

## Linear Models Assignment 5

As Lee (2021) aptly notes, in relation to party polarization and trust in science, there has been a marked “decline of trust in science among Republicans, ideological conservatives, and fundamentalist religious groups” and an increase “of trust in science among Democrats.” In line with Lee’s contention, this paper will examine what affected voter feelings toward Antony Fauci, Chief Medical Advisor to the President and leader of the United States Covid-19 response, in the 2020 Presidential Election. Using an excerpt of the 2020 American National Election Study, this paper will examine factors that Voter perceptions of Fauci, first specifying a theoretical model and hypothesis, before conducting a statistical analysis on the ANES dataset.

### 1. Research Question and Hypothesis

Accordingly, the primary question of this paper asks, in the 2020 Presidential election, what explains voters feelings toward Anthony Fauci? To answer this question, this paper will examine key social and political indicators, hypothesizing that perceptions of Fauci are influenced more by partisan identification and voting behaviour, than they are by social factors or Covid-19 perceptions. Formally then, **H0:** Social factors or Covid-19 perceptions have a greater impact on voters' feelings towards Anthony Fauci than partisan identification and voting behavior in the 2020 Presidential election. **H1:** Partisan identification and voting behavior have a greater impact on voters' feelings towards Anthony Fauci than Social factors or Covid-19 perceptions in the 2020 Presidential election.

### 2. Statistical model

Before defining how this hypothesis will be tested, it is first prudent to identify the specific variables that will be tested and then operationalize them as seen in Table 1.

Table 1. Operationalization of Variables

Concept:	Variable:	Variable label:	Type:
Perceptions towards Anthony Fauci	FauciFT	Antony Fauci’s ratings on the feeling thermometer	Continuous

Partisan Identification	PartyIDDirection	Republican and Democrat identification	Binary
	voteJoe	Whether respondent voted for Joe Biden	Binary
Social factors	famincomek	Family Income (in \$1,000)	Categorical
	age	Respondents age	Continuous
	sex	Respondents sex	Binary
	race	Respondents race	Categorical
	education	Respondents highest level of education	Categorical
Covid-19 perceptions	hydrosafe	Is Hydroxychloroquine safe?	Binary
	covidlabgrown	Was Covid intentionally grown in a lab?	Binary

Following on from operationalization, to test my hypothesis, this paper will a standard multivariate OLS regression equation of the general form of equation 1 below.

(1)

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon$$

Where y is the dependent variable.  $\beta_0$  is the intercept.  $\beta_1, \beta_2, \beta_n$  are the slope coefficients.  $X_1, X_2, X_n$ , represent the independent variables. Finally,  $\varepsilon$  is the error term for the difference between the real and predicted value of y. Following on from this, the actual statistical model used, is represented by equation 2 below.

(2)

$$\text{FauciFT} = \beta_0 + \beta_1 \text{partyiddirection} + \beta_2 \text{voteJoe} + \beta_3 \text{famincomeK} + \beta_4 \text{age} + \beta_5 \text{sex} + \beta_6 \text{race} + \beta_7 \text{education} + \beta_8 \text{hydrosafe} + \beta_9 \text{covidlabgrown} + \varepsilon$$

Where FauciFT is the continuous dependent variable representing Antony Fauci's ratings on the feeling thermometer, where 0 is cold, and 100 is warm.  $\beta_0$  is the intercept.  $\beta_1, \beta_2, \beta_n$  are the slope coefficients.  $\beta_1, \beta_2, \beta_n$  are the slope coefficients. Partyiddirection, voteJoe, famincomeK, age, sex, race, education, hydrosafe, and covidlabgrown are the independent variables. Finally,  $\varepsilon$  is the error term for the difference between the real and predicted value of y.

This paper's specification's theoretical rationale follows Evans & Hargittai (2020), who examined beliefs in the expertise and shared values of scientists during the Covid-19 pandemic. The authors specifically identified that social class, gender, and race were key predictors of feelings towards high profile scientists surrounding Covid-19. Accordingly, this paper has selected a range of variables pertaining to that social class, gender, and race, alongside political and Covid-19 specific variables, to understand their impact on perceptions of Dr. Fauci. Firstly, partisan and voting is likely a significant predictor of voters' perceptions of Fauci. Republicans can be expected to have a more negative perception of Fauci, as they have been critical of Fauci's recommendations to mitigate Covid-19, such as mask-wearing and social distancing, while Democrats and those who voted for Joe Biden are expected to have a more positive view of him, as Democrats supported Fauci's recommendations. Furthermore, according to Evans & Hargittai's (2020) findings, social factors such as family income can influence how individuals perceive Fauci. The study notes that high-income men and women are more likely to share the same "values" as scientists, which can lead to a more positive perception of Fauci. It is also likely that an individual's age affects their perception of Fauci, as older individuals are normally more vulnerable to health risks posed by COVID-19, and thus, identify the importance of relying on scientific expertise. Furthermore, Evans & Hargittai (2020) found that women are more prone to identify with the expertise and shared values than men, and thus, it is likely that women may feel more positively about Fauci. More broadly, it is plausible that individuals that have higher levels of education may have a better understanding of Covid-19's health risks and be better at evaluating scientific information, allowing them to better assess the credibility of public health officials, and potentially have a positive view of Fauci. Moreover, as Evans & Hargittai (2020) found, race influences an individual's perception of scientists. One potential explanation of this is that racial groups may have historically been mistreated by institutions and authorities, leading to a general distrust of authority figures, which likely extends to public health officials like Fauci. Finally, it is likely that Covid-19 perceptions directly influence perceptions of Fauci. Individuals who believe in Hydroxychloroquine or the intentional lab-growth of Covid-19, which contradicts WHO and Fauci's messaging, are expected to have a less favorable view of Fauci.

## 4. Primary Model

**Figure (1) Primary Regression**

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Call:
lm(formula = FauciFT ~ partyIDdirection + votejoe + famincomek +
    age + sex + race + Education + hydrosafe + covidlabgrown,
    data = gs)

Residuals:
    Min       1Q   Median       3Q      Max
-91.468 -11.587   2.705  12.386  78.996

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    48.859521   2.434331   20.071 < 2e-16 ***
partyIDdirectionRepublican -5.710259   0.965643   -5.913 3.57e-09 ***
votejoe         25.387007   1.035334   24.521 < 2e-16 ***
famincomek      0.021666   0.004966    4.363 1.31e-05 ***
age             0.295706   0.017996   16.432 < 2e-16 ***
sex            -0.195623   0.598165   -0.327  0.7437
raceAsian       1.156074   1.664376    0.695  0.4873
raceBlack      -4.631116   1.157452   -4.001 6.39e-05 ***
raceHispanic   -2.879904   1.166175   -2.470  0.0136 *
raceMultiple   -3.064515   1.714992   -1.787  0.0740 .
raceNative American -2.119067   2.256433   -0.939  0.3477
EducationBachelors  0.061302   1.922505    0.032  0.9746
EducationGraduate  0.615434   1.966022    0.313  0.7543
EducationHS      -0.652826   1.989988   -0.328  0.7429
EducationmorethanHS  0.919828   1.889178    0.487  0.6264
hydrosafe      -15.801175   0.798626  -19.785 < 2e-16 ***
covidlabgrown   -9.103616   0.723850  -12.577 < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 21.11 on 5134 degrees of freedom
Multiple R-squared:  0.5204,    Adjusted R-squared:  0.5189
F-statistic: 348.1 on 16 and 5134 DF,  p-value: < 2.2e-16
```

Interpreting the coefficients of my primary model, we see a intercept Fauci feelings thermometer of 48.559 (where race is white and education is less than High School). The first coefficient, partyIDdirectionRepublican sees a large decrease of -5.711 at a statistically significant level of 3.57e-09, meaning that on average, Republicans rated Fauci's 5.71 points lower than Democrats. The second coefficient, votejoe, saw an increase of 25.39 at a significant <2e-16, indicating that respondents who voted for Joe Biden rated Fauci 25.39 points higher than those who did not vote for Biden. The next coefficient, famincomek, saw an increase of 0.0216 at a significance level of 1.31e-05, meaning that for every thousand-dollar increase in family income, an individual's rating of Fauci increased by 0.02 points. Age, saw a small increase of 0.2957 at a significance level of <2e-16, demonstrating that, for every one-year increase in age, the rating of Fauci's job performance increased by 0.2957 points. The sex coefficient is not statistically significant and thus doesn't need to be interpreted. The only statistically significant race coefficients were Black and Hispanic. The perception of Fauci amongst respondents whose race was Black, saw a -4.631 decrease at a level of 6.39e-05, while respondents who identified as Hispanic also saw a negative effect on their perception of Fauci, decreasing -2.8799

at a statistically significant level of 0.0136. The education coefficients are not statistically significant and thus do not need to be interpreted. The second-last coefficient, hydrosafe, had a large negative effect of -15.8011 at a significant  $<2e-16$ , meaning that respondents who believe Hydroxychloroquine to be safe rate Fauci 15.80 points lower than those who do not believe it is safe. Finally, covidlabgrown, had a large negative effect of -9.10 at a highly significant level of  $<2e-16$ , meaning that respondents who believe that Covid-19 was created in a lab rated Fauci 9.10 points lower than those who did not. The regression also had a low total p-value and high R-squared, indicating that a majority of the variance can be explained by this model.

## 5. ANOVA

**Figure (2) ANOVA**

Analysis of Variance Table

Response: FauciFT

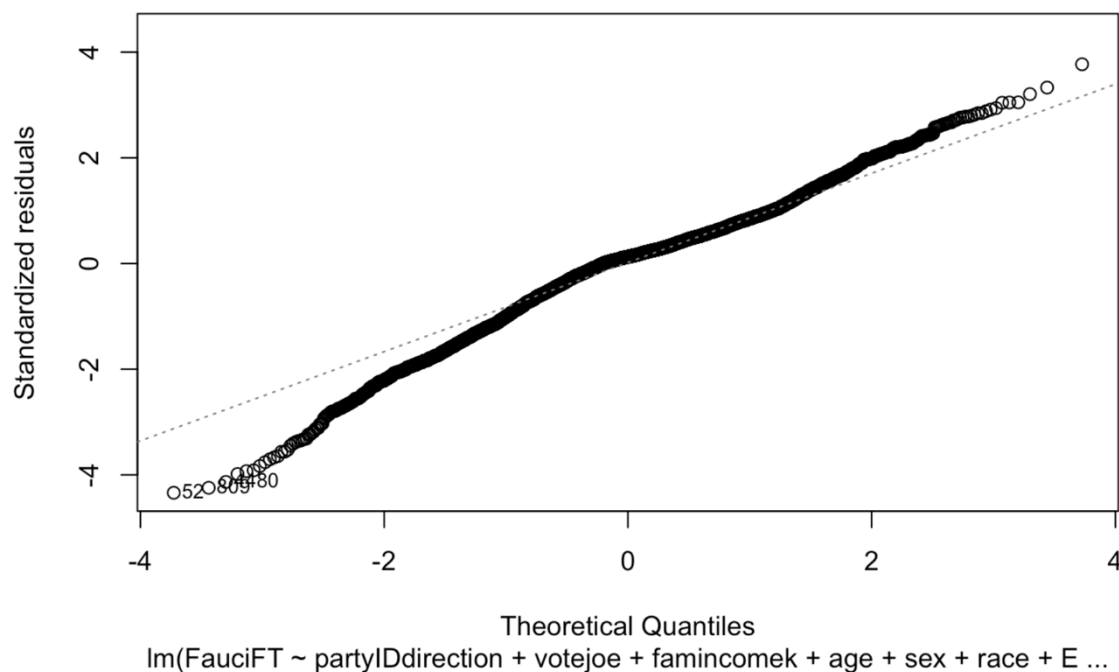
	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
partyIDdirection	1	1418243	1418243	3183.7761	$< 2.2e-16$	***
votejoe	1	560098	560098	1257.3503	$< 2.2e-16$	***
famincomek	1	22415	22415	50.3180	$1.485e-12$	***
age	1	148022	148022	332.2914	$< 2.2e-16$	***
sex	1	807	807	1.8113	0.178418	
race	5	34497	6899	15.4882	$3.759e-15$	***
Education	4	6580	1645	3.6926	0.005244	**
hydrosafe	1	220082	220082	494.0562	$< 2.2e-16$	***
covidlabgrown	1	70459	70459	158.1724	$< 2.2e-16$	***
Residuals	5134	2286988	445			
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Signif. codes:	0	***	0.001	**	0.01	*
				0.05	.	
				0.1	'	
					'	1

Primarily due to the large sample size and the inclusion of categorical and binary variables, visual interpretations of the residual plots of the Gauss-Markov assumptions are difficult. Thus, instead of examining residuals, we can use an ANOVA test to examine between group means compared to the variation within groups, to see if they are different. Examining Figure 2 above, we see that there is a statistically significant difference in the means of our predictor variables in the primary regression (except sex), with all of them except sex having p-values of below 0.05. Unfortunately, the p-value for the sex variable is not significant, suggesting that there is no significant difference in the mean values of FauciFT across different levels of the sex variable. However, as we see in our primary regression, the sex variable does not have a statistically significant effect on FauciFT and thus, there is no need for significant concern. Furthermore, although linearity is not included as an assumption in

ANOVA, for variables that have a p-value below 0.05, we can conclude that a linear relationship exists between them and FauciFT. Therefore, we can reject the null hypothesis, and assert that outside of sex, that there is no significant difference in the mean values of FauciFT across different levels of these predictor variables.

## 6. Additional Robustness: Normality of Errors

**Figure (3) Normal Q-Q**



Exploring the Q-Q plot for normality of errors in my primary model, we can see that the residuals deviate from the diagonal line at both the top and tail ends. More specifically, the tail of the residuals have lower values than would be expected under standard modeling assumptions, moving off the diagonal line between the -2 and -4 quartiles, being dragged down by the residual outliers 52, 809, and 4480. The effect is the opposite at the top end of the residuals, with there being higher values than would be expected under standard modeling assumptions, moving off the diagonal line between the 2<sup>nd</sup> and 4<sup>th</sup> quartiles. Considering the large sample size and the inclusion of categorical and binary variables, there is, overall, decent normality of errors across the residual values present within the data, with a majority of points falling on, or extremely close to the reference line.

## 7. Analysis

This paper initially hypothesized that perceptions of Fauci were influenced more by partisan identification and voting behavior than by social factors or Covid-19 perceptions. Examining our results from the primary regression, we see results consistent with such a hypothesis. Specifically, the results suggest that political affiliation and voting, are among the most significant predictors of how individuals perceive Fauci. Respondents who identified as Republicans rated Fauci lower than Democrats. Similarly, those who voted for Joe Biden rated Fauci significantly higher than those who did not vote for him, exhibiting the largest positive relationship out of all the variables in the model. Valuably, such findings suggest that political affiliation plays a significant role in how individuals perceive Fauci, and likely reflect the differences in how Republicans and Democrats consumed and interpreted information surrounding Fauci's handling of the Covid-19 pandemic. The results also reveal that as income and age increase, so does Fauci's rating, a finding that is not only consistent with Evans & Hargittai (2020), but potentially reflects a greater trust in Fauci's expertise among older and wealthier individuals, who may be more likely to rely on scientific information and news sources to form their opinions.

Furthermore, we observe large negative effects on Fauci's ratings associated with Black and Hispanic respondents, a result that is again consistent with Evans & Hargittai (2020). Such a result is potentially indicative of a larger effect, in which races which are historically more likely to be suspicious of authority or statistically more likely to be religious, distrust public health officials like Fauci. Finally, Covid-19 perceptions directly influenced perceptions of Fauci, with respondents who believed Hydroxychloroquine to be safe and that Covid-19 was created in a lab rating Fauci lower, as a result of their antithetical stances to Fauci, than those who held the opposite beliefs. Of note, consistent with Evans & Hargittai (2020), the coefficients for sex and education were not statistically significant, suggesting that these factors are not significant predictors of how individuals rate Fauci. Notably, all of these variables effects were less than those of political affiliation and voting. Thus, after considering the results of the primary regression, we can reject the null hypothesis and conclude

that Partisan identification and voting behavior have a greater impact on voters' feelings towards Anthony Fauci than Social factors or Covid-19 perceptions in the 2020 Presidential election.

However, I do have specific reservations about these results. The effects outlined within the model assume that respondents are aware of Fauci, his rhetoric, and partisan rhetoric surrounding his role. This assumption is a large, and somewhat unrealistic one. Specifically, respondents who are lower-education or working class, may not have time to engage with the aforementioned topics, and thus, may not have had enough understanding to score correctly. Such an issue would potentially explain the lack of statistical significance surrounding the education coefficient. Furthermore, the ANOVA test demonstrated high residual degrees of freedom and sums of squares, all of which indicate that there is a lot of unexplained variation in the model. Such a result indicates that the current variables in the model struggle to explain all the variations, and that there may be unequal variances that bias my estimates and SE. All of this causes me to be sceptical about my findings ability to explain Fauci's thermometer score completely. That being said, with specific reference to my specification, and to the work of Evans & Hargittai (2020), my results are extremely valuable.



**Bibliography:**

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