Field of Bachelor's Degree for First Major

A Look in the US Census data on college degree preferences

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September 14, 2020

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Paragraph 0 - About the topic

According to the Pew Research Center, young adults today are much better educated than their parents and grandparents, as measured by the level of bachelor's degree attainment. Millennials, now aged 25 to 37, have a 39% of earning a bachelor's degree or higher. This number among GenX'ers, Boomers, and the Silent/Traditional generations are roughly 29% for the former two and 15% for the latter.

Intrigued by this dynamic, I wanted to further investigate the preferences to degree type attainment across these age groups.

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Paragraph 1 - About the Data

Dataset: 'Field of Bachelor's Degree for First Major' (S1502)
Tool: Python

The dataset 'Field of Bachelor's Degree for First Major' (code name S1502) from the U.S. Census Bureau captures the count and percentages of college degree attainment by the first major across three different age groups of adults over 25 years old across 52 states of the United States in 2018. The data is collected by the American Community Survey (ACS) and in tandem with the Census Bureau's Population Estimates Programs to produce the final and official estimates for the national and local population and housing units.

Regarding data accuracy, the data on the geographical division of states and counties are from 2010, so the data might not reflect as accurately the current population and housing units of states. It is also a self-reported survey in which respondents can report more than one major for their bachelor's degree without specifying the degree earned. Thus, comparisons between states might be different with a more updated dataset, and reported degree types should be regarded as a preference rather than degree obtained.

The data contains 1-year estimates so I aim to perform basic aggregate functions to get an overview of the data. Time-series or causal inference analyses are not suitable for this dataset.

'Field of Bachelor's Degree for First Major' is a **MultiIndex** (although data was transformed to one-dimensional after download), in which there are two main dimensions: **degree type and age group**. There are 5-degree types identified, including:
   ● Science and Engineering
   ● Science and Engineering Related Fields
   ● Business
   ● Education
   ● Arts, Humanities and Others
There are three age groups, namely:
   ● 25 to 39
   ● 40 to 64
   ● 65 and over
I regarded these groups as Millennials, GenX and Boomers, and Seniors, respectively.
The data also identifies **male and female** populations, which are reported values for each index.

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Paragraph 2 - Retrieve, clean, and manipulate data

Link to GitHub:
https://github.com/nhb-uyen/US_Census_with_Python/blob/master/New%20Steam%20Project.ipynb

Data retrieval: download from the website as csv.
Clean: filter out N/A, rename columns, group columns.
Manipulate data: aggregate functions, create pivot tables, create plots.

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Paragraph 3 - Planning and identify possible analyses

Steps:
1. Identify possible ways to look at the data.
2. Identify trends (highest, lowest, changes across groups).
3. Identify possible explanations for the data trends.
4. Arrive at a conclusion on each trend.
5. Identify the next steps to further data findings.

Possible analyses:
● Bachelor's degree attainment by age groups.
   ○ Does a larger proportion of the younger age group attain higher education compared to the older age group? (Gen X vs. Millennials?)
● Bachelor's degree attainment by age groups across states.
   ○ Is there a difference across states on the percentage of the population with a bachelor's degree?
   ○ Are there more preferred degrees in some states?
● Bachelor's degree attainment by sex across various degrees.
   ○ Does degree type preference differ among males and females in the U.S. in general?
● Bachelor's degree type preference by sex across states.
   ○ Does degree type preference differ among males and females of different states?

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Paragraph 4: Findings & Reasonings

By geography

California has the highest rate of higher education attainment overall, followed by Texas, New York, Florida, and Illinois.

The spikes can be explained by the fact that these are the most populous states in the U.S., having established a strong technological and industrial establishment that appeals to all generations. A further investigation of the data shows that the top three states for millennials (age 25 to 39), gen-X'ers and boomers (age 40 to 64) are California, Texas, and New York. For the Silent Generations (age 65 and over), it is California, Florida, and Texas - Florida being the popular destination for retired home-owners.

The concentration of college degree owners in several states indicates a higher populace within these states, but might also indicate migration trends. More accurately, as the ACS data is consolidated with the geographical and population census from the Census Bureau's Population Estimates Program, we are looking at where college degree owners choose to live after college. Texas, New York, Florida, and Illinois are all highly industrialized states with an advanced and booming technological industry. Thus, it is no surprise that young adults from generations before until now still choose to relocate to these cities.
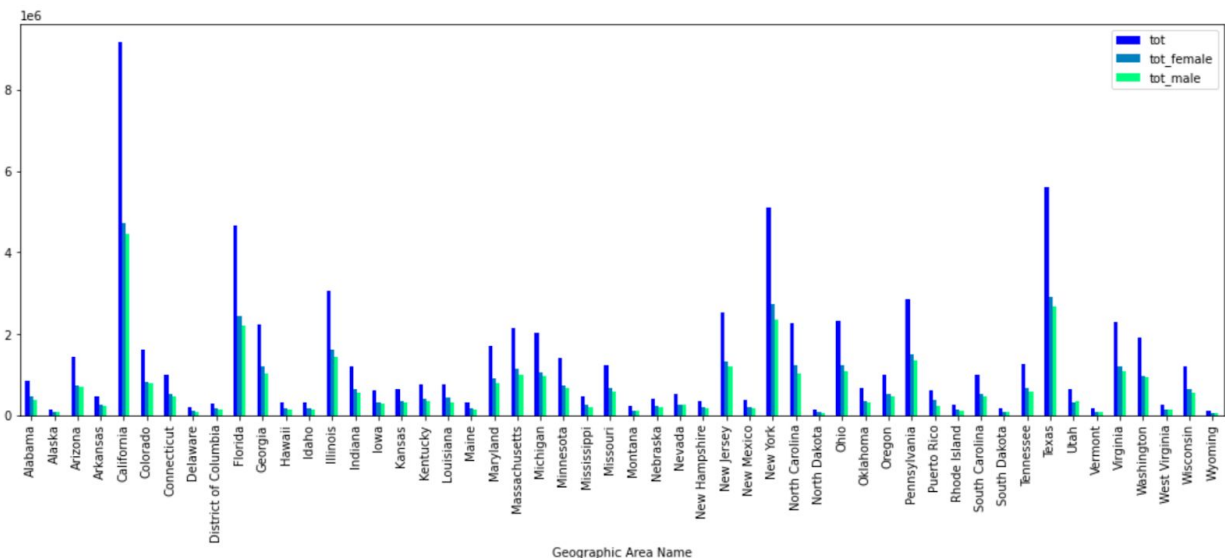
*Graph 1. Bachelor's degree attainment by states*

By Age + Gender
age
Millennials (aged 25 -37) have a higher percentage of bachelor's degree attainment compared to GenX'ers and Boomers (aged 40 - 64) and the Silent Generation (aged 65 and above) (Graph 2).

gender
Female Millennials, GenX'ers, and Boomers have a higher overall percentage of degree attainment compared to their male counterparts, which is not true for males and females of the Silent generation (Graph 2).

The male-female ratio of college degree attainment for the Silent Generation is 1.09, indicating more males than females have a bachelor's degree. Such a ratio for GenX and Boomers is 0.87 and for Millennials is 0.81, indicating that females have outpaced males in this regard. The reversion in trends among female and male college students can be explained by the 'education managerial shift' in the 1970s, which was around the same time many Boomers started to enter college. The revision of the educational system to increase access via grants and financial aids could have played a vital role in getting more students to college, especially female students.
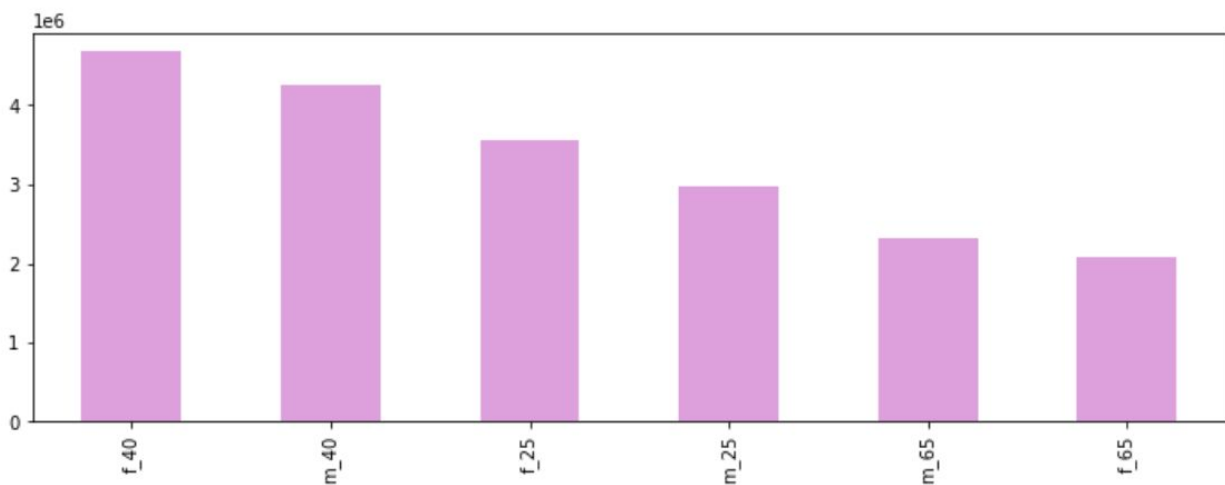

Graph 2. Male and female populations with a bachelor's degree, group by age groups. There are significantly fewer males and females from the Silent Generation (f_65, m_65) in total compared to that of GenX and Boomers (f_40, m_40) and Millennials (f_25, m_25).
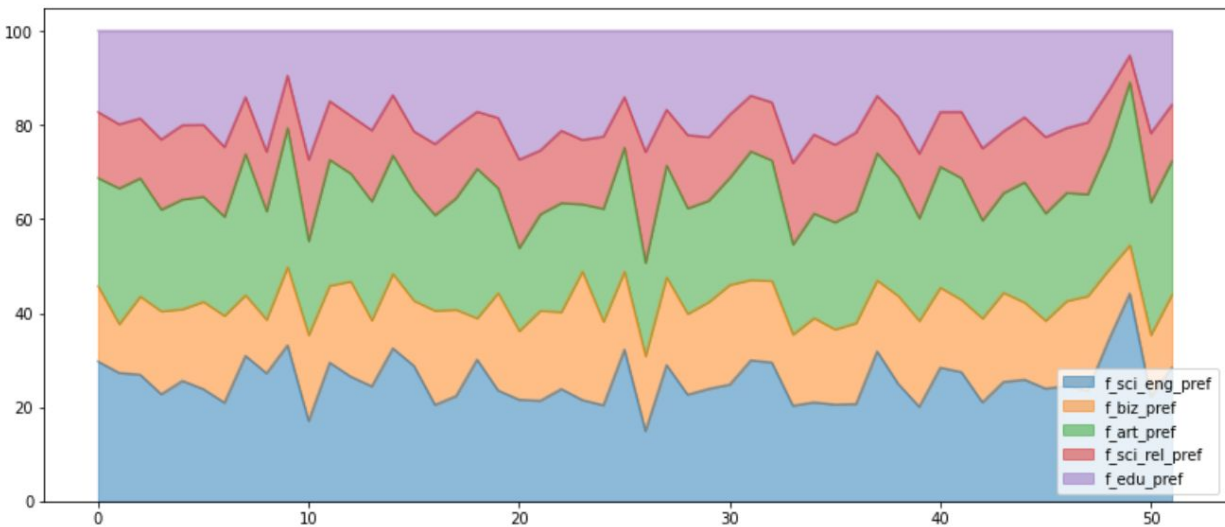
By Degree Type
Science and Engineering are the most preferred first major for a Bachelor's degree regardless of sex and age.

On closer inspection, we see that Science and Engineering is a very popular major among males (Graph 3). The second most common major for males is business and the arts and humanities. For females, there is not as stark a difference in degree type preference (Graph 4). However, we can see that science and engineering is a major also chosen by a high volume of college students, followed by the arts and humanities, and education. Interestingly, science- and

engineering-related fields are not popular among males but are more common among female college-goers.
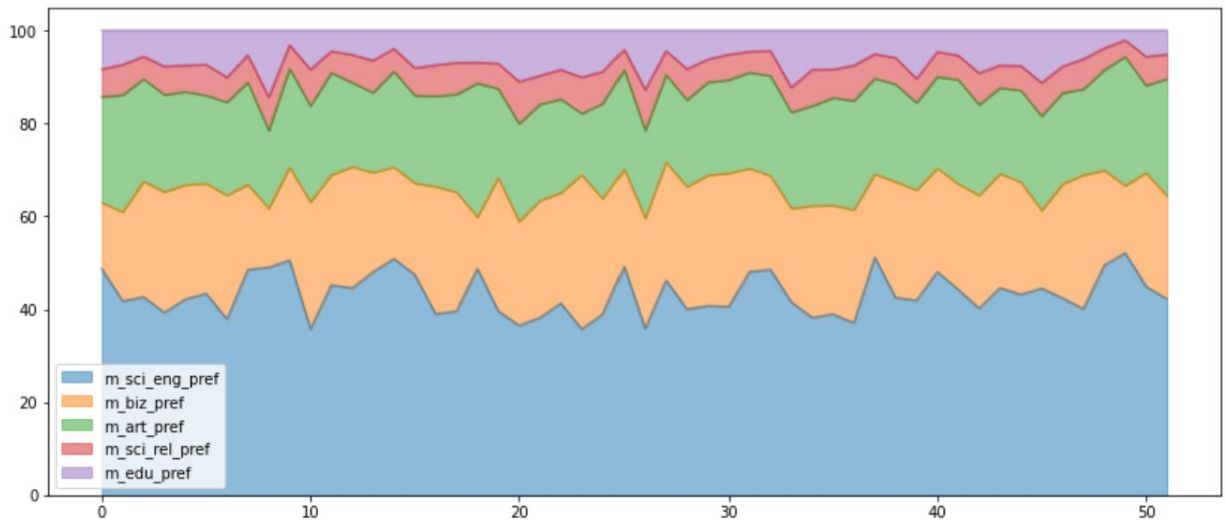
Graph 3. Degree type preference of U.S. male across all age groups

Graph 4. Degree type preference of U.S. female across all age groups

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Paragraph 5 - Recommendations

Higher education and job creation in states

The U.S. government and local government can utilize this dataset to follow the progress of giving more access to higher education to American youth. Throughout the years, there has been a steady rise in the total number of bachelor's degree attainment overall. However, we see that there is a high concentration in only a number of states and not evenly spread throughout the country.

The internal migration trends have proved rather fixed in a few states, creating a demand for higher education and jobs for the upcoming generations of those who have moved there, allowing these states to flourish further. For states with grimmer prospects, a commitment to creating a more compelling environment for entrepreneurship and supporting this ecosystem will allow them to retain students and young workers more effectively.

More access for more people

We have seen a positive and steady improvement in the female population to earn a bachelor's degree, which signifies better and fairer opportunities for a wider group of people. However, to improve equal access to education among American youth, we must also look at racial data on access to college and college degree attainment.

Local governments should also investigate why the number of male college-goers has gone down. There might be a direct correlation to the boom in data-related and startup jobs that don't require a college degree.

Hyperfocus on technology and industry

The data on degree preference among males and females shows that a large number of young adults pursue a science and engineer field. While such a trend is in tune with the global advancement in technology, we must be careful of an oversupply in certain jobs (like data science) and scarcity in others, especially those that play an essential role in our society (like nurses).

Colleges will be interested in looking at this data to help guide college students to fields and areas where they can both succeed and make a meaningful contribution to the national workforce.