
Business Types and Poverty Rates

STAT 320

By: Jair, Luke and Tae

Poverty / Intro

- The poverty rate in the United States as of 2021 is 11.6%
 - Over 38 million people cannot afford the basic needs for their lives
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- ▶ Goal:
 - ▶ To examine the various factors that contribute to poverty in specific counties in the United States.



"National Poverty in America Awareness Month: January 2023."
Census.Gov, Jan. 2023,
www.census.gov/newsroom/stories/poverty-awareness-month.html.


Davies, Dave. "Private Opulence, Public Squalor: How the U.S. Helps the Rich and Hurts the Poor." NPR, 21 Mar. 2023,
www.npr.org/sections/health-shots/2023/03/21/1164275807/poverty-by-america-matthew-desmond-inequality.



Our Question?

How is poverty rate impacted by the rate of different business types?

We hypothesize that some types of business, such as healthcare will increase the wealth of a county, leading to a lower poverty rate for that county, while other types of business like vice related businesses will lead to a higher rate of poverty for that county.



The Data

- Environmental Protection Agency Data from 2013
- All counties in the USA
 - Dropped NA's
 - Split testing/training
- Used 9 business rates
 - Number of business of that type within the county divided by population

The Data

Quantitative Business types predictors: Quantitative response:

- Vice
 - Entertainment
 - Education
 - Negative food
 - Positive food
 - Healthcare
 - Recreation
 - Transportation
 - Civic
- Poverty Rate

► Creating our Model

- Multiple linear regression
- Applied log transformation on the predictors and the results to fix normality
- Backward elimination
 - Dropped Vice because it was not significant

Model Results

- P-value < 2.2e-16
- R^2 on training = 20.39%
 - Testing = 19.2%
- All predictors very significant

Call:

```
lm(formula = trans_pov ~ trans_civic + trans_food_pos + trans_food_neg +  
    trans_hc + trans_ed + trans_trans + trans_rec + trans_ent,  
    data = training)
```

Residuals:

| Min | 1Q | Median | 3Q | Max |
|----------|----------|---------|---------|---------|
| -1.32859 | -0.24725 | 0.02366 | 0.28140 | 1.07783 |

Coefficients:

| | Estimate | Std. Error | t value | Pr(> t) |
|----------------|----------|------------|---------|--------------|
| (Intercept) | 3.82046 | 0.43177 | 8.848 | < 2e-16 *** |
| trans_civic | 0.08712 | 0.02263 | 3.850 | 0.000126 *** |
| trans_food_pos | 0.49437 | 0.06181 | 7.999 | 3.73e-15 *** |
| trans_food_neg | 0.27095 | 0.05069 | 5.345 | 1.14e-07 *** |
| trans_hc | -0.14033 | 0.04780 | -2.936 | 0.003412 ** |
| trans_ed | -0.07976 | 0.02800 | -2.848 | 0.004491 ** |
| trans_trans | -0.06292 | 0.02283 | -2.756 | 0.005970 ** |
| trans_rec | -0.09396 | 0.02713 | -3.463 | 0.000559 *** |
| trans_ent | -0.22176 | 0.02998 | -7.398 | 3.09e-13 *** |

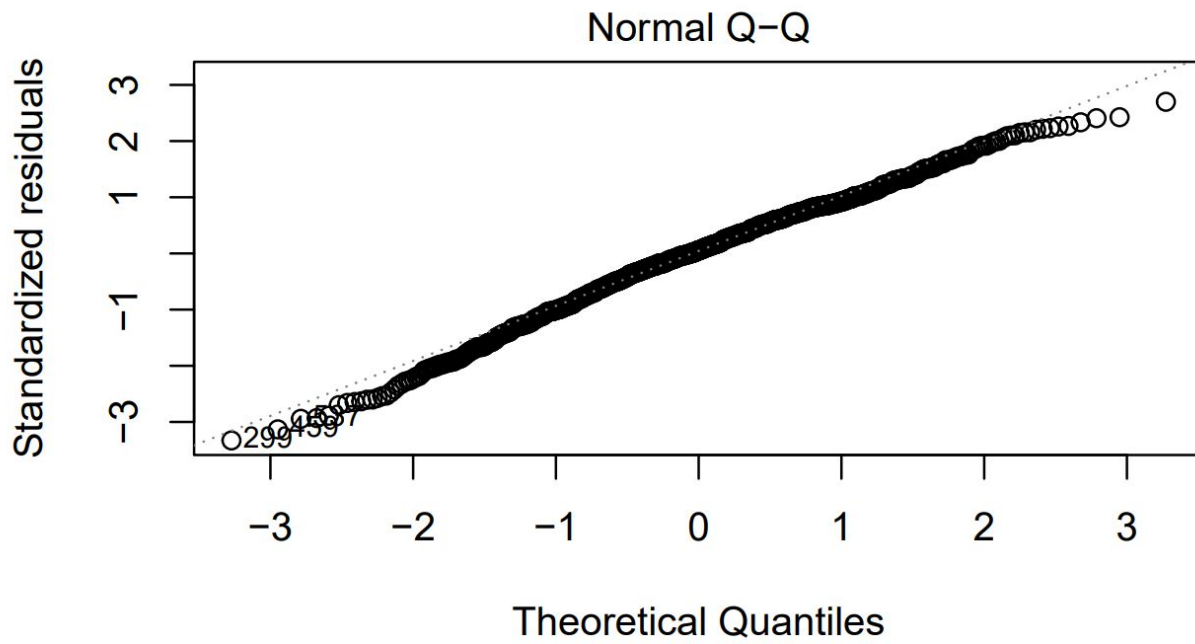
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

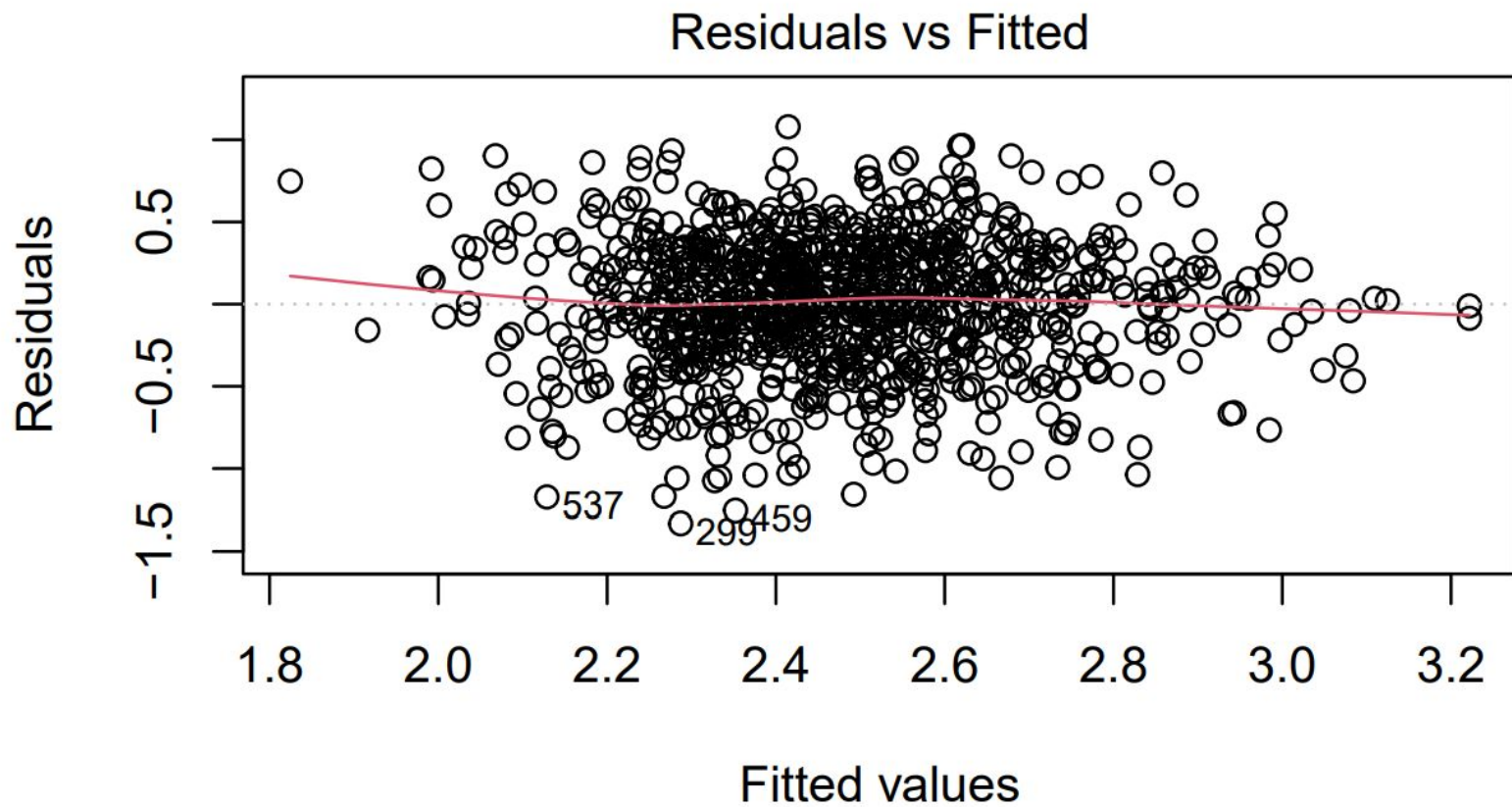
Residual standard error: 0.4012 on 930 degrees of freedom

Multiple R-squared: 0.2039, Adjusted R-squared: 0.1971

F-statistic: 29.77 on 8 and 930 DF, p-value: < 2.2e-16

Conditions





Our findings

Higher Poverty

- Civic
- **Positive food = 0.49**
- Negative food

Lower Poverty

- Education
- Healthcare
- Transportation
- Recreation
- **Entertainment = -0.22**

► Limitations and Conclusions

- We kept 1878 counties.
 - The dropped counties may have something in common
- Not applicable outside of the US
- Might change over time, might only work for 2013
- More categories of business types
 - Be more specific with results
- Use case: More informed economic development strategies