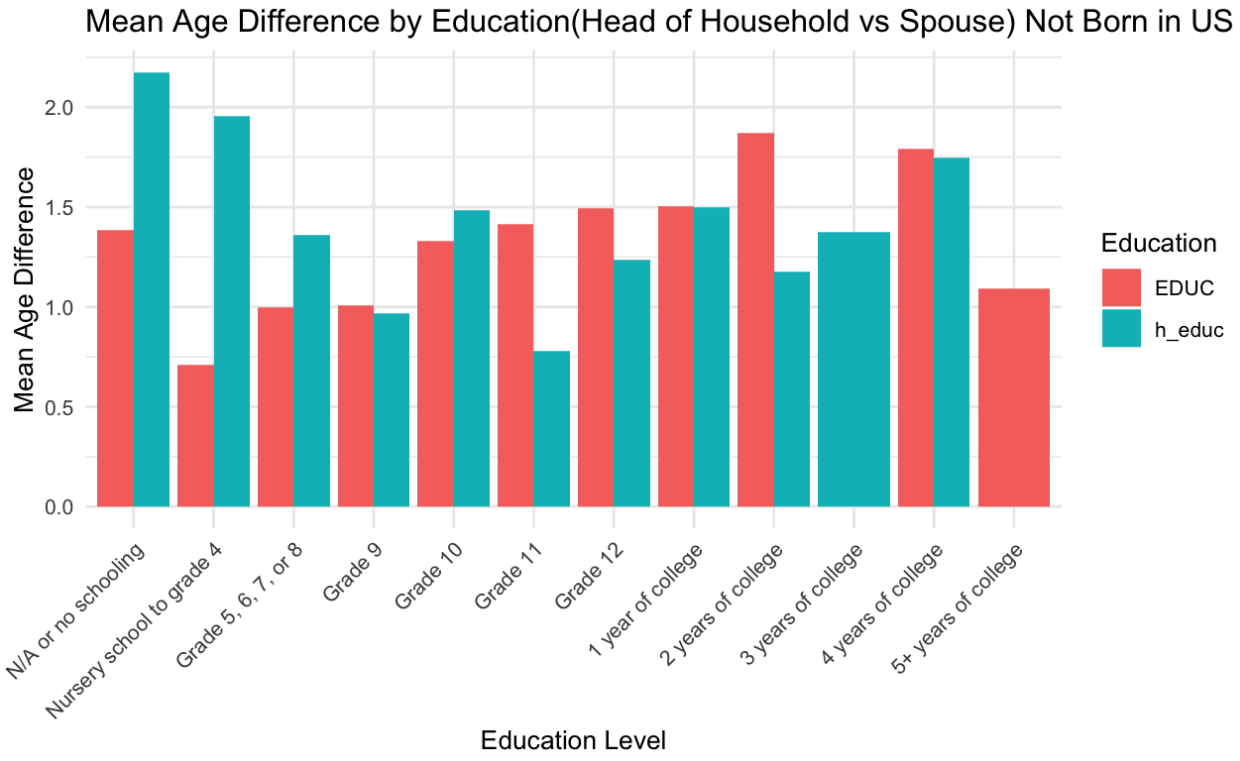
Lab 6 Summary

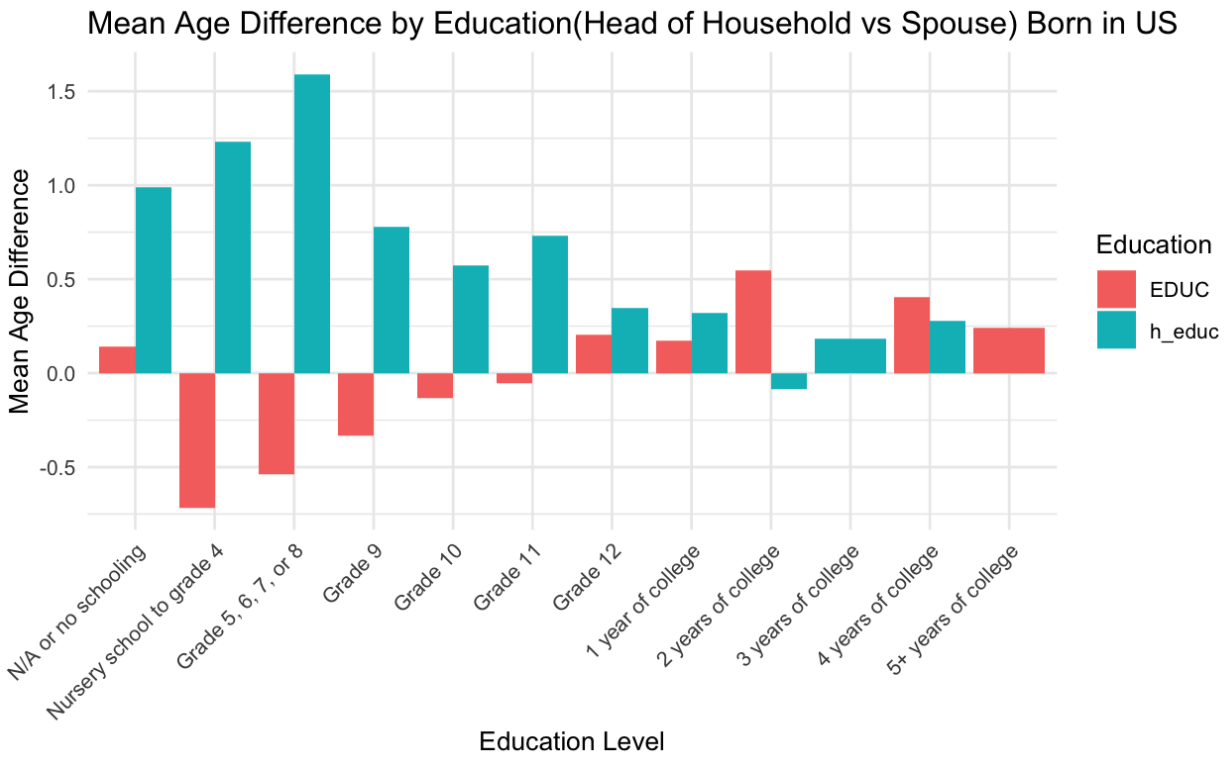
Riyesh Nath, Jason Seda

Educational Level, Immigrant Status, and Spousal Age Difference

Objective

This lab investigates whether educational attainment and immigrant status influence the **average spousal age difference** in U.S. married couples using data from the **2021 American Community Survey (ACS)**.





Hypothesis 1

H_0: There is no major discrepancy between the average spousal age difference among different educational levels.
H_a: There is a discrepancy between average spousal age difference based on different educational levels.

Step 1 — Data Loading and Preparation

- The dataset `ACS_2021_couples.RData` was loaded, containing detailed demographic, educational, and income information for married and partnered individuals.
- The sample was restricted to cases where the relationship variable equaled **"Spouse"** to ensure only married couples were analyzed.
- Key variables included:
    - `EDUC` = individual's education level
    - `h_educ` = spouse's education level

- `Age_DIFF` = difference between partners' ages
- `born_in_USstate` = indicator of U.S.-born vs. immigrant status

Step 2 — Model 1: Education and Spousal Age Difference

The model assessed whether educational attainment of both partners significantly predicts the spousal age gap.

Results Summary:

- The regression output showed that several education categories for both partners were statistically significant at the 1% level ($p < 0.01$).
- The overall F-test rejected the null hypothesis ($\mathbf{p < 2.2 \times 10^{-16}}$), implying that educational differences meaningfully explain variations in spousal age differences.
- However, the R^2 value (~0.0033) indicates a **weak overall explanatory power**, suggesting that education affects but does not solely determine spousal age gaps.

Interpretation:
We **reject H_0** and conclude that **educational level has a statistically significant, though modest, association with spousal age difference.**

Hypothesis 2

H_0: There is no major impact on the results from the prior hypothesis based on immigrant status.
H_a: There is a large influence/impact on the prior results based on immigrant status.

Step 3 — Model 2: Adding Immigrant Status

To test the second hypothesis, a second model included the `born_in_USstate` variable:

Results Summary:

- The immigrant status coefficient (`born_in_USstateborn in a state in the US`) was **highly significant ($p < 2 \times 10^{-16}$)**, indicating a notable shift in age-difference patterns between U.S.-born and foreign-born couples.

- The adjusted R^2 increased from 0.0033 to 0.0102, showing improved model fit.

- The sign of the coefficient (negative ≈ –1.20) suggests that U.S.-born couples tend to have a **smaller average age gap** than immigrant couples.

Interpretation:
We **reject H_0** for the second hypothesis. Immigrant status has a **meaningful and statistically significant influence** on the relationship between education and spousal age difference.

Step 4 — Model Diagnostics and Visualization

- Plots of residuals were generated to confirm approximate normality and constant variance.

- Visual inspection indicated no severe heteroskedasticity or model violations.

- Education and birthplace effects remained stable across visual diagnostics.

This lab used 2021 ACS data to examine how education and immigrant status affect the age difference between spouses in U.S. marriages. The sample included only couples identified as “Spouse” pairs.

Results from the first model showed that education significantly influences spousal age gaps, with several schooling levels showing measurable differences. Although the effect size was modest, the findings rejected the null hypothesis, confirming that education contributes to variations in age difference among couples.

Adding immigrant status in the second model improved the fit and revealed that U.S.-born couples tend to have smaller age gaps than immigrant couples. The birthplace variable was highly significant, indicating that immigrant status meaningfully affects how education relates to spousal age differences.

Overall, both education and immigrant status jointly shape patterns in marital age dynamics, with cultural and social factors likely reinforcing these observed differences.

```
               Df  Sum Sq Mean Sq F value Pr(>F)
EDUC            10   10396  1039.6   24.94 <2e-16 ***
Residuals   121416 5061513    41.7
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
                Df  Sum Sq Mean Sq F value Pr(>F)
h_educ          10    8593   859.3   20.61 <2e-16 ***
Residuals   121416 5063315    41.7
---
 Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The ANOVA results confirm that both individual and spouse education levels have a highly significant effect on spousal age differences ($p < 2e\text{-}16$). However, the relatively large residual variance shows that education explains only a small portion of the overall variation. This fully supports the summary's conclusion that education matters but is not the main determinant of age differences between spouses.

Articles:

Jason Seda

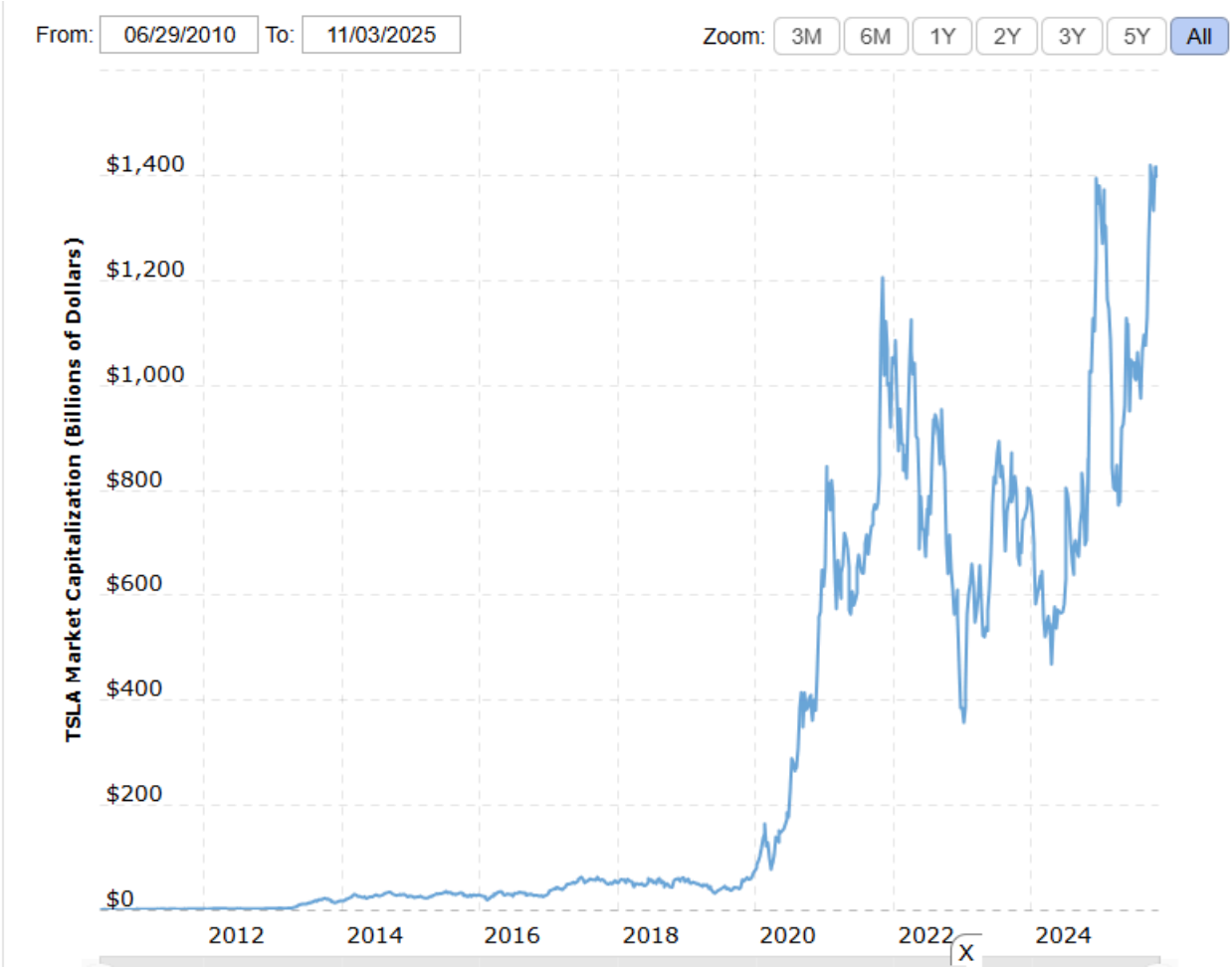
The paper "Green Economy and Stock Market Returns: Evidence from European Stock Markets" studies how green growth policies affect stock market performance in Europe. Using data from 19 European countries (2000–2018) sourced from OECD.Stat, the authors analyze green growth indicators, inflation, and interest rate spreads.

They apply a fixed-effects panel model and use principal component analysis (PCA) to summarize forty OECD green indicators into key measures like energy productivity and solar feed-in tariffs. The study asks whether greener economic policies lead to higher or lower future stock returns. Results show a negative relationship, meaning that as economies adopt more green policies, investors perceive lower risk and therefore accept lower expected returns on the market.

The World Resources Institute (2025) paper draws on data from the U.S. Energy Information Administration (EIA), Cox Automotive, and the American Clean Power Association to assess U.S. renewable energy trends through 2024. Using trend and descriptive analysis, it evaluates

growth in solar, wind, battery storage, geothermal, and nuclear energy capacity and measures progress toward the U.S. goal of achieving a 90% carbon-free grid by 2035. The report highlights record solar installations, rapid battery storage expansion (nearly 29 GW total), and a resurgence in geothermal and nuclear projects, while noting headwinds from high interest rates, limited grid capacity, local siting opposition, and policy reversals under the new federal administration. It also emphasizes the role of state-level initiatives, such as Vermont's and Maryland's 100% clean energy commitments, in sustaining momentum despite federal uncertainty.

When paired with Tesla's financial trajectory, which rose from under $100 billion in 2020 to peaks near $1.4 trillion in 2025, the analysis suggests that investor sentiment toward EVs and clean technology strongly influences renewable growth. Tesla's valuation trends often align with surges in EV adoption and battery storage investment, signaling broader market confidence that can accelerate innovation and financing. Conversely, volatility in Tesla's stock may raise risk perceptions and tighten capital conditions, potentially slowing renewable infrastructure expansion and progress toward national decarbonization targets.



Riyesh Nath

Paper: Can artificial intelligence and green finance affect economic cycles?

Link: (https://www.sciencedirect.com/science/article/pii/S0040162524005389)

The focus of this paper is to see if technology influences the market cycle. We see an initial comparison between two theories. The first one (Schumpeterian Theory and Real Business Cycle (RBC) claims that oscillation of technological progress causes fluctuation of output resulting in an economic cycle. While the second theory, presumes that technological advancements would result in decrease of the fluctuation of market cycle stabilizing the economic growth. This paper proposes that these two models do not take in factors in global economic shocks. To do that, the paper uses 'Green Finance', 'Artificial Intelligence', 'Paris Agreement', 'Geopolitical Shock' (ex: Ukraine and Russian conflict & China and US trade war) and Belt and Road initiative (China's initiative to loan money to build modern silk road). This paper uses CAViaR-TVP-VAR to see how each of the listed variables are connected. Quantile Coherence is used to measure how different market cycles (bearish, bullish and normal) affect the data (data from Covid-19, full sample, and Ukraine and Russia war). Then another 2 models are used (QQGC and PQQKRLS) to check as compared to their work until Quantile coherence method. DATA USED: AI (Global Artificial Intelligence Index), Paris Agreement (Net Zero 2050 Paris Aligned Index), Green Finance (Green Bonds Index), Belt and Road initiative is measured through an index created by another research by Chishti et al.(2024). Further data is also obtained by looking at various sources like 2014 and 2020 GDP per capita data from World Development Indicators. These data and paper used for some data sources are accessible.

Paper: Fiscal Histories – John H. Cochrane

Link: (https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.36.4.125)

This paper discusses of how the fiscal theory of the price level can account for inflation changes. The goal is to use formal quantitative analysis to show that fiscal theory of the price level is not just a story but a strong model. We discuss how the government increasing debt level results in nominal currency inflation to match debt value. As the debt increases, so does the inflation. We also look at how greater surplus after paid debt and liabilities has a positive effect on unemployment. We use historical data to see trends. Data from US Bureau of Economic Analysis, US Bureau of Labor Statistics and Federal Reserve is used. They are available data.