848	3.302647
year2001	0.774432	0.233369	1.359624
year2014	1.597731	1.091089	2.116682
inheritNot Inherited	-0.522662	-0.999695	-0.035091
broad_industryFinance	-0.293198	-1.026840	0.416828
broad_industryHealthcare	-2.179914	-3.220494	-1.207436
broad_industryHedge funds	-0.679160	-1.733979	0.532830
broad_industryManufacturing	-0.538971	-1.492749	0.503136
broad_industryMedia & Entertainment	0.368714	-0.611234	1.511191
broad_industryNatural Resources	-0.645716	-1.421874	0.082491

R squared value of our model: 0.02403523

Col1	Stronger Average Correlation	Weaker Average Correlation
Positive Average Impact on Net Worth	Year 2001, Year 2014, Region Europe, Region North America	Industry Media & Entertainment, Industry retail, Industry Technology, Gender Male, Region Latin America, Region Sub-Saharan Africa
Negative Average Impact on Net Worth	Not Inherited, Industry Healthcare, Industry Natural Resources, Industry Real Estate	Industry Finance, Industry Hedge Fund, Industry Manufacturing, Region Middle East/North Africa, Region South Asia

Conclusions + future work

Future research should aim to address the limitations of this study while expanding on its findings. Some additional research that would improve this study include:

- A more detailed, region-specific analyses.
- Gender-specific analysis (exploring unique barriers faced by women).
- Identifying strategies to promote gender equity in wealth accumulation.
- Societal impacts of billionaire wealth.
- Qualitative analysis about the self perception of billionaires.
- Motivational tips/ what aided in each respective billionaires accomplishments.

Lastly, future work should focus on the societal impacts of billionaire wealth.