

PSC 202

SYRACUSE UNIVERSITY

INTRODUCTION TO POLITICAL ANALYSIS

**HYPOTHESIS TESTING WITH ONE
CONFOUNDER, PART 1**

LAST TIME

- **Test statistic t:**

$$t = \frac{H_A - H_0}{\text{Standard Error}}$$

- **H_A : observed difference between samples**
- **H_0 : difference between samples if H_0 is true**

BIVARIATE RELATIONSHIPS

Independent Variable

Nominal/Ordinal

Interval

Dependent Variable

Nominal/Ordinal

Cross-Tabulation

Not In This
Class...

Interval

Mean
Comparison

Correlation
Coefficient, Linear
Regression

GENDER AND STUDYING

Gender	Mean Hours	Frequency	Standard Error
Female	3.66	54	0.24
Male	3.05	27	0.30
Difference	0.61	81	0.39

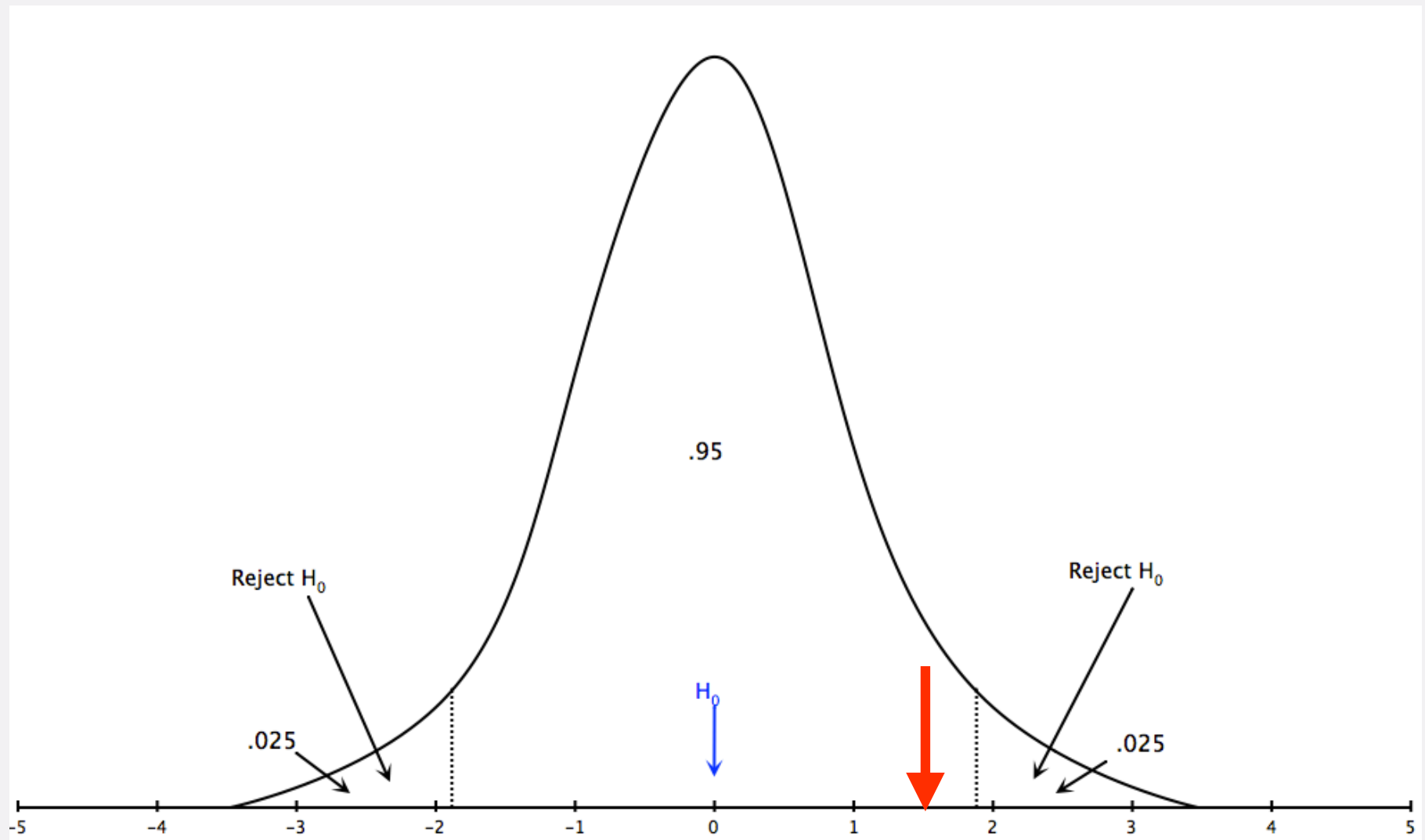
- Do men really study less than women?

TEST STATISTIC

- H_A : 0.61
- H_0 : 0
- Standard Error of Difference: 0.39

$$\begin{aligned} t &= \frac{H_A - H_0}{\text{Standard Error}} \\ &= \frac{0.61 - 0.0}{0.39} \\ &= 1.56 \end{aligned}$$

SIGNIFICANCE TEST



- t-score: 1.56

SIGNIFICANCE TEST

- **We cannot reject H_0**
- **Chance to get a difference of 0.61 hours (or larger) in sample of 81 students if there is no difference between men and women in population of students is larger than 5%**

BIVARIATE RELATIONSHIPS

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CROSS-TABULATION

- **Very similar approach as for mean comparisons**

PARTISANSHIP & ECONOMY

- How would you say the economy is doing?
 - Bad, very bad: 28%
 - Very good, good, neither good nor bad: 72%

PARTISANSHIP & ECONOMY

	Democrats	Republicans	Total
Very Bad, Bad	24.5% (13)	50.0% (4)	27.9% (17)
Very Good, Good, Neutral	75.5% (40)	50.0% (4)	72.1% (44)
Total	100% (53)	100% (8)	100% (61)

- Difference: 25.5%, or 0.255

CROSS-TABULATION

- Difference in bad economic perception between R and D is 0.255
 - Standard error of difference: 0.183

CROSS-TABULATION

- Difference in bad economic perception between R and D is 0.255
 - Standard error of difference: 0.183

$$\frac{H_A - H_0}{\text{Standard Error of Difference}}$$

$$= \frac{0.255 - 0.0}{0.183}$$

$$= 1.39$$

- Is this t-statistic large enough to reject H_0 ?

REJECT H_0 ?

- We reject H_0 if $t < -1.96$ or $t > 1.96$
- We had $t = 1.39$
- So we cannot reject H_0 that there is no difference between Republicans and Democrats in economic perceptions

BIVARIATE RELATIONSHIPS

Independent Variable

Nominal/Ordinal

Interval

Dependent Variable

Nominal/Ordinal

Cross-Tabulation

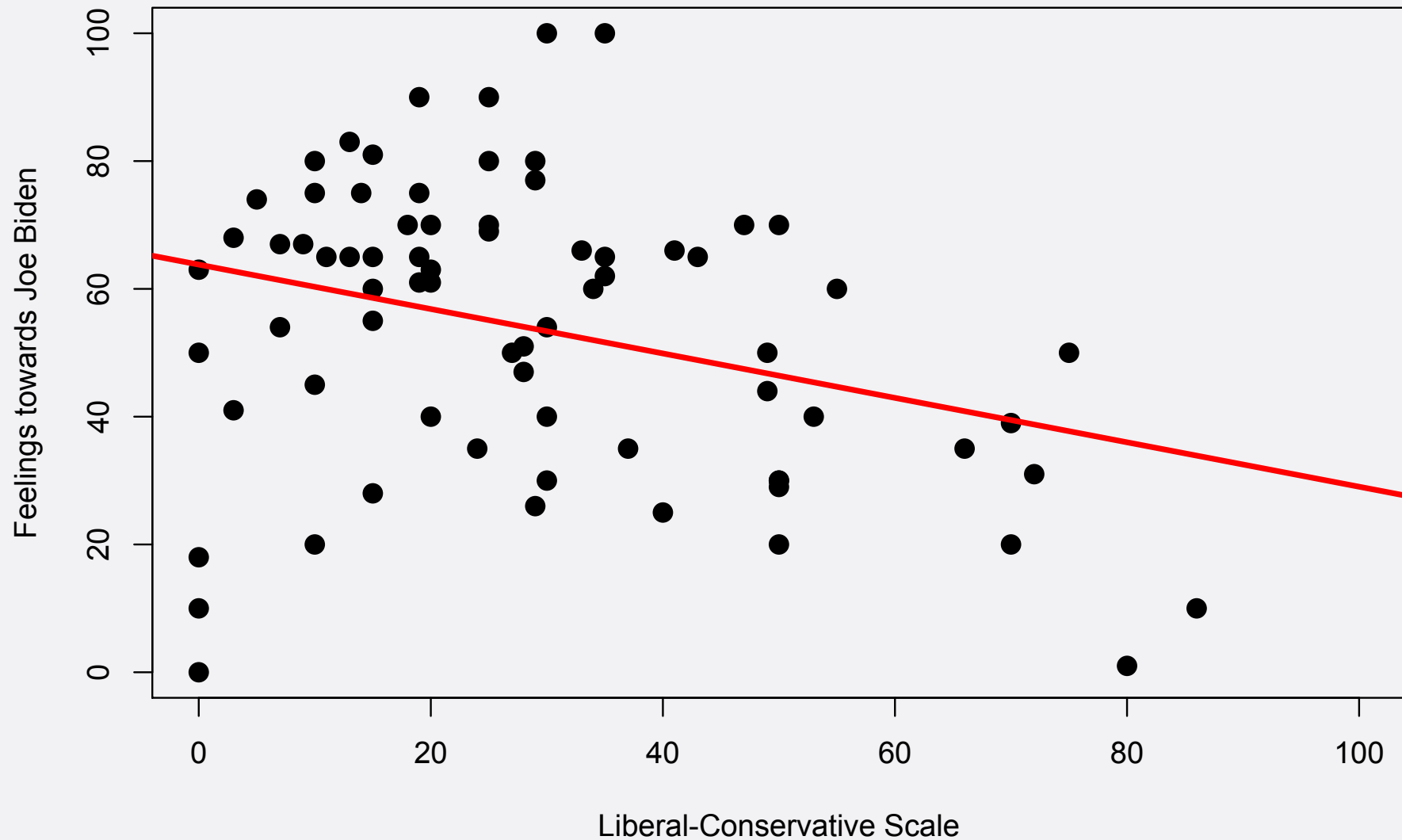
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JOE BIDEN



- **Thermometer Score = $63.8 - 0.348 * \text{Lib/Cons}$**

REJECT H_0 ?

- Can we reject H_0 that there is no relationship between lib/cons and feelings towards J. Biden?

FORMULA

$$t = \frac{H_A - H_0}{\text{Standard Error}}$$

- H_A : -0.348
- H_0 : 0
- Here, the relevant standard error is the SE of the linear regression coefficient

REGRESSION TABLE

```
. reg therm_2 libcons_1
```

Source	SS	df	MS	Number of obs	=	74
Model	3834.01698	1	3834.01698	F(1, 72)	=	8.06
Residual	34232.5776	72	475.452467	Prob > F	=	0.0059
				R-squared	=	0.1007
				Adj R-squared	=	0.0882
Total	38066.5946	73	521.4602	Root MSE	=	21.805

therm_2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
libcons_1	-.347605	.1224088	-2.84	0.006	-.5916224	-.1035876
_cons	63.79618	4.3579	14.64	0.000	55.10887	72.4835

REJECT H_0 ?

$$t = \frac{H_A - H_0}{\text{Standard Error}}$$

$$= \frac{-0.348 - 0}{0.122}$$

$$= -2.85$$

RECAP

- Is there a credible causal mechanism that connects X to Y ?
- Can we rule out the possibility that Y could cause X ?
- Is there covariation between X and Y ?
- Have we controlled for all confounding variables (Z) that might make the association between X and Y spurious?

RECAP

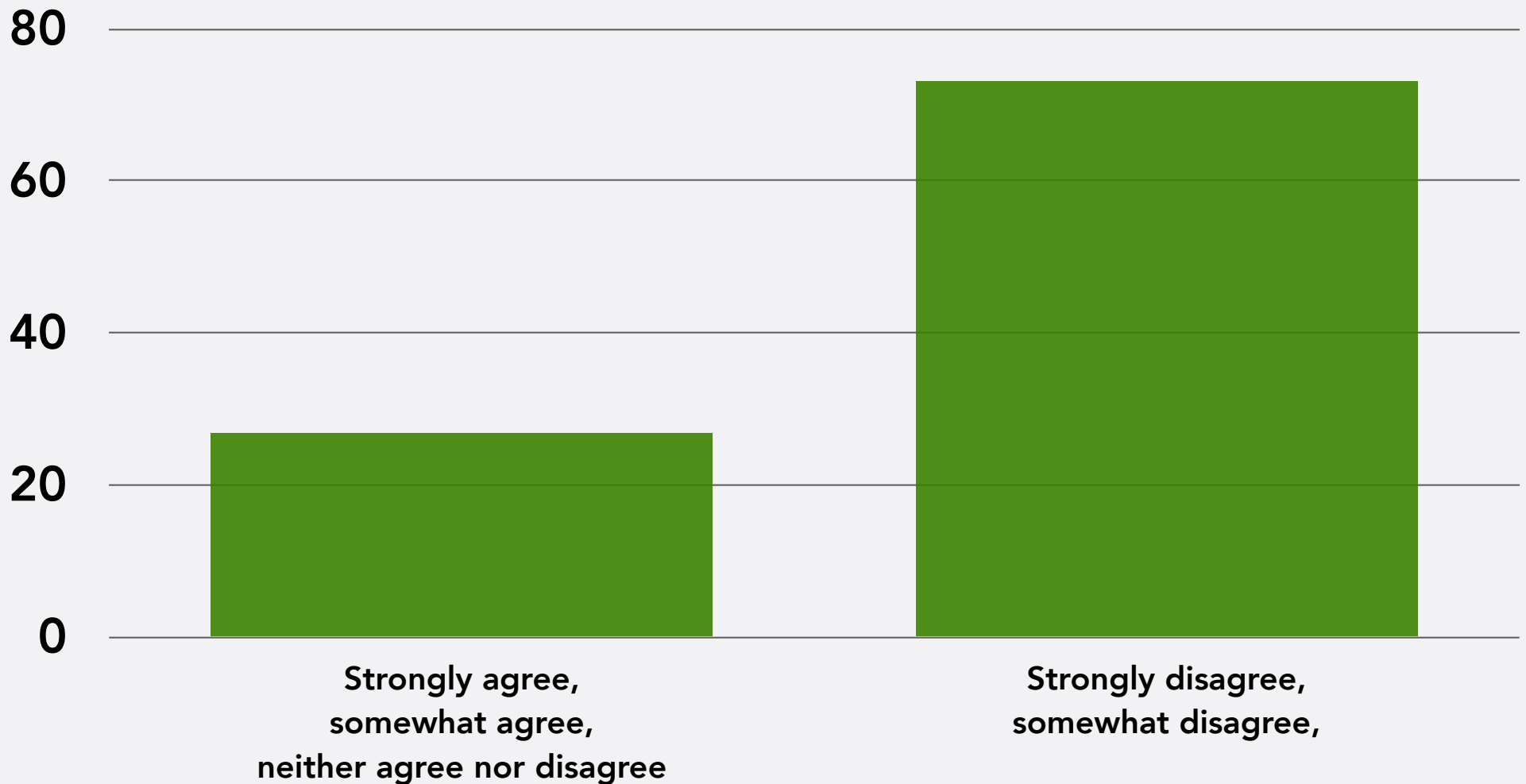
- **We are now able to...**
 - ...tell whether there is covariation between X and Y in a sample
 - ...tell whether our evidence (from a sample) is strong enough to conclude with reasonable certainty that the covariation is also present in the population

NOW

- Is there a credible causal mechanism that connects X to Y ?
- Can we rule out the possibility that Y could cause X ?
- Is there covariation between X and Y ?
- Have we controlled for all confounding variables (Z) that might make the association between X and Y spurious?

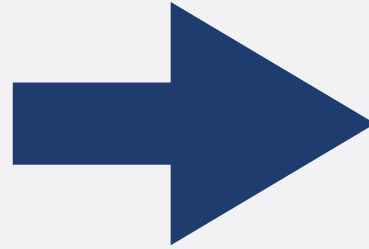
SURVEY

- How much do you agree with the following statement:
The involvement of the US in Afghanistan has been beneficial.



BIVARIATE RELATIONSHIP

?



**Evaluation of
Afghanistan
involvement**

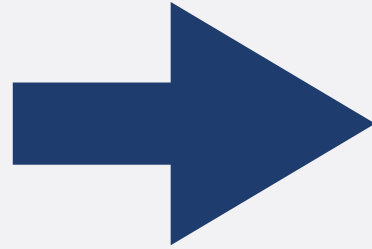
- **What explains why some of you think involvement was beneficial, while others do not think so?**

PARTISANSHIP & AFGHANISTAN

	Democrats	Not Democrats	Total
Agree	19.2% (10)	41.4% (12)	27.2% (22)
Disagree	80.8% (42)	58.6% (17)	72.8% (59)
Total	100% (52)	100% (29)	100% (81)

BIVARIATE RELATIONSHIP

Partisanship



Evaluation of
Afghanistan
involvement

- **Zero-order effect: Non-Democrats are 22.2% more likely to agree that Afghanistan involvement was beneficial than Democrats**

CAUSALITY

- Want to know *causal* effect of partisanship on Afghanistan involvement evaluation:
- Attitude of person if Democrat - Attitude of same person if not Democrat
 - Fundamental problem of causal inference: We can't observe alternate reality in which you identify with the other party!

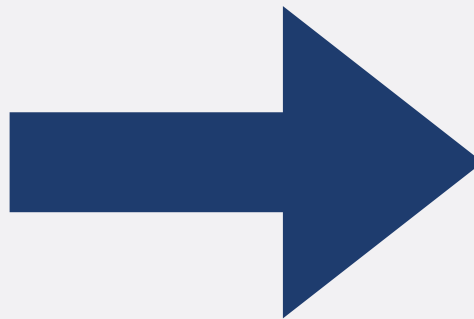
CAUSALITY

- Also: Whether people identify as Democrats or not depends on certain factors
 - e.g. gender, age
- These other factors might *also* determine people's attitudes towards Afghanistan involvement

CONFOUNDER?

Gender (Z)

Partisanship (X)



**Afghanistan
position (Y)**

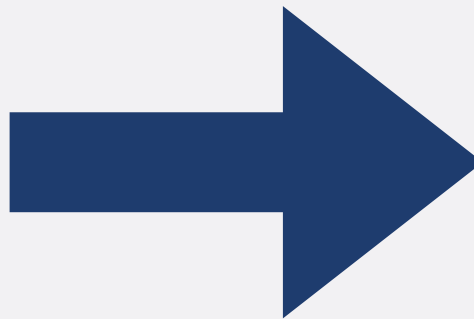
MAYBE THIS IS GOING ON?

Gender (Z)

W more likely to be
Democrats than M



Partisanship (X)



Afghanistan
position (Y)

MAYBE THIS IS GOING ON?

Gender (Z)

W might be more
critical of

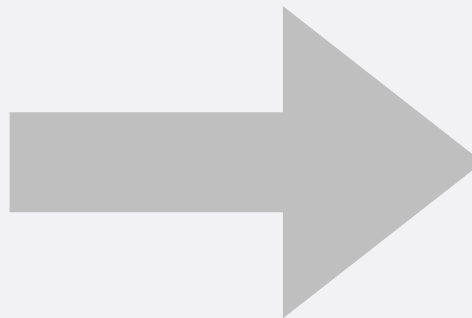
benefits of war than
M

W more likely to be
Democrats than M

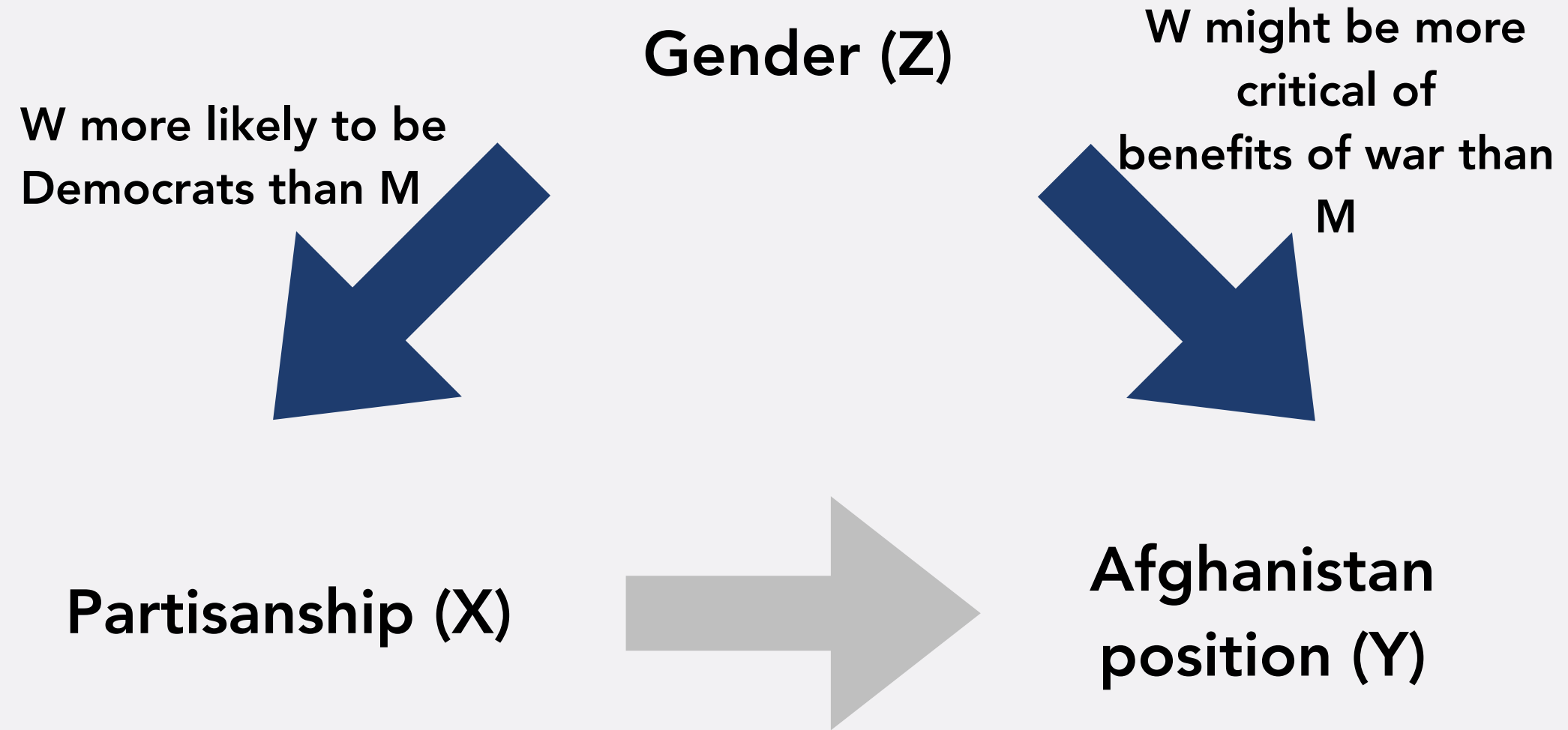
Partisanship (X)

**Afghanistan
position (Y)**

Partisanship by itself has
no effect on climate
change position



MAYBE THIS IS GOING ON?



- How can we find out if this is what's going on?

CONTROLLED COMPARISON TABLE

Afghanistan war was beneficial

Female				Male		
Dem		Non-Dem	Total	Dem	Non-Dem	Total
Agree						
Disagree						
Total						

CONTROLLED COMPARISON TABLE

Afghanistan war was beneficial

Female				Male		
	Dem	Non-Dem	Total	Dem	Non-Dem	Total
Agree	18.9% (7)	41.2% (7)	25.9% (14)			
Disagree	81.1% (30)	58.8% (10)	74.1% (40)			
Total	100% (37)	100% (17)	100% (54)			

CONTROLLED COMPARISON TABLE

Afghanistan war was beneficial

Female				Male		
	Dem	Non-Dem	Total	Dem	Non-Dem	Total
Agree	18.9% (7)	41.2% (7)	25.9% (14)			
Disagree	81.1% (30)	58.8% (10)	74.1% (40)			
Total	100% (37)	100% (17)	100% (54)			

22.3%

PARTISANSHIP & AFGHANISTAN

- **Among women, non-Democrats are more likely to agree that Afghanistan involvement was beneficial than Democrats**
 - **Non-Democratic women 22.3% more likely to agree**

TERMINOLOGY

- Controlled effect: relationship between an independent variable (X) and a dependent variable (Y) within one value of another independent variable (Z)
- e.g. relation between partisanship (X) and Afghanistan position (Y) among women (one value of Z)

CONTROLLED COMPARISON TABLE

Afghanistan war was beneficial

Female				Male		
	Dem	Non-Dem	Total	Dem	Non-Dem	Total
Agree	18.9%	41.2%	25.9%	20.0%	41.7%	29.6%
	(7)	(7)	(14)	(3)	(5)	(8)
Disagree	81.1%	58.8%	74.1%	80.0%	58.3%	70.4%
	(30)	(10)	(40)	(12)	(7)	(19)
Total	100%	100%	100%	100%	100%	100%
	(37)	(17)	(54)	(15)	(12)	(27)

CONTROLLED COMPARISON TABLE

Afghanistan war was beneficial

Female				Male		
	Dem	Non-Dem	Total	Dem	Non-Dem	Total
	22.3%			21.7%		
Agree	18.9%	41.2%	25.9%	20.0%	41.7%	29.6%
	(7)	(7)	(14)	(3)	(5)	(8)
Disagree	81.1%	58.8%	74.1%	80.0%	58.3%	70.4%
	(30)	(10)	(40)	(12)	(7)	(19)
Total	100%	100%	100%	100%	100%	100%
	(37)	(17)	(54)	(15)	(12)	(27)

PARTISANSHIP & AFGHANISTAN

- Among men, non-Democrats are also more likely to agree that Afghanistan involvement was beneficial than Democrats
 - Non-Democratic men 21.7% more likely to agree

PARTISANSHIP & VOTING

- So even if we take gender into account, partisanship *still* has effect on evaluations of Afghanistan involvement
 - Among both men and women, non-Democrats are more likely to see benefits

TERMINOLOGY

- Partial relationship/partial effect: relationship between two variables after taking effect of other variables into account
 - e.g. relation between partisanship and evaluation of Afghanistan engagement, controlling for gender
 - Partial relationship summarizes the controlled effects

HOW DOES THIS HELP?

- Is there a credible causal mechanism that connects X to Y?
- Can we rule out the possibility that Y could cause X?
- Is there covariation between X and Y?
- Have we controlled for all confounding variables (Z) that might make the association between X and Y spurious?

HOW DOES THIS HELP?

- Logic of control
- What is the relationship between X and Y when we control for *one* confounder?
 - Ultimate goal: What is the relationship between X and Y when we control for *many* confounders?