The Space Age

Examining the relationship between age and sentiment regarding spending on space exploration

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Research Question & Hypothesis

Research Question

Is age associated with differing attitudes on space exploration?

Independent Variable

Age

Dependent Variable

Sentiment on how much society is spending on space.

Measured on Likert scale with 1 (too little), 2 (about right) and 3 (too much) as possible responses.

Hypothesis

Age is significantly associated with one's sentiment on spending on space exploration.

However, it is difficult to predict the direction of this effect. On one hand, young people might be more interested in technology. Alternatively, boomers who grew up during the Cold War might have more favorable attitudes towards space.

This is therefore an interesting area to investigate using two-tailed hypothesis tests.

Relevance

The growth of companies like Space X and Virgin Galactic have sparked interest in extraterrestrial exploration.

Geopolitical tensions with China have re-ignited debate on whether the US should invest more in its Space Program.[1]

Findings linking demographics such as age to sentiment might thus be useful to (1) investors who wish to decide where to put their money in, or (2) politicians who wish to better represent their constituents.

[1]Davenport, Christian. "As China's Space Ambitions Grow, NASA Tells Congress It Needs More Money to Compete." *The Washington Post*, 17 June 2021, Accessed 17 Dec. 2021.

Statistical Approach

Data Source

GSS2021 Cross-Section

Primary Analysis

Chi-Squared Test of Independence

Age is continuous but can be converted into a categorical variable by binning into generations.

The Likert scale is ordinal, but it is best to treat it as nominal so as not to make strong assumptions on the change in attitude between levels.

Secondary Analysis

Linear Regression

Model will be constructed as robustness checks to determine whether observed differences are due to the independent variable or relevant confounds such as income, political views, or educational level.

Chi-Squared Test of Independence

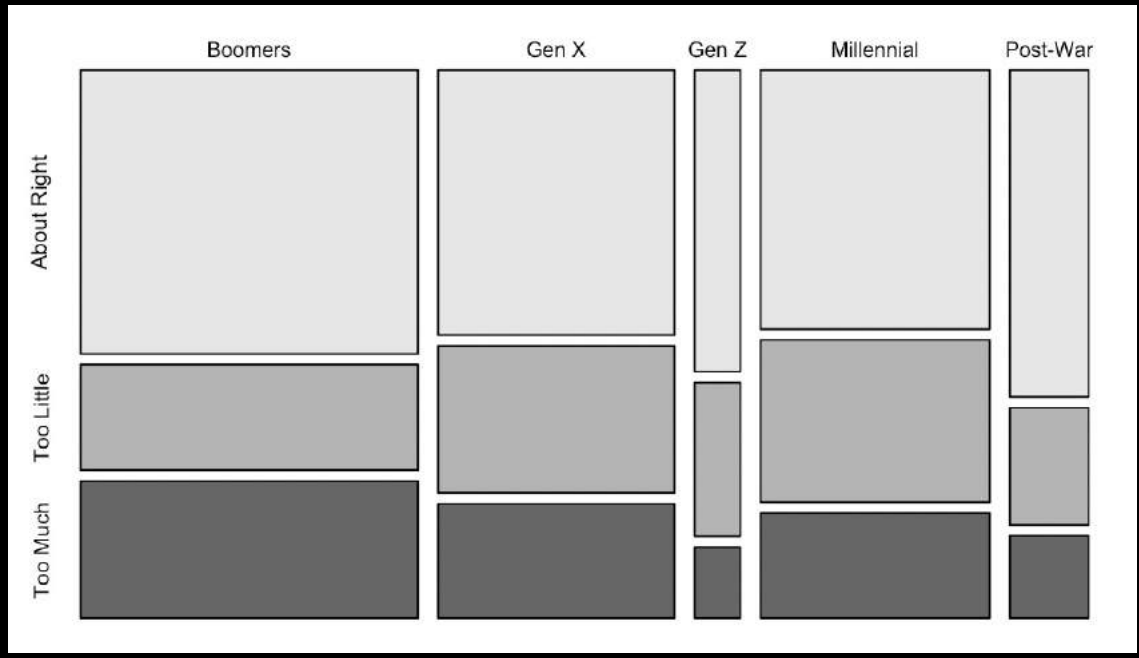
After removing missing values, there were n = 1801 data points.

Age was binned into generations, using commonly agreed upon cutoffs.[2]

The Likert scale was converted to categorical variables, with “About Right”, “Too Little”, and “Too Much” as the levels.

Based on the results of the chi-squared test, we reject the null hypothesis that age and sentiment are independent (p = 0.00014). We tentatively conclude that age is significantly associated with sentiment on space spending.

	Generation					
Sentiment	Boomers	Gen X	Gen Z	Millennial	Post-War	Total
About Right	353	231	51	219	95	949
Too Little	131	128	26	137	34	456
Too Much	171	100	12	89	24	396
Total	655	459	89	445	153	1801



[2]“Age Range by Generation.” *Beresford Research*, 14 Oct. 2021, https://www.beresfordresearch.com/age-range-by-generation/.

Univariate & Multivariate Linear Regression

Univariate

A univariate regression with age as the sole explanatory variable confirmed that it is a statistically significant predictor.

The coefficient is positive, suggesting that an increase in age is associated with increased likelihood of thinking that society spends “Too Much” on space.

However, the practical significance is almost zero, as evidenced by the very small coefficient term.

Multivariate

A multivariate regression controlling for income, education, and political views similarly confirms that age is a significant predictor.

Again, while these results are statistically significant, the coefficients are so small that we can say that there is little practical significance.

Regression Analysis

	DV: Sentiment on Space Exploration (1–3)	
	Model	
	Univariate	Multivariate
Age	0.003***	0.003***
	(0.001)	(0.001)
Education (Years)		−0.025***
		(0.006)
Income Level		−0.069***
		(0.018)
Political Views		0.001
		(0.011)
Constant	1.793***	2.359***
	(0.051)	(0.117)
Observations	1,801	1,734
R2	0.007	0.030
Adjusted R2	0.006	0.028
Residual Std. Error	0.685 (df = 1799)	0.679 (df = 1729)
F Statistic	12.698*** (df = 1; 1799)	13.490*** (df = 4; 1729)

*p<0.1; **p<0.05; ***p<0.01

Note: Income and political views data were collected through Likert scales. However, this regression treats these data as numeric, so the coefficients may be interpreted as the expected change in sentiment for every step increase towards the upper end of the scale (i.e. high-income, conservatism). Limitations of this approach will be discussed in subsequent slides.

Limitations

Problems with Data Collected

Rating sentiment on space exploration on a scale of 1-3 is reductionist and may not accurately capture public opinion. Before drawing substantive conclusions, one should consider triangulating data from different sources, such as more in-depth surveys or qualitative interviews.

Strong Statistical Assumptions

In binning age into generations for the Chi-squared test, we assumed homogeneity within groups. However, there might be differences between the younger and older people within the same generation which the test could not account for.

The regression analysis assumed that variables on the Likert scale were interval and have equal spacing. However, this was likely not the case. As such, it might have been better to construct dummy variables and conduct an ordinal logistic regression instead.

Limited Consideration of Confounders and Interactions

In the interest of parsimony, only three possible confounders were included in the multivariate regression, and the low R-squared suggests weak predictive power. Future research should account for more confounders and include interaction coefficients.

Conclusions

There is strong statistical evidence that age is significantly associated with thinking that society is spending too much on space. These findings were robust and the effect was still observed even when potential confounds were controlled for.

However, the practical significance is questionable as the coefficient terms suggest extremely small effect sizes.

More data is needed to make a substantive conclusion regarding the relationship between age and sentiment on space. The data collected where participants rate from 1-3 is flawed, and even the most sophisticated statistical techniques cannot correct for this.

Summary

Hypothesis

Age is significantly associated with sentiment regarding spending on space exploration.

Sample

1801 US-based adults who participated in GSS2021.

Methods

Chi-squared test using age binned by generation. Linear regression as robustness checks.

Findings

There are statistically significant effects suggesting that older individuals are inclined to think that society is spending too much on space. However, the effect sizes are small and the practical significance is close to zero.

Limitations

Strong assumptions were made regarding the nature of variables measured on the Likert scale; limited confounding variables were included in the OLS regression and interactions were not considered.

Conclusion

While observed effects were statistically significant, the small effect sizes, limited data and methodological flaws mean that more research is necessary to determine whether age is causally related to sentiment on space exploration, and whether such effect is generalizable.