Employment versus Highest Education Rate Obtained

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Introduction

In this report, I will examine how the highest level of education attained by an individual can affect his/her employment chances, as well as how education distribution affects employment on a macro-economic level. Education is the basis of many government systems and does more than provide a certificate that one can collect; it can have effects on the quality of individual and collective well-being.

Datasets

I made use of multiple data sets, as one clear relationship could not be determined through just one dataset. Moreover, I believe that using various datasets help solidify the relationship identified as there will be multiple sources confirming it. Even in the case that there are contradicting conclusions, having multiple datasets also helps maintain the integrity of the outcome as it is less likely to be misleading. In my datasets, I found that there is a relationship between the percent of people who have obtained bachelor's degrees and GDP as well as inflation.
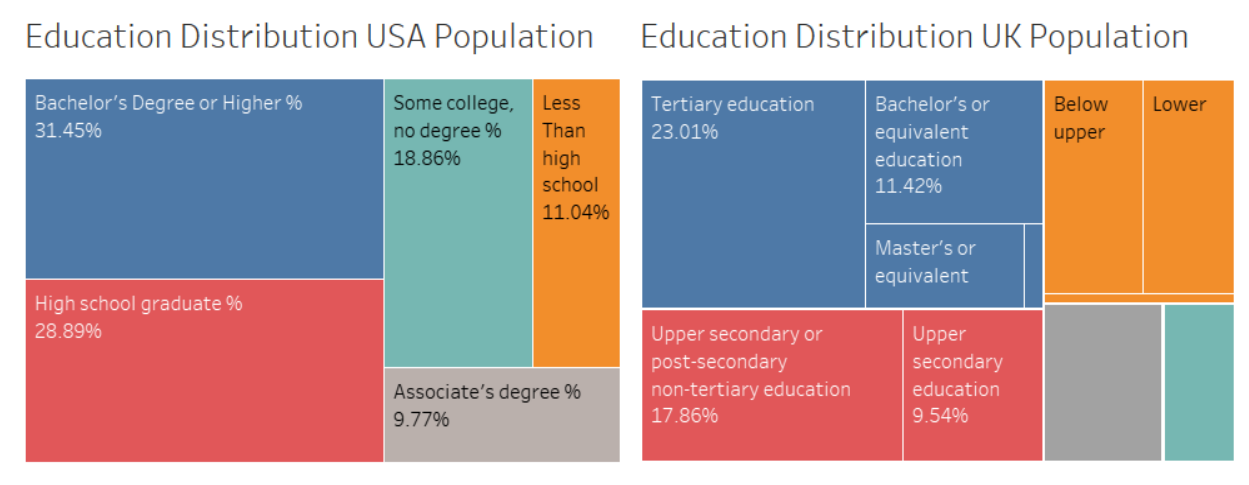
Dashboards

The dashboards help us see multiple graphs and charts in one instance, thereby streamlining the process of making decisions as more data can be visualized at once. With dashboards, we can see the relationship between education level and wage as well as education level and employment rate. Not only can the relationship between fields of the same dataset be

seen, but also among different datasets, thereby solidifying the credibility of the information. Though I have separated some dashboards below to explain them in detail, the caption below each figure indicates which dashboard and category each one belongs in.

Education Distribution

First, we will look at how education is distributed in the UK and the USA. This data represents the population in 2017 that is above the age of 25 and able to work (regardless of current employment status). For comparison purposes, I have made it so that each color block corresponds to the same level of educational attainment (as the two nations have different educational systems and names for them.) I chose this way to represent my data as, though this, we can easily see the dominant portions of the dataset and differentiate general categories by the color block that it falls in.
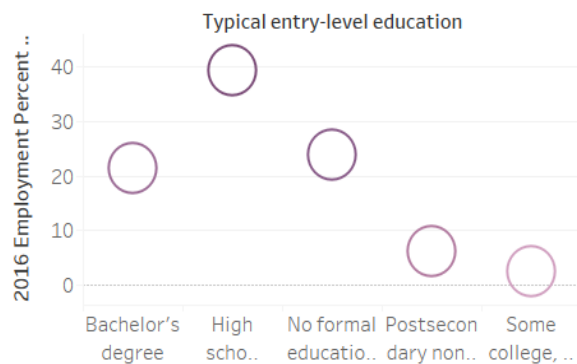

Dashboard 1.1: Education Distribution, USA vs. UK, 2016-2017

As we can see, the UK has a more significant proportion of the population that has achieved higher education (higher education being defined as any form of education, government-funded or not, beyond the scope of a high school/secondary degree). At the same time, the UK also has a more significant percentage of people holding less than a high school

degree. The USA, on the other hand, has a larger portion of the population obtaining a high

school degree, Associate's degree (the UK having 8.40% in the grey box) and no degree but

having attended a college (the UK having 5.10% in the turquoise box).

How does this affect the distribution of the workforce? Here, only people employed at the

time of data collection (2016 for USA, 2017 for UK) and above the age of 18 are included. The

data consists of the highest education level obtained by the population as they first enter the

workforce (thus, if one were to enter the workforce with a high school degree but later go on to

hold a Bachelor's, he/she will be recorded only has to have a high school diploma, as that was all

that was achieved at the time of entry).
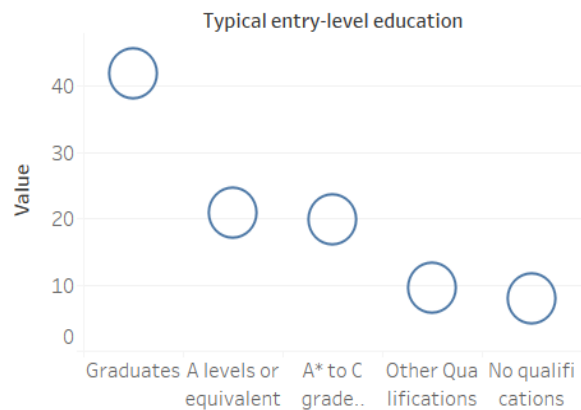
Dashboard 1.2 : Education Distribution, USA vs. UK, 2016-2017

Again, each column corresponds to the same level of educational attainment. This plotted

graph was used to show the discrepancies between the two since the highest plotted points

respectively do not fall under the same field. Though both nations have most of the population to

be college graduates, followed by high school graduates, the UK's higher portion of people with

bachelor's degree or higher has resulted in the majority of the entry-level workforce falling into

the same category. The USA, on the other hand, has a higher portion of the entry-level workforce

being high school graduates. Possible explanations are that 1) in the US, a high school diploma is the most demanded level of education and thus must hold the lowest unemployment rate, or 2) more American adults enter the workforce before they complete their educational journey.

In the following visualizations I will explore how education level affects unemployment rates (Unemployment being defined as people who do not have a job, but are actively looking for one) in the US, proving the second explanation to be more feasible, as we can see on the bar chart to the left that, as education level rises, unemployment rate falls; while people with less than a high school diploma face an unemployment rate of over 5%, people with a bachelor's degree or higher only have a little over 2% . The chart on the right shows that as education level rises, average yearly wage also rises. This correlation suggests that with a lower unemployment rate (i.e., higher demand), people are more incentivized with higher pay as well. Bar charts are used to demonstrate the length difference between the two graphs to make the comparison more straightforward, as this way, the relationship between the two factors can be seen.

Unemployment Rate by Education Level   Average Wage by Education Level
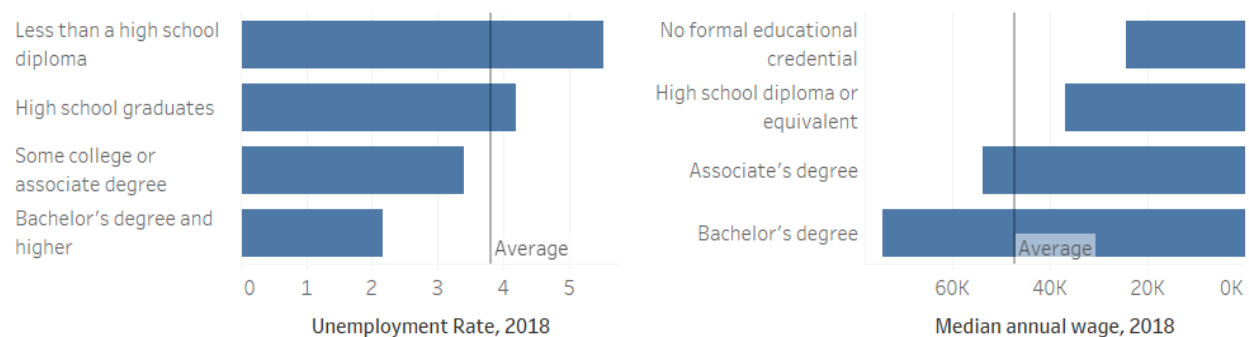
Dashboard 2.1: Employment vs. Wage, USA

This incentive has also leads to an increase in people getting higher education. As modeled below, as wage level (USA, 2018) increases, employment change is projected (2016-

2026) to change in a similar overall matter. With a line graph, we can see the overall increasing

trend for both wage level and employment change, as well as how they perform relative to each

other. Higher wages lead to a more considerable positive percentage change in people obtaining

that level of education. Combined with the relationship that education has with unemployment,

we can thus rule out one of the two previous explanations: in the US, a high school diploma is

not the most in-demand qualification.
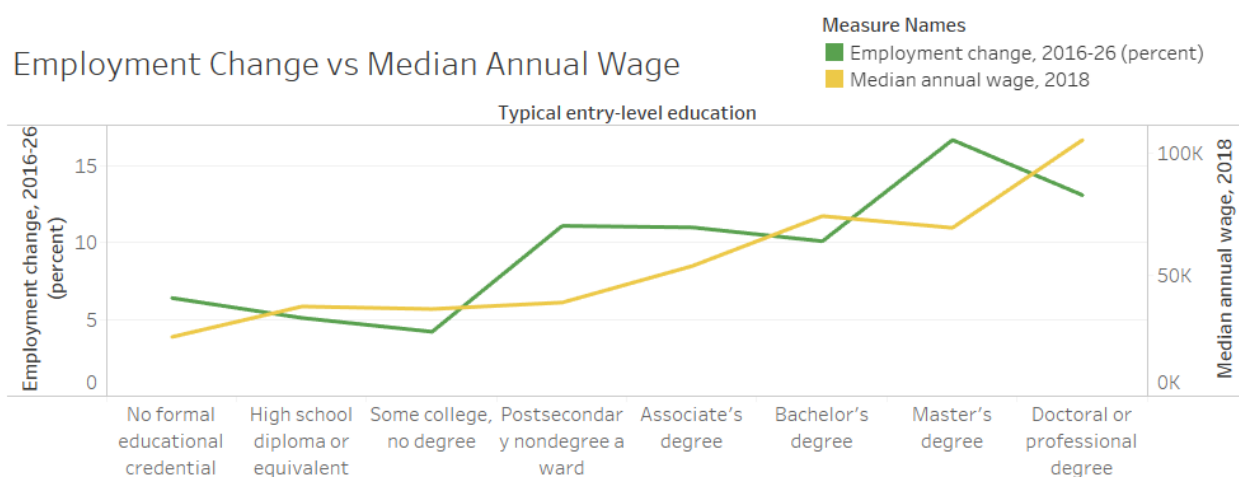
*Dashboard 2.2: Employment vs. Wage, USA*

To look at things from a different perspective, we can examine the employment rate for

the UK and US, categorized by the highest level of education obtained. Employment rate here is

defined as the number of people who have a job compared to the full workforce; thus it accounts

for people who do not have a job and are not looking for one (which is why unemployment and

employment rates do not add up to 100). Again, as the level of education increases, employment

rate increases, supporting the explanation that higher qualifications are of higher demand in the

economy. Again, bar charts are used so that the quantitative levels of each level of education can

be seen clearly. Moreover, the similar rate at which each bar length grows with respect to

education level shows how this is not just a phenomenon in one nation - it is international.

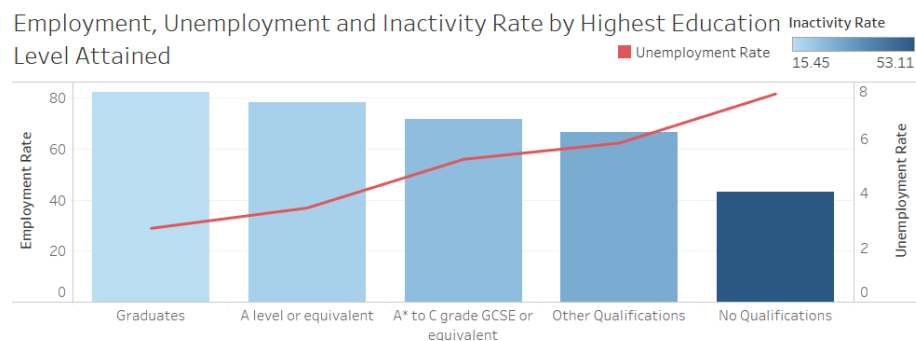Employment Rate by Highest Level of Education Attained, USA
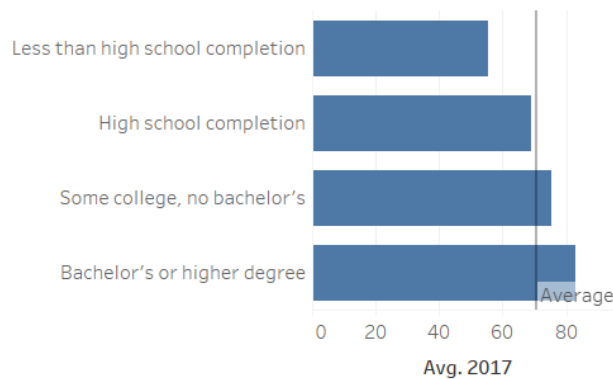
Employment Rate by Highest Level of Education Attained, UK
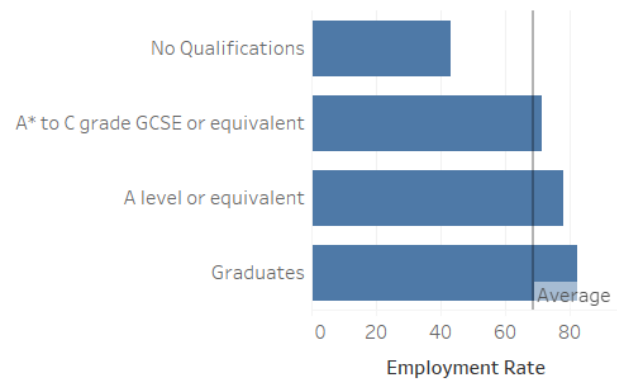
Dashboard 3.1 Employment, Unemployment and Inactivity Rate by Highest Education Level Attained

We can examine unemployment vs. employment more closely in the UK, along with inactivity rate. Inactivity rate is the number of non-participants in the labor force, whether or not they are actively looking for a job. Employment rate is depicted as the level of bars for each qualification level, while the shading indicates the inactivity rate (the darker the color, the higher the rate) and the red line shows the unemployment rate. As we can see, there is a direct relationship between highest education level obtained and employment, as the trends in the bar height, shade and line show.

Employment, Unemployment and Inactivity Rate by Highest Education Level Attained

Dashboard 3.2: Employment, Unemployment and Inactivity Rate by Highest Education Level Attained

Global Perspective

From a worldwide point of view, countries with more people obtaining bachelor's degrees have fewer people without a formal education. I chose to represent this in a map so that global trends can be easily seen. The shades of blue are the percentage of people who have obtained a bachelor's degree with darker being a higher percentage. The red squares are the percentage of people not having any formal education credential, with ones bigger in size meaning a higher proportion. The countries that are white in color and do not have a square mean that my dataset did not have data on this country.

Bachelor's Attainment vs. No Formal Education
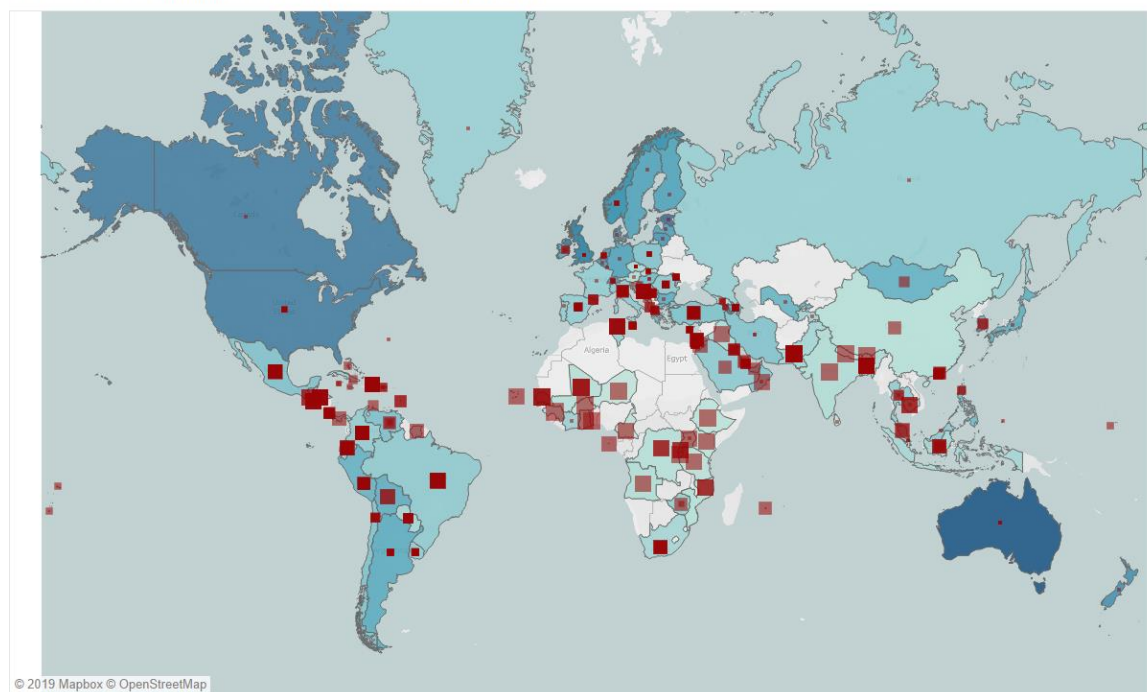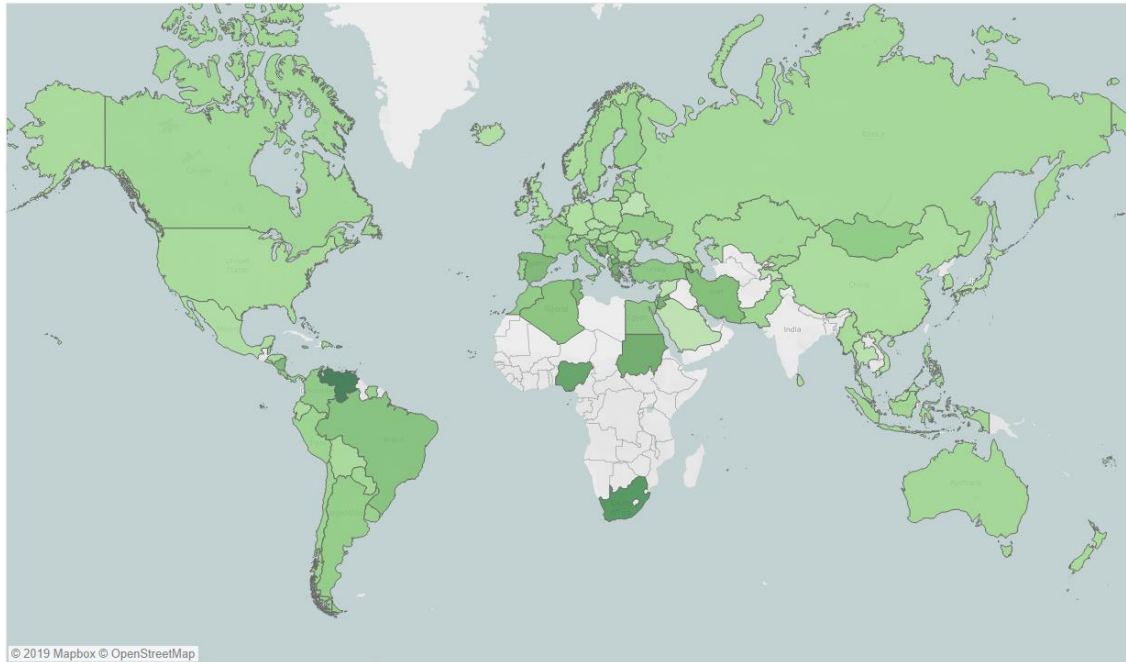

Dashboard 4.1: Global Education Level vs Unemployment Rate

I I also chose to represent unemployment rates around the world with the map below. The darker shade of green indicates a high unemployment rate, and white means there is no data

for that country.

2018 Global Unemployment Rate

Dashboard 4.2 Global Education Level vs Unemployment Rate

Though it is hard to see the relationship between the percent of bachelor's obtained compared to

unemployment rate just from those maps, so I picked a few nations to examine up close the

unemployment rate versus the percentage of people with a college degree or equivalent.

Dashboard 5: % of Bacheler's and Masters Attained vs Unemployment Rate

The length of the bars on the right indicates the % of people who have obtained a Bachelor's or equivalent for all the nations listed while the shade shows the number of people who have a Master's degree. The position of the blue circle indicates the & of people who have no formal education whatsoever. On the bar chart on the right, unemployment rate for 2017 is indicated by the length of the bar, and the red line indicates the projected rate for 2022. The axis on the right chart is not linear – it is logarithmic to show that there is an inverse relationship between the percent of people obtaining Bachelor's and Master's degrees and unemployment rates. As the percentage of people with a bachelor's increases, the percent of people with Master's increases on an overall trend, while the unemployment rate decreases proportionally to 1/(% of bachelor's obtained). Though there is no trend between the percent of people with no formal education and unemployment rate as well as highest education level attained, for Kazakhstan, Norway, Germany, Switzerland, New Zealand and the UK all have very low rates of no schooling and low rates of unemployment. It is possible that a higher percentage of no schooling does not indicate anything, but a low percentage (>5%) means there will be a low unemployment rate.

Applications of AI

Why would governments care about this relationship? As shown below, unemployment rate is related to a nations GDP (Gross Domestic Product). The size of the square indicates the GDP with a larger square indicating a higher GDP. The shade of the square indicates the unemployment rate with a darker shade meaning a higher unemployment rate. I chose this table to model how GDP and unemployment rate is related as we can see how, as the size of the square grows bigger, the shade becomes lighter (overall).

GDP vs Unemployment Rate

Economy
Australia
Brazil
Canada
France
Germany
Indonesia
Italy
Japan
Mexico
Netherlands
Russian Federation
Saudi Arabia
Spain
Turkey
United Kingdom

Dashboard 6.1 : Applications of AI

Thus, if unemployment rate is related to GDP, and the percent of the population with bachelor's degrees obtained is inversely related to unemployment rate, the percent of bachelor's obtained is inversely related to a nations GDP.

Artificial intelligence can then be used to predict a nation's GDP through its education levels. It has been used here to model how it affects employment in various nations and can be used to analyze past trends to probe more in-depth as to just how exactly does fluctuations in education levels affect GDP and what shifts in education levels need to be present in order for the GDP to increased or decrease. It can also be used to predict unemployment rates, which is useful for many reasons.

We can see in the graph below the highest educational attainment by age for the US. I chose this chart to easily show which sectors have the most significant number of people. A darker blue shade indicates a larger number of people falling into that age group with that educational attainment. As we can see, the number of people with bachelor's degrees increase and the shade darkens as age group decreases. We can thus conclude that more people today are

attaining qualifications that are beyond the scope of high school.

Highest Educational Attainment by Age

		25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+
Educational	None	18	51	53	53	46	80	76	73	56	53	158
Attainment	1st - 4th grade	71	78	102	119	111	146	125	157	147	138	297
	5th - 6th grade	114	208	325	328	330	307	313	318	295	191	405
	7th - 8th grade	172	238	280	297	268	267	260	271	287	310	816
	9th grade	224	298	385	316	335	311	278	229	239	198	440
	10th grade	351	277	306	253	279	366	358	313	273	279	607
	11th grade	761	620	623	581	641	661	699	560	490	367	813
	High school graduate	6,076	5,418	5,152	4,646	5,753	6,553	7,125	5,892	4,830	3,863	7,206
	Associate's degree, academic	1,463	1,376	1,284	1,197	1,300	1,473	1,426	1,196	875	577	735
	Associate's degree, occupational	918	893	914	941	907	1,020	1,024	892	780	511	609
	Some college, no degree	4,462	3,680	3,209	2,890	3,149	3,338	3,515	3,393	2,805	1,951	3,063
	Bachelor's degree	6,028	5,356	4,984	4,622	4,612	4,247	4,235	3,658	3,295	2,308	2,918
	Doctoral degree	214	458	434	432	410	394	353	358	358	270	396
	Master's degree	1,675	2,197	2,438	2,273	2,198	1,937	1,715	1,859	1,707	1,247	1,346
	Professional degree	197	357	283	325	323	264	337	319	312	200	254

Dashboard 6.2: Applications of AI

This shift could indicate several factors for the US, both good and bad. As we have concluded

before, a higher proportion of people obtaining bachelor's degrees means that we can expect a
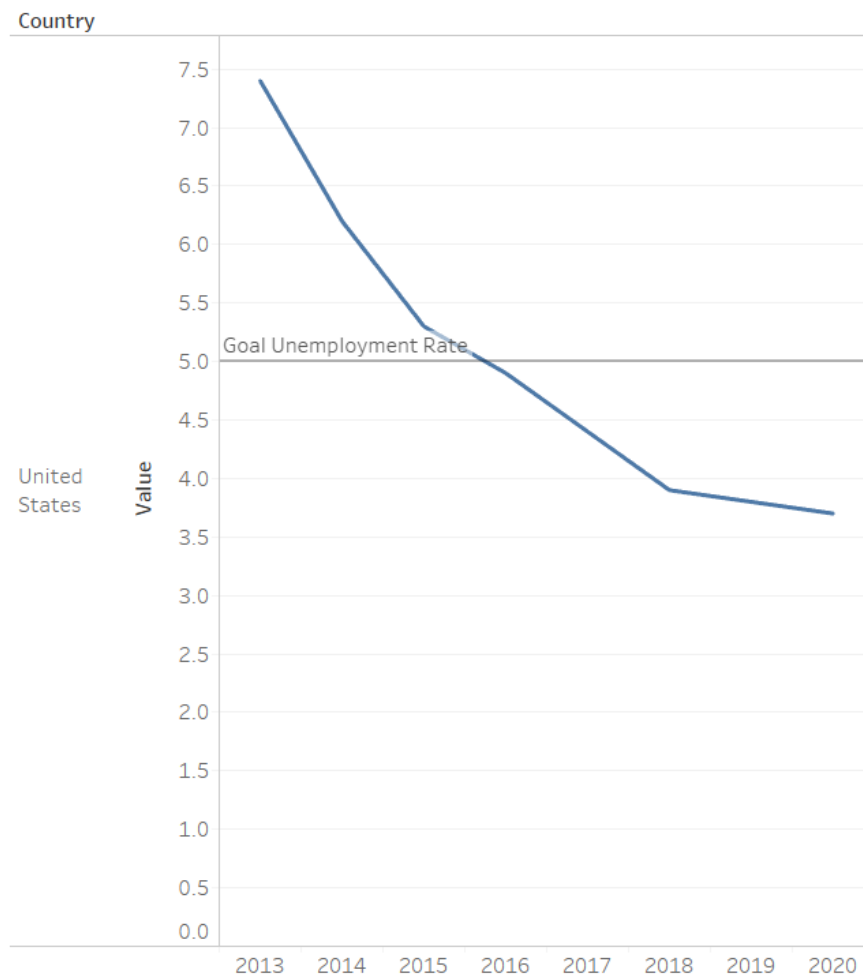
higher GDP, which is probably a good sign for the state of the economy. We can also project that the unemployment rate will go down and continue to go down. In the graph below, we can see past unemployment rates as well as expected future rates. I chose to use a line graph to represent the changes over time so that making predictions for years beyond 2020 can also be more manageable.

Dashboard 6.3: Applications of AI

While we can expect a lower unemployment rate, this may not be good for the US economy, as low unemployment rate leads to inflation and thus other economic shifts. Hence the US government tries to maintain the unemployment rate at about 5% to maintain a stable inflation rate. Through AI and modeling, we can see that the US unemployment rate is going down, below the target level. Since this is not ideal for the US economy, the government can then take measures to counteract this.

Through Artificial Intelligence, trends were visualized and the relationships between multiple fields were identified and linked to each other; thus, relationships between seemingly dissimilar fields were surfaced.

Machine learning can be implemented to analyze past trends in education, under supervised learning, and determine how much, and how exactly education level can change the economic factors of a nation. With this, economists can then predict the future state of the economy up to years in advance. AI can also be further applied to see how other factors affect the economy on a macro scale, such as racial diversity, disposable income, or crime rates.

Conclusion

In conclusion, we can use AI to show how education levels can affect unemployment rates and use this data to predict future rates. Mathematical models can be derived from these relationships. This could then, in turn, be used to predict the state of the economy (GDP, inflation, etc.) and thus give governments time to take appropriate measures as well as measure the health of the economy.

Data Sources

- databank.worldbank.org
- stats.oecd.org
- bls.gov
- census.gov