Time Series Minimum Wage Studies Meta-Analysis - Presentation

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Introduction

- our project is based on the paper written by *David Card & Alan B. Krueger* in 1995 regarding research of the best-known predictions of standard economic theory that an increase in the minimum wage will lower employment of low-wage workers. Their result indicates that an increase of 10% in the minimum wage as a result a reduction between 1-3 % in teenage employment.
- The main idea of our project is to reproduce their research by add our dataframe via Meta-Analysis
- In this work, we're going to implement the previous meta analysis with 3 most recent studies.
- requirements to re-run the obtained results are:

`R version 4.1.3`, `rmarkdown 2.14`, `tidyverse 1.3.1`, `stargazer 5.2.3`, `rcompanion 2.4.15`.

Meta-Analysis

- A meta-analysis is a statistical analysis that combines the results of multiple scientific studies. Meta-analyses can be performed when there are multiple scientific studies addressing the same question, with each individual study reporting measurements that are expected to have some degree of error.
- The aim then is to use approaches from statistics to derive a pooled estimate closest to the unknown common truth based on how this error is perceived. Meta-analytic results are considered the most trustworthy source of evidence by the evidence-based medicine literature

Data (1/3)

- the professor give us the Data of the *Card and krueger's Meta-Ananlysis*, but in that table missing three variable:
  - information about teenager sub-sample
  - square root of degree of freedom
  - logarithm of square root of degree of freedom
- we would be able to calculate the last two, but also reading the paper of the others author we couldn't find enough information about teenager sub-sample.
- The original study includes 15 observations of 14 variables by year 1992.

Data (2/3)

- our implementation concern:
  - *Jinlan Ni , Guangxin Wang & Xianguo Yao*, "Impact of Minimum Wages on Employment", **2011**
  - *Majchrowska and Zolkiew*, "The Impact of the National Minimum Wage on Employment", **2012**
  - *Bewley et al.*, "The Impact of the National Minimum Wage on Employment", **2015**
- Below we will conduct two regression models which present by graph and table, first we'll use just the previous fifteen studies to reproduce the Card and Krueger's M-A, then we'll implement with our data and we'll see if the study keeps its validity

Data (3/3)

t_stat

```
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.450   1.475   1.945   1.949   2.208   4.430
```

coef

```
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.0520  0.0775  0.0980  0.1345  0.2042  0.2700
```

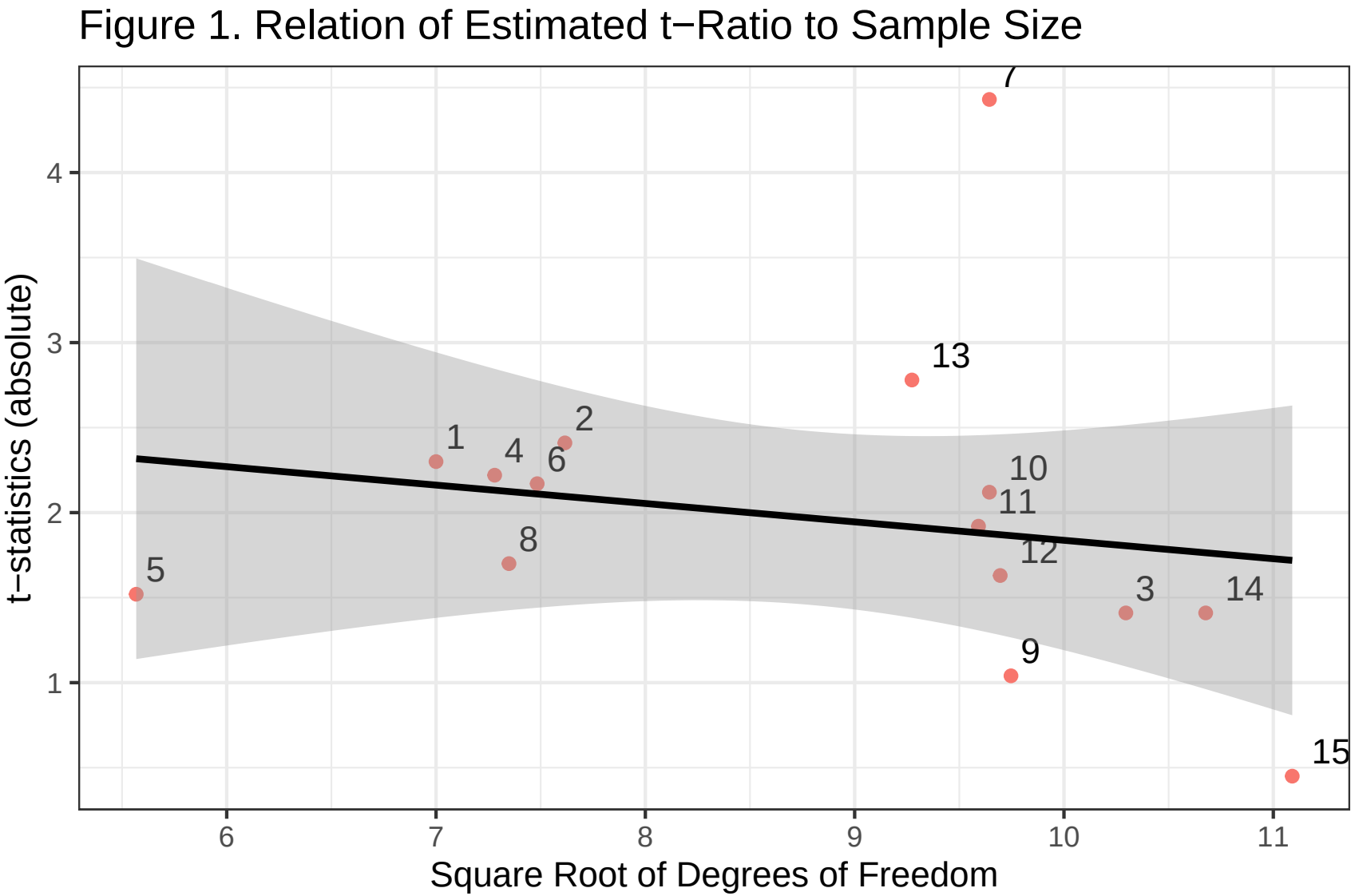
df

```
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    31.00   56.50   93.00   88.17  105.75  157.00
```

Procedure

- Now we're going to show our reproduction of the *Card and Krueger* study and then we'll compare their result with the same study implemented with our implementation.
- We followed step by step their analysis, the first figure shows us the correlation between t_stat and logarithm of square root of degree of freedom.
- As you could see our result are consistent with the previuos Meta-Analysis.

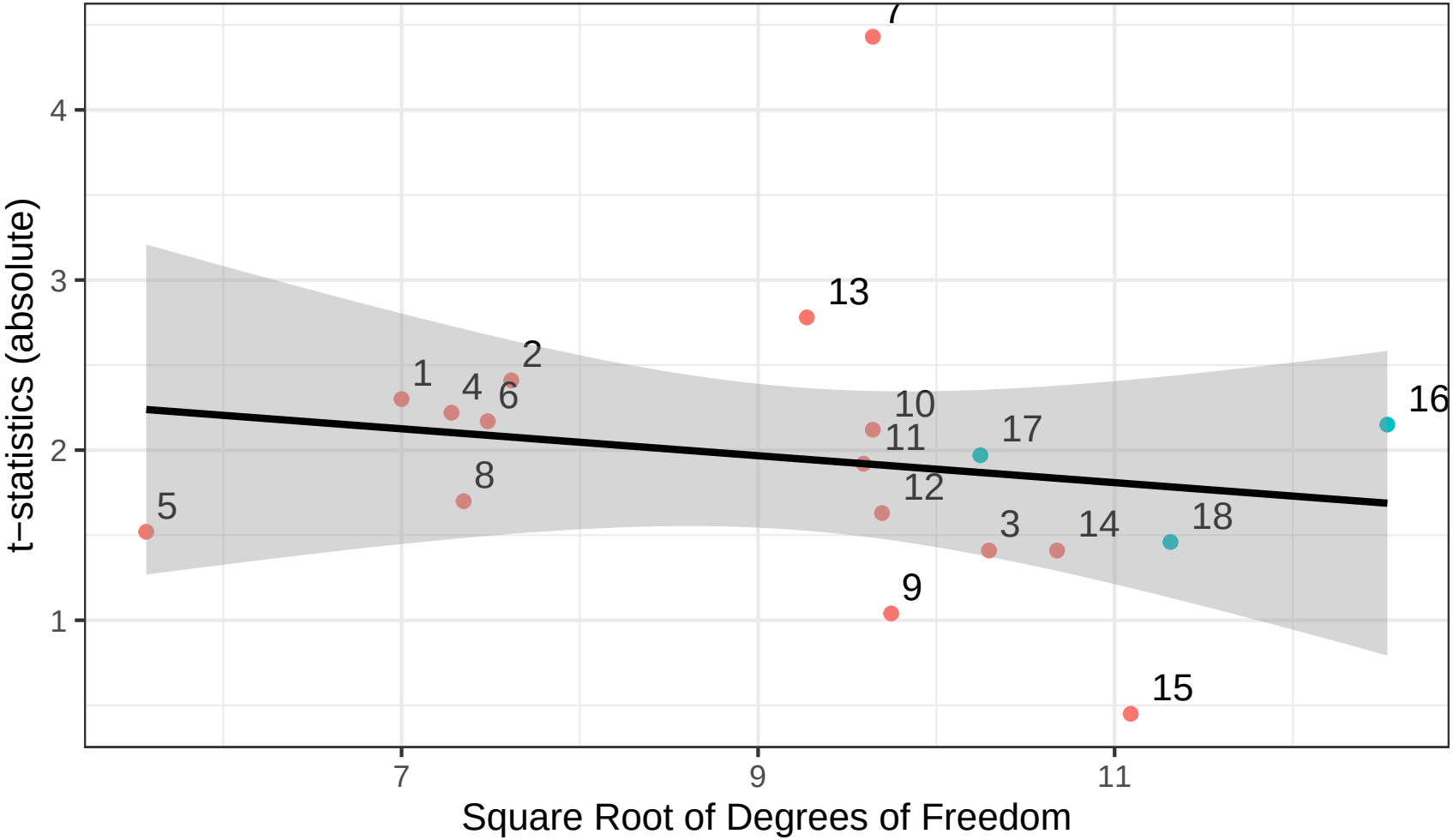
Relation of Estimated t-Ratio to Sample Size (1/2)



Relation of Estimated t-Ratio to Sample Size (2/2)

Figure 1. Relation of Estimated t−Ratio to Sample Size

Implemented studies are plotted in Blue.



Procedure

- In order to control the potential impact of other research characteristics on this dependence, we performed regressions with the logarithm of absolute t-ratio as the dependent variable selected independent variables were the logarithm of the square root of degrees of freedom, a number of explanatory variables in given research, and binary variables indicating whether the model specification in given research was logarithmic and if the autoregressive correction was implemented.
- As we could see the graph shows a negative relationship between the t ratios and the degrees of freedom. The coefficient on the square root of the degrees of freedom is quite far from 1, its theoretical expectation. The inclusion of additional explanatory variables does not change the sign of the coefficient or reduce its effect.
- Next, we will present the reproduced regressions in Table which gives us more information about the correlation. Furthermore, due to the fact the study number 7 is considered as biased data set, therefore we will also conduct table to analysis the result which excludes study number 7.

Descreptive Regression Models (1/2)

	Dependent variable:		
	log(t_stat)		
	(1)	(2)	(3)
l_sqrt_df	−0.81	−0.64	−0.94
	(0.69)	(0.66)	(0.62)
autoreg_correction		−0.07	−0.11
		(0.27)	(0.24)
log_spec		−0.55*	−0.63**
		(0.28)	(0.26)
no_exp_var			0.05*
			(0.03)
Constant	2.31	2.41	2.61*
	(1.49)	(1.40)	(1.27)
Observations	15	15	15
R^2	0.10	0.33	0.50
Adjusted R^2	0.03	0.15	0.30
Residual Std. Error	0.50 (df = 13)	0.47 (df = 11)	0.43 (df = 10)
F Statistic	1.37 (df = 1; 13)	1.83 (df = 3; 11)	2.51 (df = 4; 10)
Note:			*p<0.1; **p<0.05; ***p<0.01

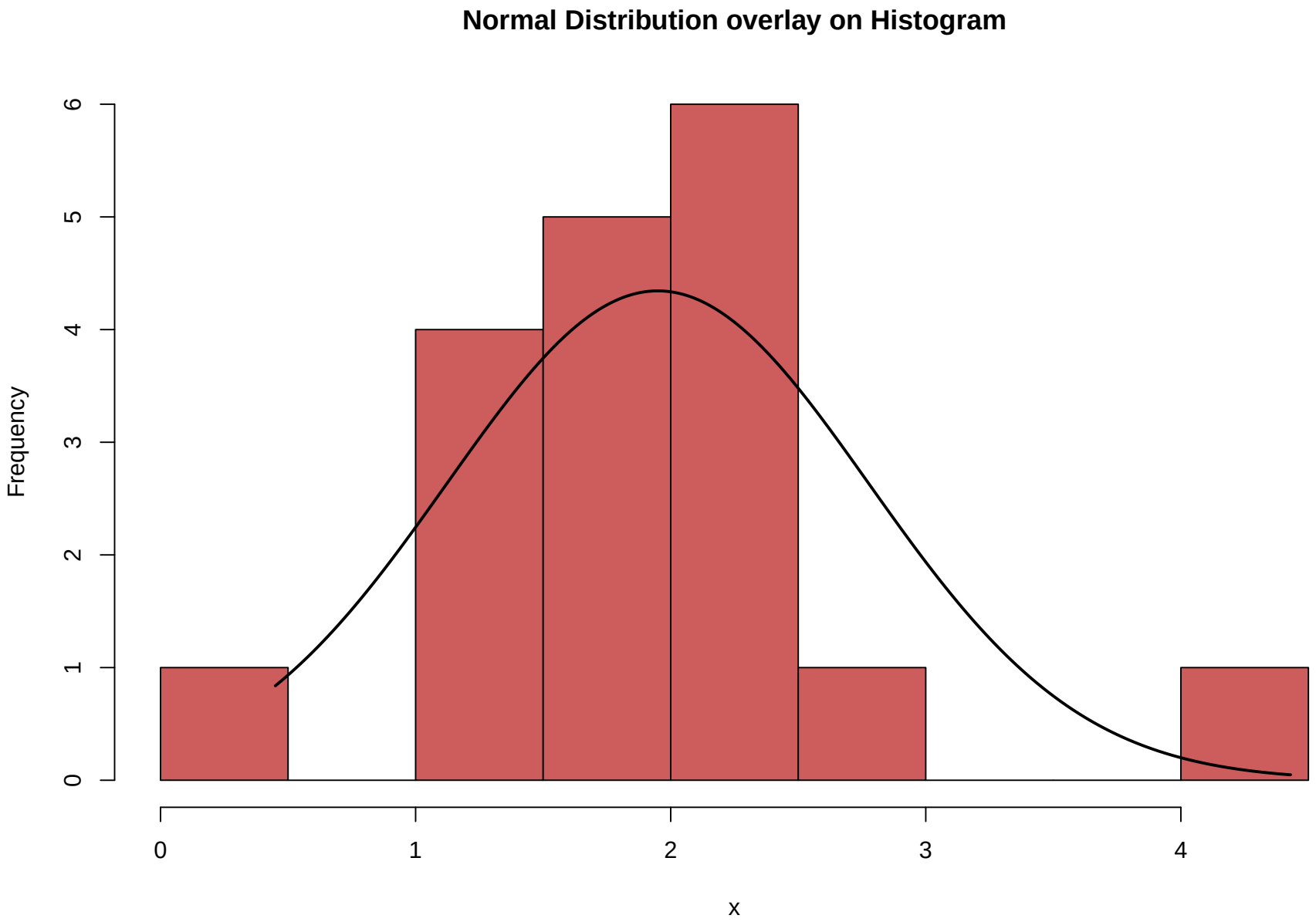
Descreptive Regression Models (2/2)

	Dependent variable:		
	log(t_stat)		
	(1)	(2)	(3)
l_sqrt_df	−0.54	−0.32	−0.40
	(0.55)	(0.56)	(0.56)
autoreg_correction		−0.03	−0.03
		(0.25)	(0.25)
log_spec		−0.50*	−0.53*
		(0.26)	(0.26)
no_exp_var			0.03
			(0.03)
Constant	1.76	1.68	1.59
	(1.21)	(1.17)	(1.15)
Observations	18	18	18
R^2	0.06	0.26	0.33
Adjusted R^2	−0.001	0.10	0.12
Residual Std. Error	0.47 (df = 16)	0.44 (df = 14)	0.44 (df = 13)
F Statistic	0.98 (df = 1; 16)	1.60 (df = 3; 14)	1.58 (df = 4; 13)
Note:			*p<0.1; **p<0.05; ***p<0.01

Is it t-statics always 2?

- One sort of meta-analysis compares a coefficient's strength in each research to its estimated standard error. We employ estimates of the employment effect of a 10% increase in the minimum wage. This approach will provide a positive correlation across studies since the t ratio is defined by b/SE, where b is the estimated employment effect and SE is its standard error.

Histogram


Normal Distribution overlay on Histogram
Frequency
0
1
2
3
4
5
6
0
1
2
3
4
x

Procedure

- Now we're going to plot absolute value of the minimum-wage effect against their standard error.
- This relation needs to looking these correlation, but also to see if the coefficients estimatedvare effectively 2 times their standard error (*to see these we'll implement our graphs with a line that it's 2 times the standard error*)

Relation of Estimated Employment to Standard Error (1/2)

Figure 2. Relation of Estimated Employment to Standard Error

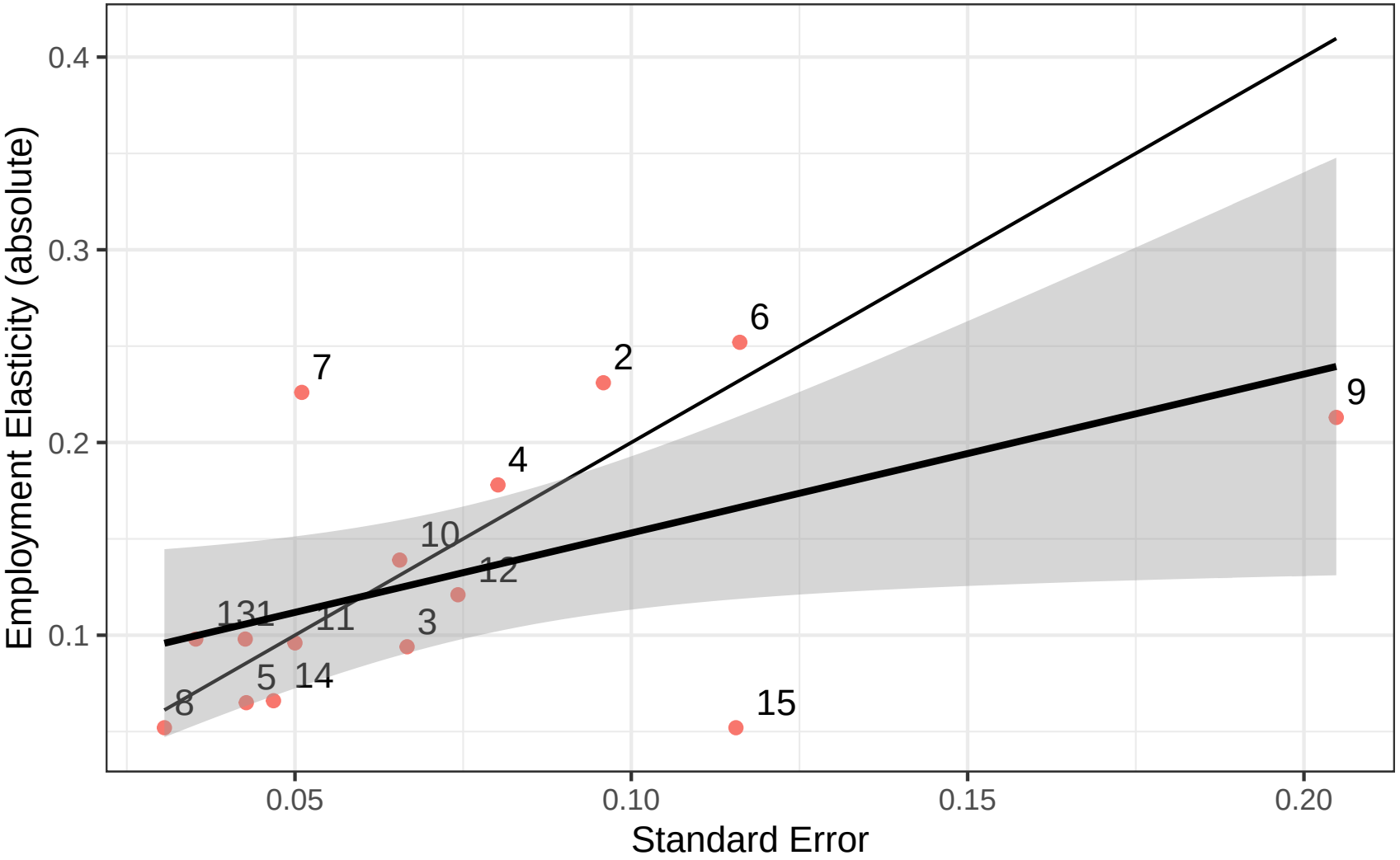
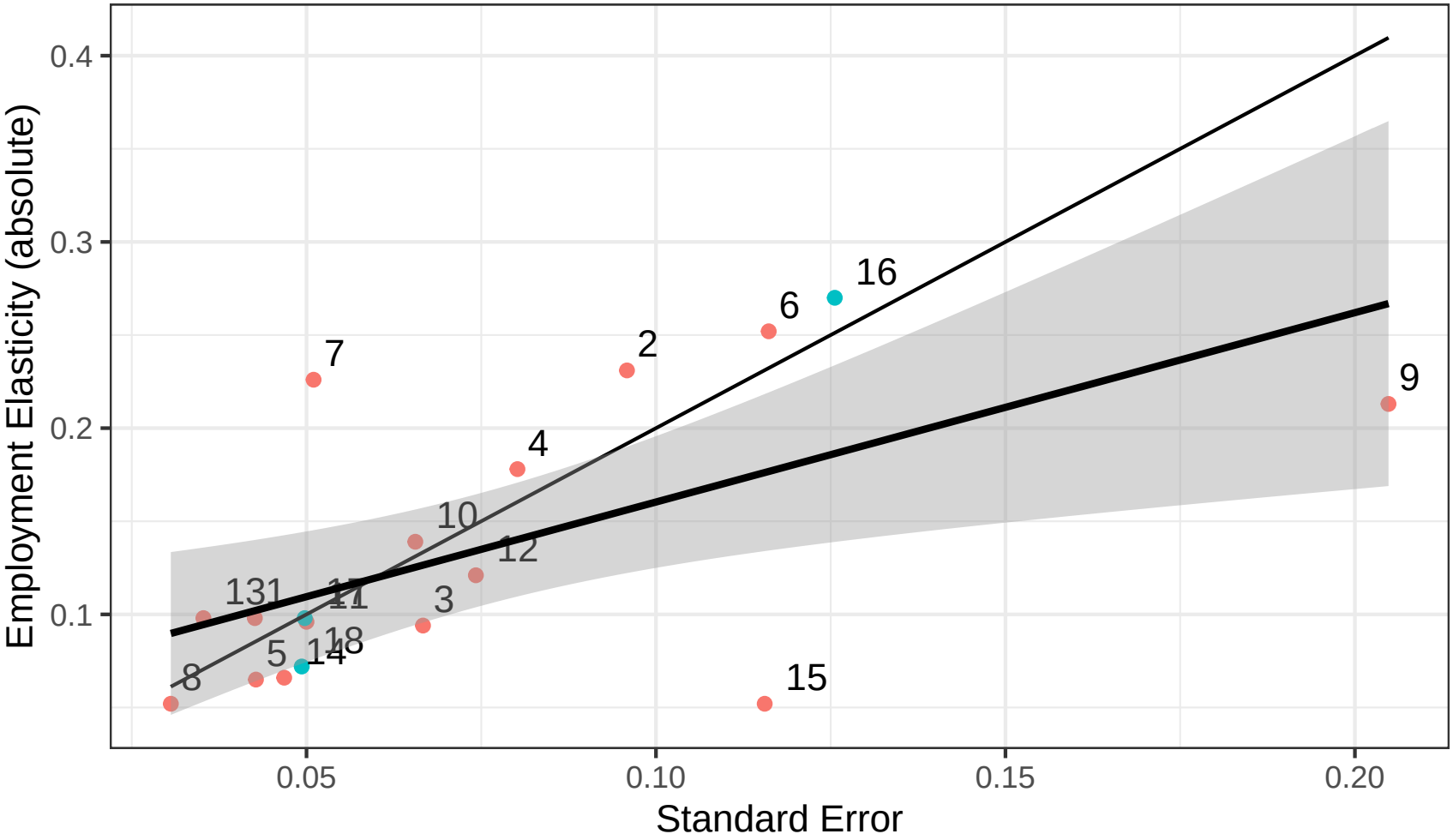


Figure 2. Relation of Estimated Employment to Standard Error

Implemented studies are plotted in Blue.



Conclusion

Our findings are consistent with the original meta-analysis by Card and Krueger (1995), who argue that these countrintuitive results are caused by the fact that, when the available data are not too large, the norms used by researchers make them were able to find a significant negative correlation between minimum wages and their expected youth employment. However, due to its fragility, the significance decreases as more data is used. Our supplementary paper confirms that this trend in research bias is critical and still exists, with lower t-ratios for papers published after the 15 papers studied by Card and Kruger, even with larger data samples.

In conclusion, there is strong evidence that research is often biased. Lack of self-awareness and excessive trust in existing literature can be misleading.

Ended

Thank You