# US Bank Wages

7th of May,  2021

# Setting

A client needs help with the data analysis of a data set. The newly hired equal opportunities officer of the US bank is interested in understanding which points can be improved in his new company.

He wants to get insights concerning following topics:

- How is the gender distribution in the US bank?
- Is there a gender pay gap?
- Do people from minority groups have a disadvantage?
- Is the education directly related to the starting salary?

# Data Source

Data source is a text file: “us_bank_wages.txt”

Content of this text files is data concerning the following items:

- job category
- starting salary
- current salary
- years of education
- gender
- information concerning whether the person is part of a minority or not

# Data cleaning

- delete / add columns
- use lowercase column names without spaces
- rename columns
- check for duplicate entries
- check for categorical parameters
- check data types

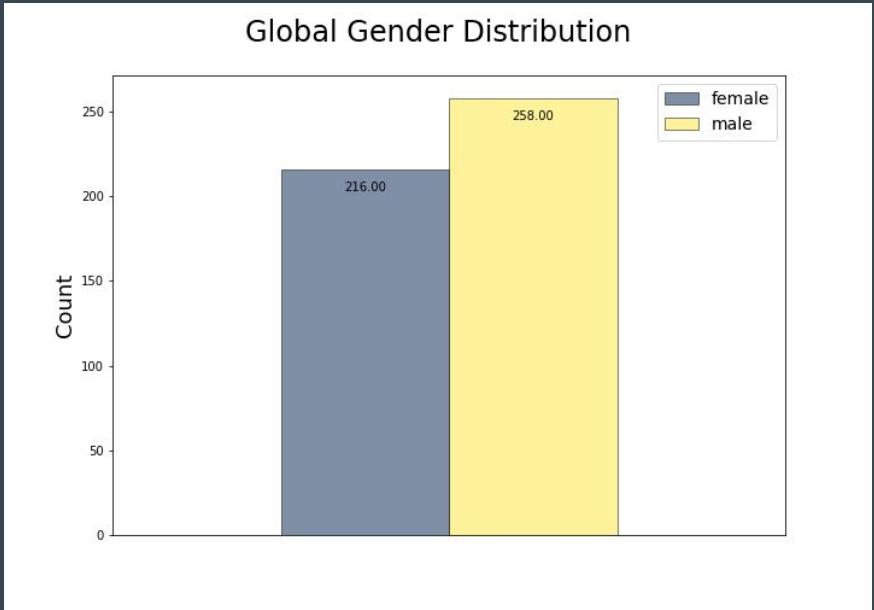
| | Unnamed: 0 | SALARY | EDUC | SALBEGIN | GENDER | MINORITY | JOBCAT |
|---|---|---|---|---|---|---|---|
| **0** | 0 | 57000 | 15 | 27000 | 1 | 0 | 3 |
| **1** | 1 | 40200 | 16 | 18750 | 1 | 0 | 1 |
| **2** | 2 | 21450 | 12 | 12000 | 0 | 0 | 1 |
| **3** | 3 | 21900 | 8 | 13200 | 0 | 0 | 1 |
| **4** | 4 | 45000 | 15 | 21000 | 1 | 0 | 1 |
| **...** | ... | ... | ... | ... | ... | ... | ... |
| **469** | 469 | 26250 | 12 | 15750 | 1 | 1 | 1 |
| **470** | 470 | 26400 | 15 | 15750 | 1 | 1 | 1 |
| **471** | 471 | 39150 | 15 | 15750 | 1 | 0 | 1 |
| **472** | 472 | 21450 | 12 | 12750 | 0 | 0 | 1 |
| **473** | 473 | 29400 | 12 | 14250 | 0 | 0 | 1 |

474 rows × 7 columns

| | start_s | current_s | jobcat | educ | gender | minority |
|---|---|---|---|---|---|---|
| **0** | 27000 | 57000 | 3 | 15 | 1 | 0 |
| **1** | 18750 | 40200 | 1 | 16 | 1 | 0 |
| **2** | 12000 | 21450 | 1 | 12 | 0 | 0 |
| **3** | 13200 | 21900 | 1 | 8 | 0 | 0 |
| **4** | 21000 | 45000 | 1 | 15 | 1 | 0 |
| **...** | ... | ... | ... | ... | ... | ... |
| **469** | 15750 | 26250 | 1 | 12 | 1 | 1 |
| **470** | 15750 | 26400 | 1 | 15 | 1 | 1 |
| **471** | 15750 | 39150 | 1 | 15 | 1 | 0 |
| **472** | 12750 | 21450 | 1 | 12 | 0 | 0 |
| **473** | 14250 | 29400 | 1 | 12 | 0 | 0 |

474 rows × 6 columns

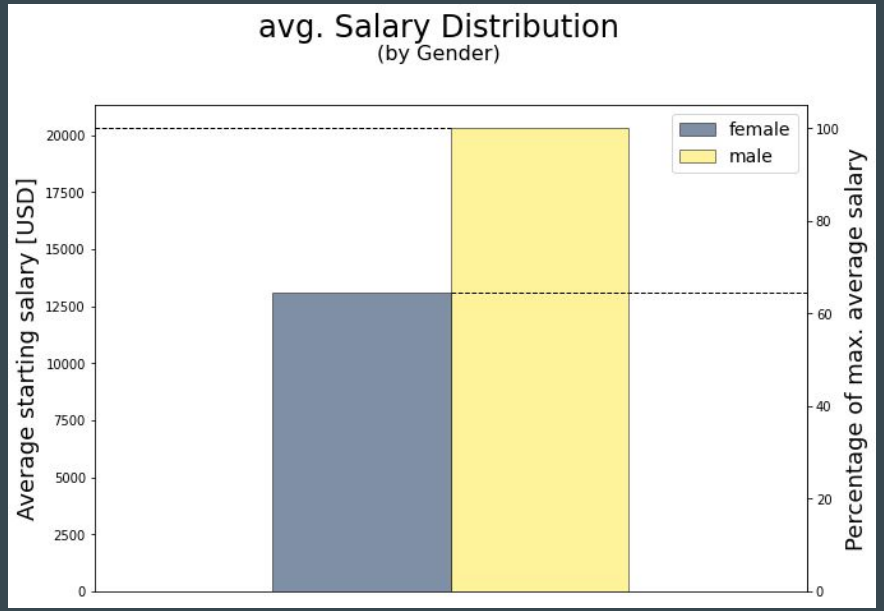
# Q: How is the gender distribution in the US Bank?




First impression:

- quite equal

# Q: Is there a gender pay gap? Focus on starting salary

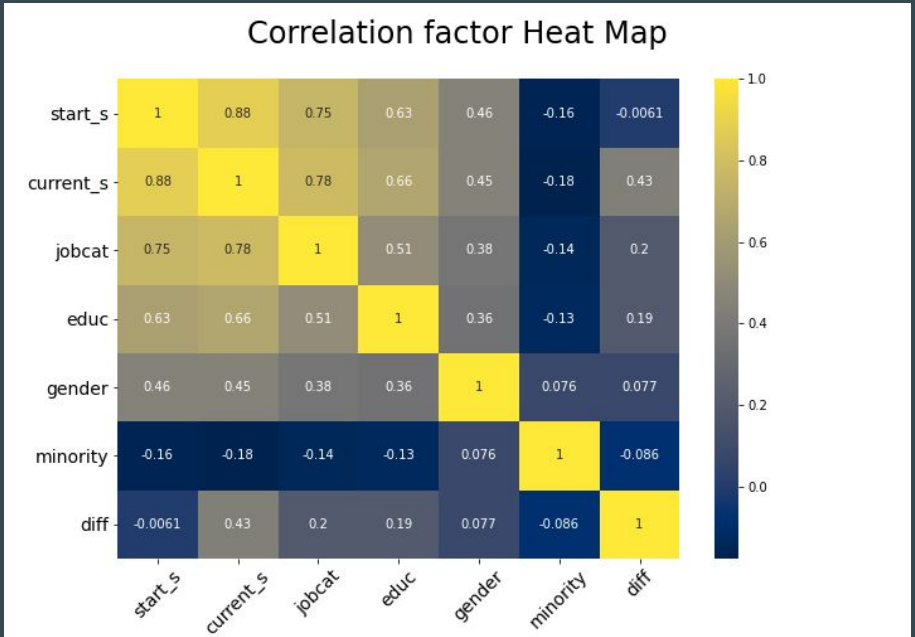



First impression:

- not equal
- female salary only 64.5% of male salary

What are the driving parameters?

# Q: Is there a gender pay gap? Focus on starting salary

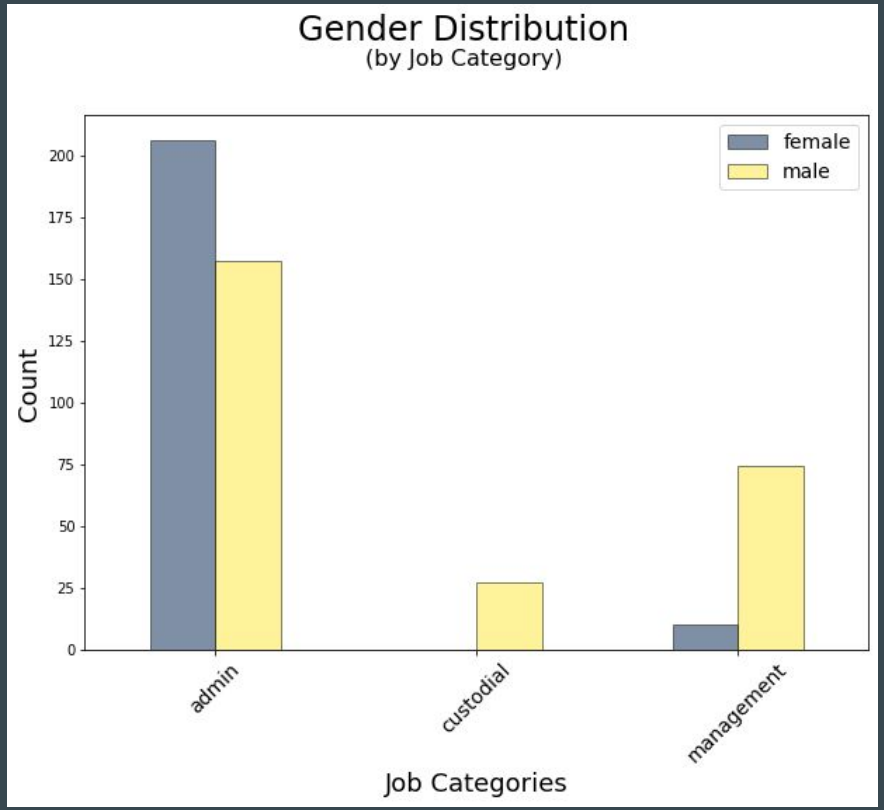



Correlated parameters:

- job category
- educational years
- gender

Let’s take a look at those!

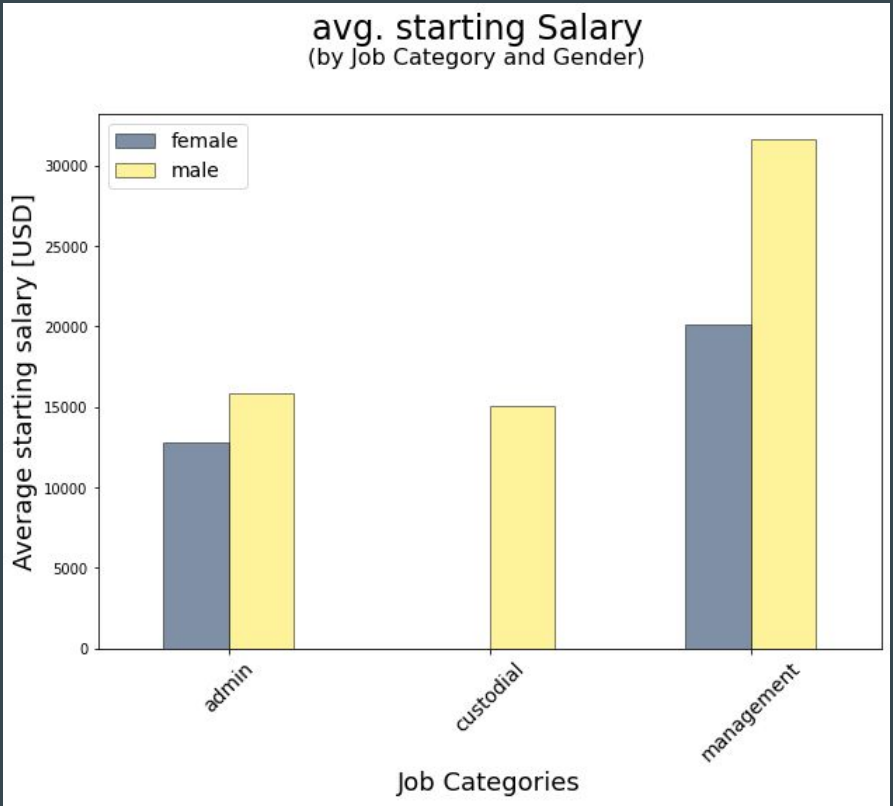
# Q: Is there a gender pay gap? Parameter: job category




Observations:

- no females in job category “custodial”
- most females employed in administration department

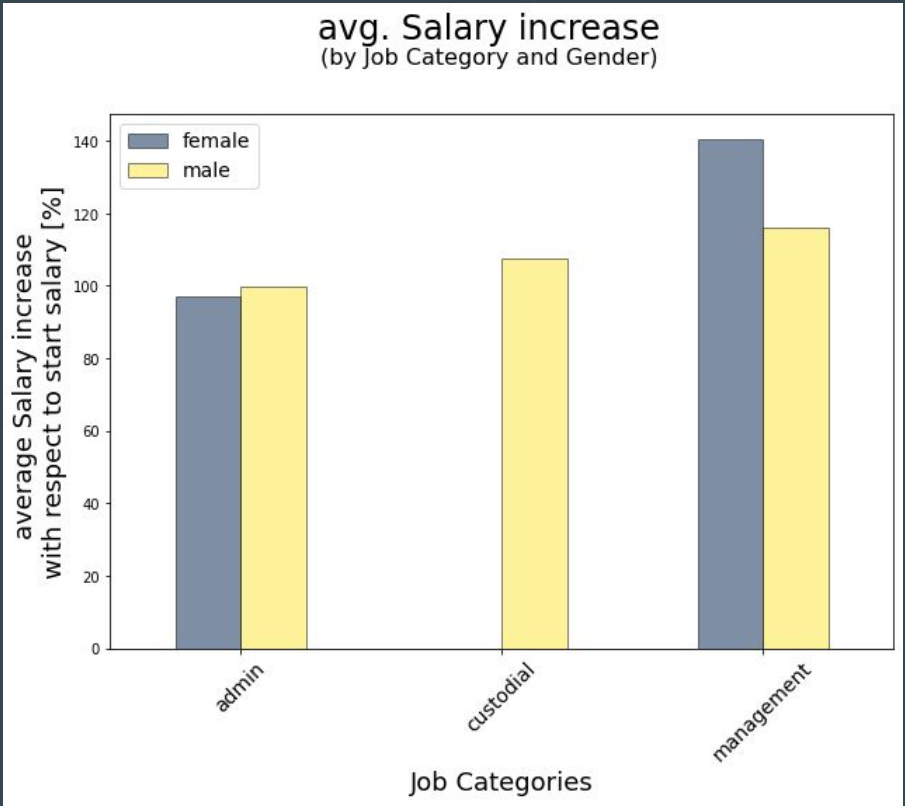
# Q: Is there a gender pay gap? Parameter: job category




Observations:

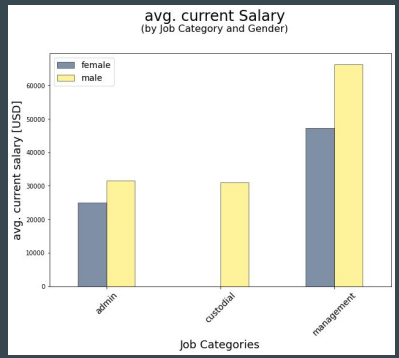
- most salary inequality in management department

# Q: Is there a gender pay gap? Parameter: salary increase




Observations:

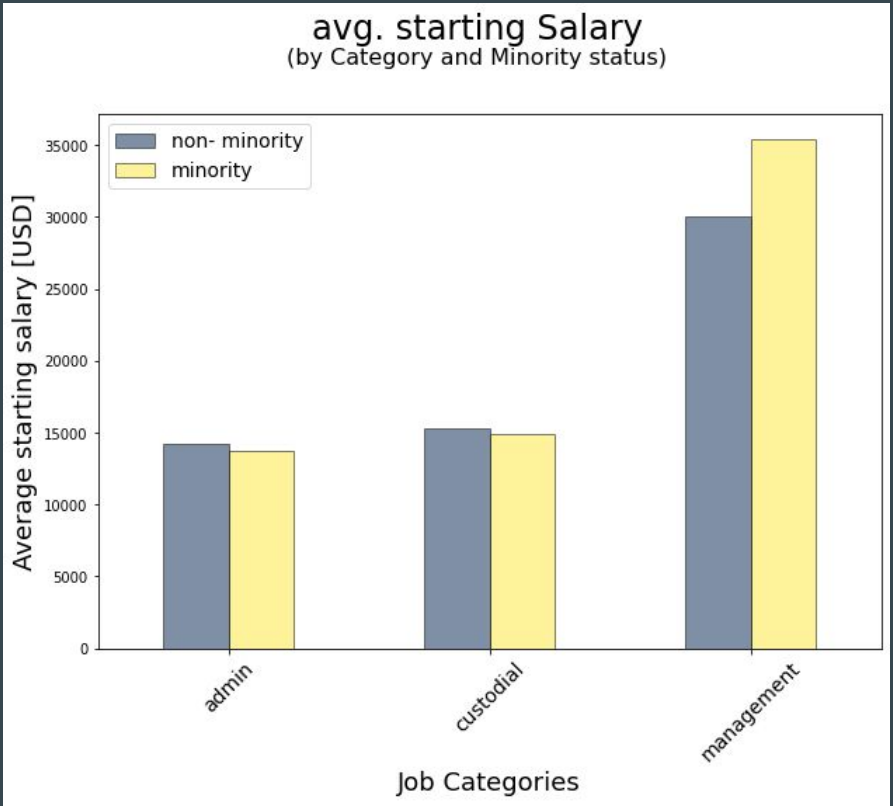
- no significant inequality in salary increase. Females have a slight advantage in the management department.




current salary

# Investigation on minority groups

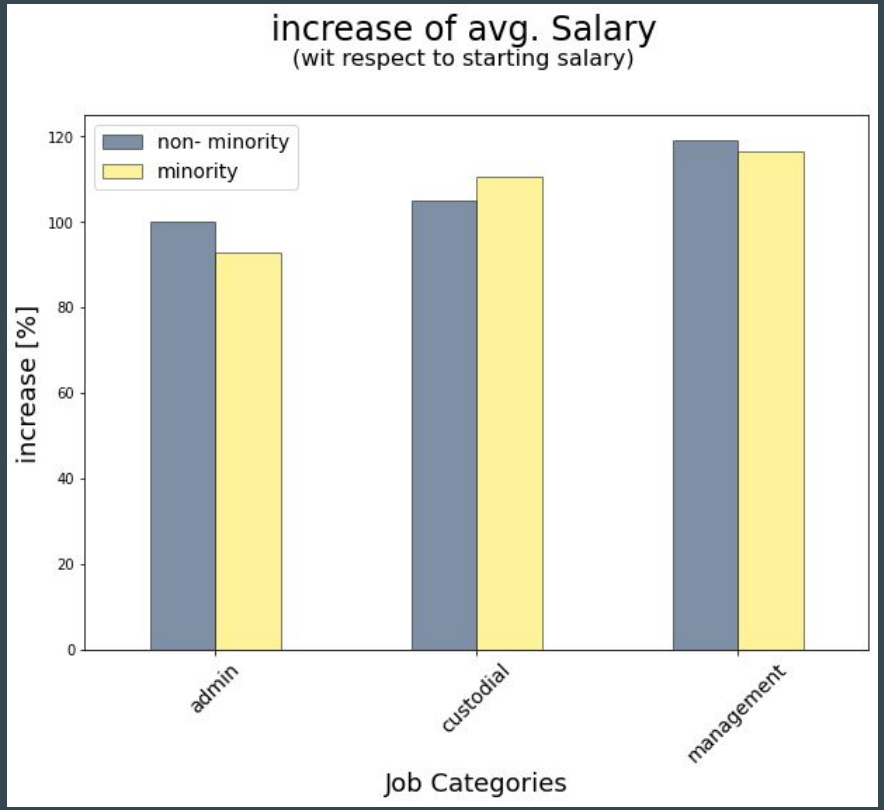
# Q: Do people from minority groups have disadvantages?




Observations:

- no obvious structural disadvantages
- slight advantage in management department

# Q: Do people from minority groups have disadvantages?

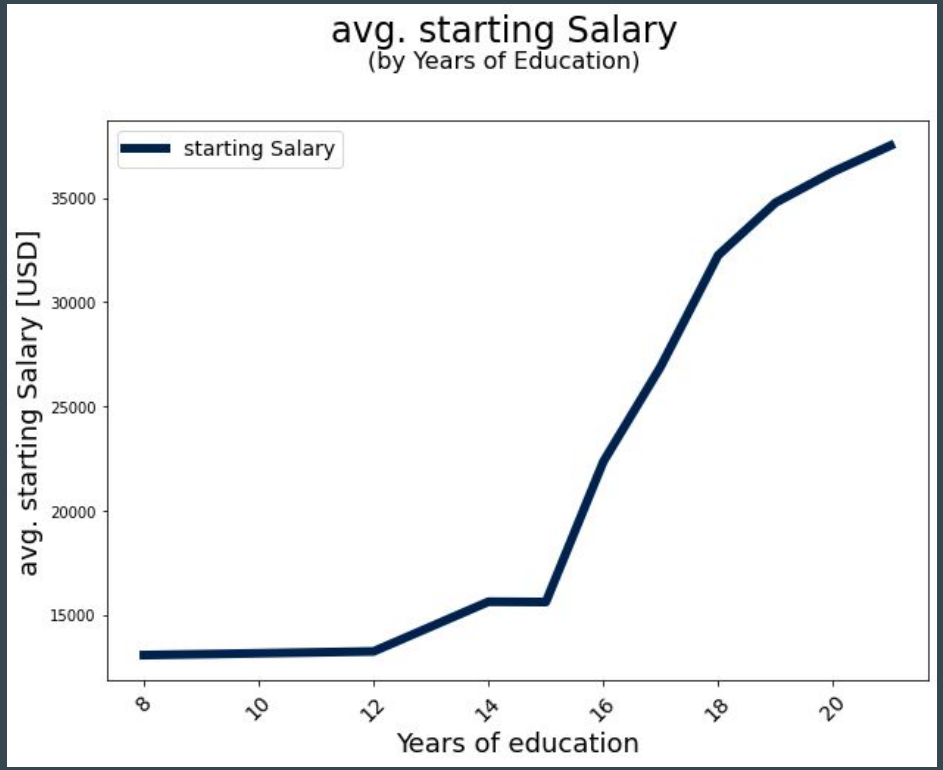



Observations:

- no obvious structural disadvantages

# Educational structure

# Q: Relation between education and starting salary

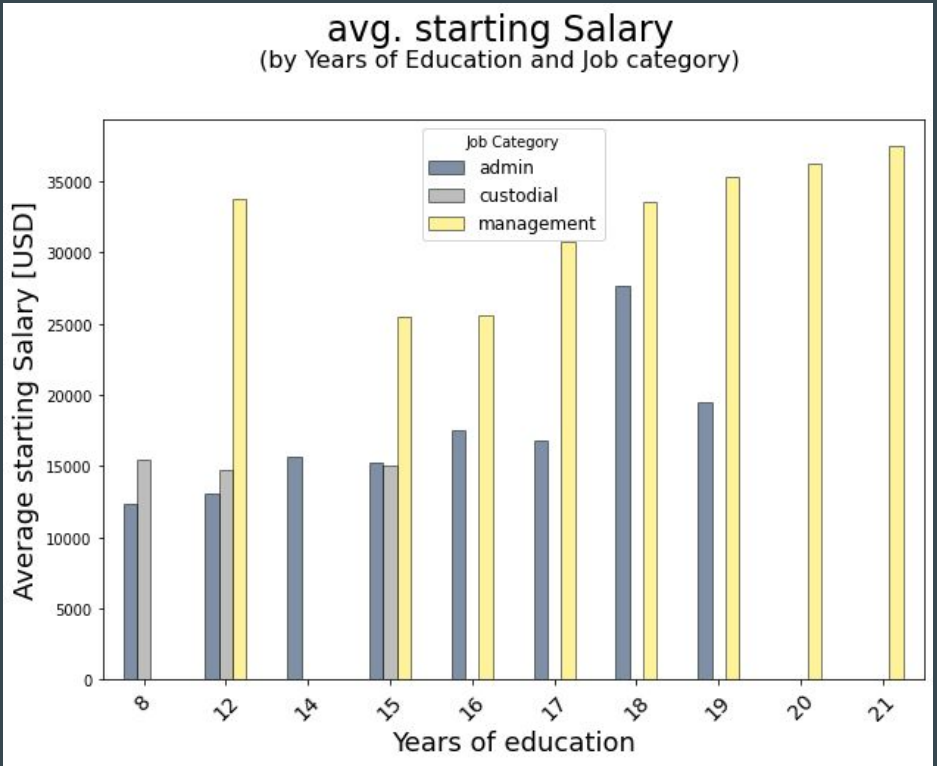



Observations:

- there is a relation, but not a linear one

Let’s take a look at the job categories!

# Q: Relation between education and starting salary




Observations:

- In order to work in the management department, at least 12 years of education is required
- years of education alone do not guarantee a substantial higher starting salary

# Regression model

# Regression model

```
X_1 = df_LR[['educ', 'gender', 'minority', 'jobcat']]
y_1 = df_LR['start_s_log']

X_train_1, X_test_1, y_train_1, y_test_1 = train_test_split(X_1, y_1, test_size=0.25, random_state=42, shuffle=True)

# Merge datasets after test split for formula notation
X_train_1 = X_train_1.merge(y_train_1, left_index = True, right_index=True)

# Create and train an OLS model
results_1 = smf.ols(formula='start_s_log ~ educ + C(gender) + C(minority) + C(jobcat)', data=X_train_1).fit()

# Return output of the model
results_1.summary()
```

OLS Regression Results

| | | | |
|---|---|---|---|
| **Dep. Variable:** | start_s_log | **R-squared:** | 0.773 |
| **Model:** | OLS | **Adj. R-squared:** | 0.770 |
| **Method:** | Least Squares | **F-statistic:** | 238.1 |
| **Date:** | Mon, 07 Jun 2021 | **Prob (F-statistic):** | 4.03e-110 |
| **Time:** | 11:48:48 | **Log-Likelihood:** | 129.75 |
| **No. Observations:** | 355 | **AIC:** | -247.5 |
| **Df Residuals:** | 349 | **BIC:** | -224.3 |
| **Df Model:** | 5 | | |
| **Covariance Type:** | nonrobust | | |

| | coef | std err | t | P>\|t\| | [0.025 | 0.975] |
|---|---|---|---|---|---|---|
| **Intercept** | 9.0298 | 0.053 | 171.283 | 0.000 | 8.926 | 9.133 |
| **C(gender)[T.1]** | 0.2001 | 0.021 | 9.419 | 0.000 | 0.158 | 0.242 |
| **C(minority)[T.1]** | -0.0519 | 0.023 | -2.271 | 0.024 | -0.097 | -0.007 |
| **C(jobcat)[T.2]** | 0.0541 | 0.044 | 1.242 | 0.215 | -0.032 | 0.140 |
| **C(jobcat)[T.3]** | 0.4786 | 0.030 | 15.913 | 0.000 | 0.419 | 0.538 |
| **educ** | 0.0334 | 0.004 | 7.946 | 0.000 | 0.025 | 0.042 |

| | | | |
|---|---|---|---|
| **Omnibus:** | 91.128 | **Durbin-Watson:** | 1.916 |
| **Prob(Omnibus):** | 0.000 | **Jarque-Bera (JB):** | 290.545 |
| **Skew:** | 1.138 | **Prob(JB):** | 8.11e-64 |
| **Kurtosis:** | 6.804 | **Cond. No.** | 90.2 |

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

- Split Data Frame into Test/Train Data Frame
- Set up multiple linear regression model

## Questions we had

- How is the gender distribution in the US bank?
- Is there a gender pay gap?
- Do people from minority groups have a disadvantage?
- Is the education directly related to the starting salary?

## Answers we found

- Quite equal, 45,5% female, 54,5% male
- Yes, due to the starting salary being not equal
- No obvious disadvantages
- It is, but the job category is more dominant