Project Review

Improve Visualization of Popular Support for Executive Actions in the U.S.

Yu Cai, Çaglar Otlu, Jens Rauenbusch

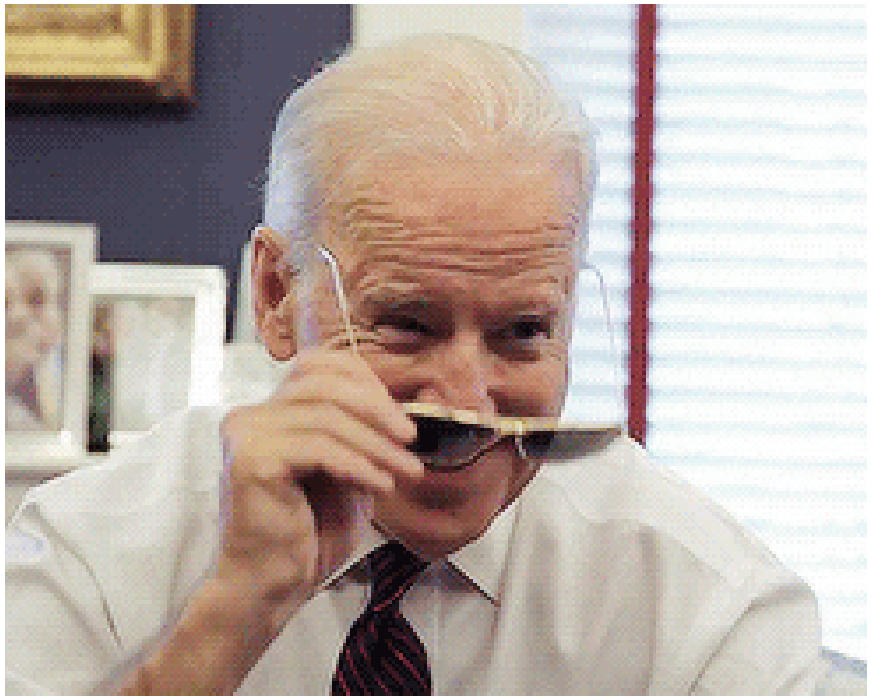
Introduction to Data Science – MIBMA 2020

Prof. Dr. Birkenkrahe

June 28, 2021

Background

American Rescue Plan Act of 2021



- Biden's COVID-19 stimulus package:
  - payments of $1,400 to almost every U.S. citizen
  - $350 billion aid to governments
  - temporary relaxation of certain tax credits
  - support for speedy distribution of vaccines
  - …
- "one of the largest economic stimulus measures in American history, a sweeping $1.9 trillion COVID-19 relief bill" (Cornwell & Brice, 2021)

Source: GIPHY (http://gph.is/24tTB0p)

Pretty popular, huh?

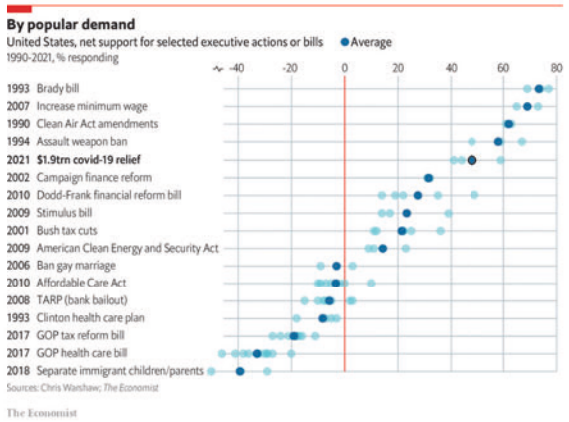
The Economist ≡ Menu | Weekly edition | Search | My account

Graphic detail

Daily chart

Joe Biden's $1.9trn stimulus package is one of the most popular bills in decades

Yet Republican legislators are united in their opposition to it



Feb 26th 2021

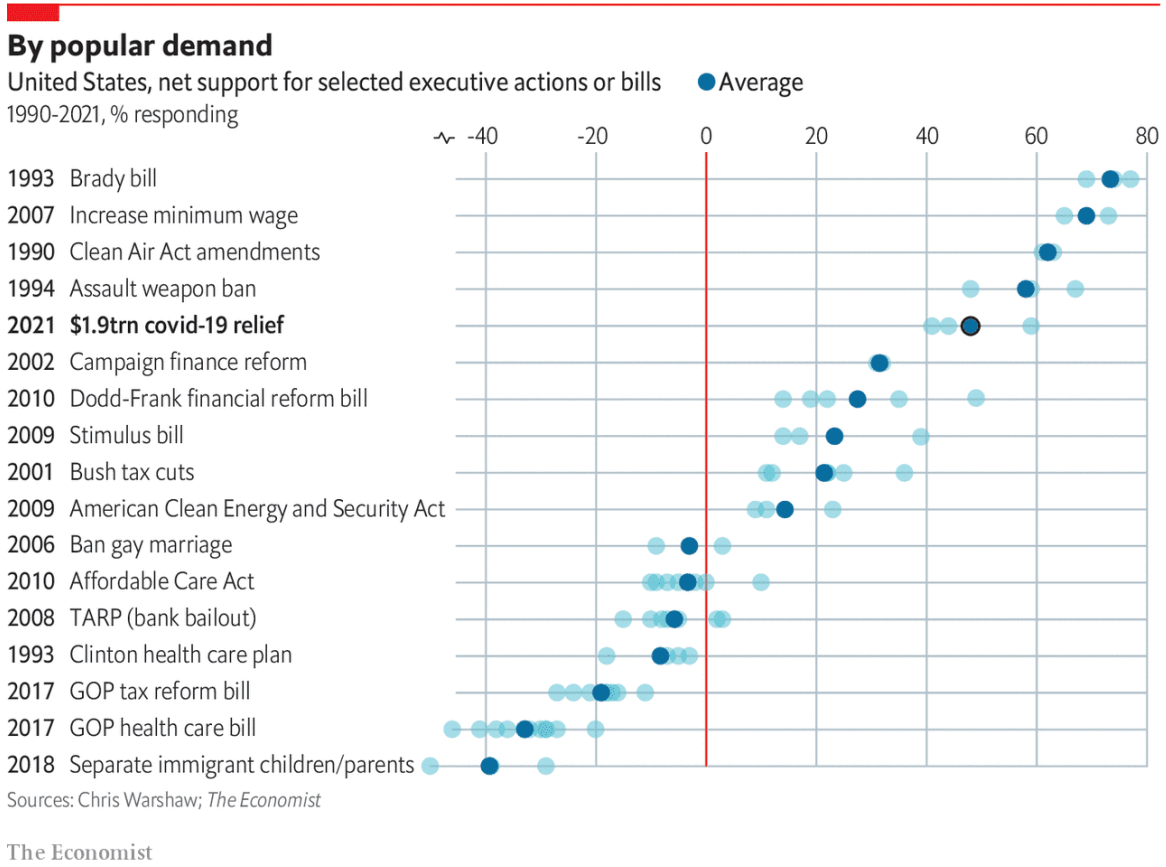
GENERALLY, LAWMAKERS want to support popular proposals. President Joe Biden's $1.9trn stimulus, which the Democratic-controlled House of Representatives passed on February 27th, certainly qualifies. The bill enjoys broad support among Americans, including a plurality of Republicans. For voters, there is much to like: the package includes $1,400 cheques for most people (at a cost of $422bn), an extra $400 a week in unemployment-insurance payments ($246bn), as well as funds for reopening schools ($130bn) and distributing vaccines ($160bn). According to data compiled by Chris Warshaw, a political scientist at George Washington University, the spending bill is one of the most popular pieces of important legislation in three decades (see chart).

Give this article

Source: The Economist, Feb 26, 2021 (https://www.economist.com/graphic-detail/2021/02/26/joe-bidens-19trn-stimulus-package-is-one-of-the-most-popular-bills-in-decades)

Project Idea

"with 70% of the public behind him, Mr. Biden may not have to listen [to criticism by Republicans]" (The Economist, 2021)



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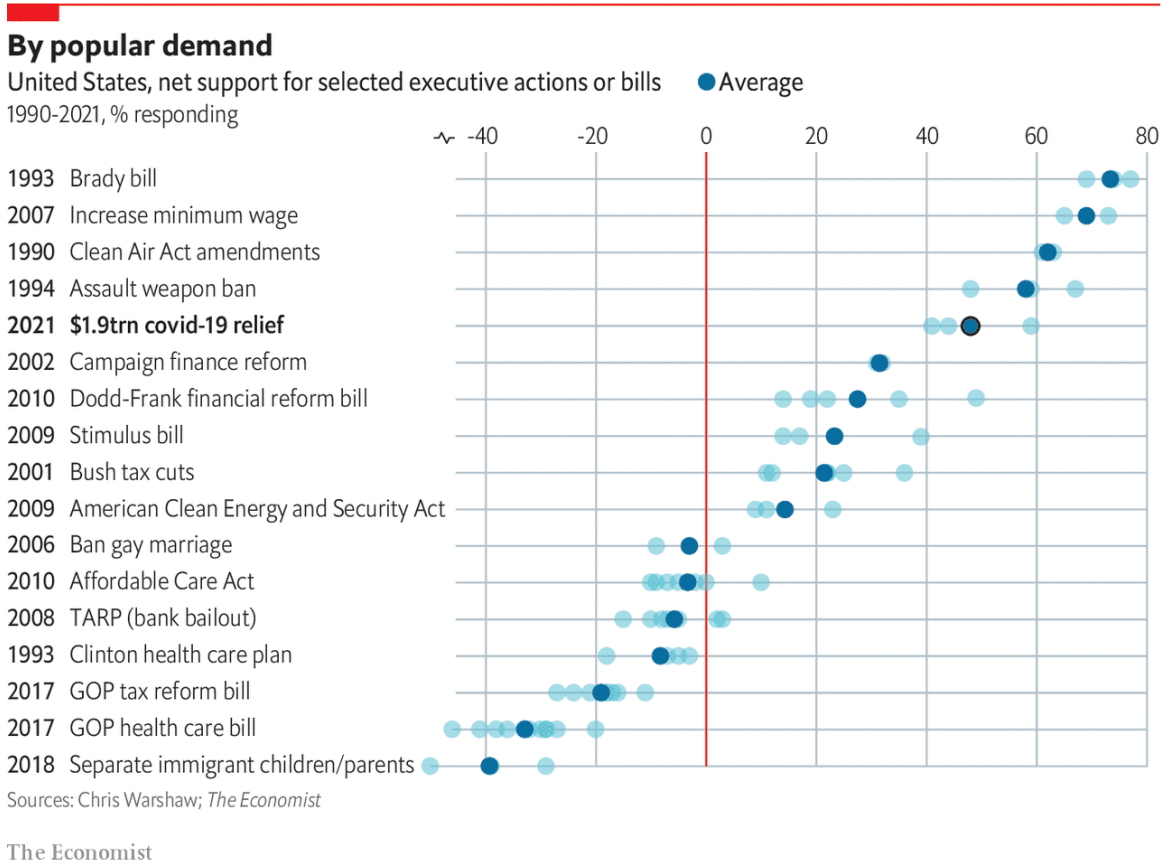
Project Idea

"with 70% of the public behind him, Mr. Biden may not have to listen [to criticism by Republicans]" (The Economist, 2021)

Goal: Recreate the visualization to better support this piece of data journalism.



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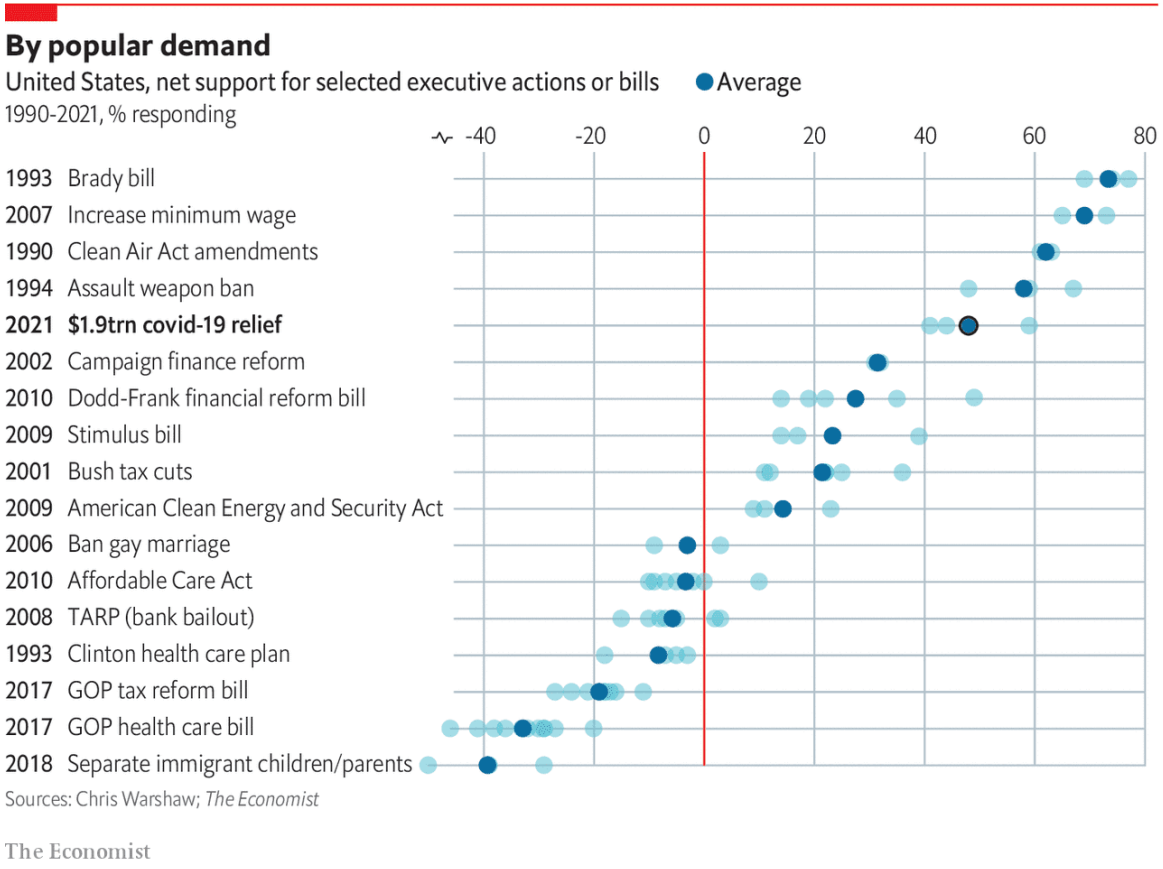
Critique of the existing visualization

Critique of the existing visualization



Source: The Economist, Feb 26, 2021 (https://www.economist.com/graphic-detail/2021/02/26/joe-bidens-19trn-stimulus-package-is-one-of-the-most-popular-bills-in-decades)

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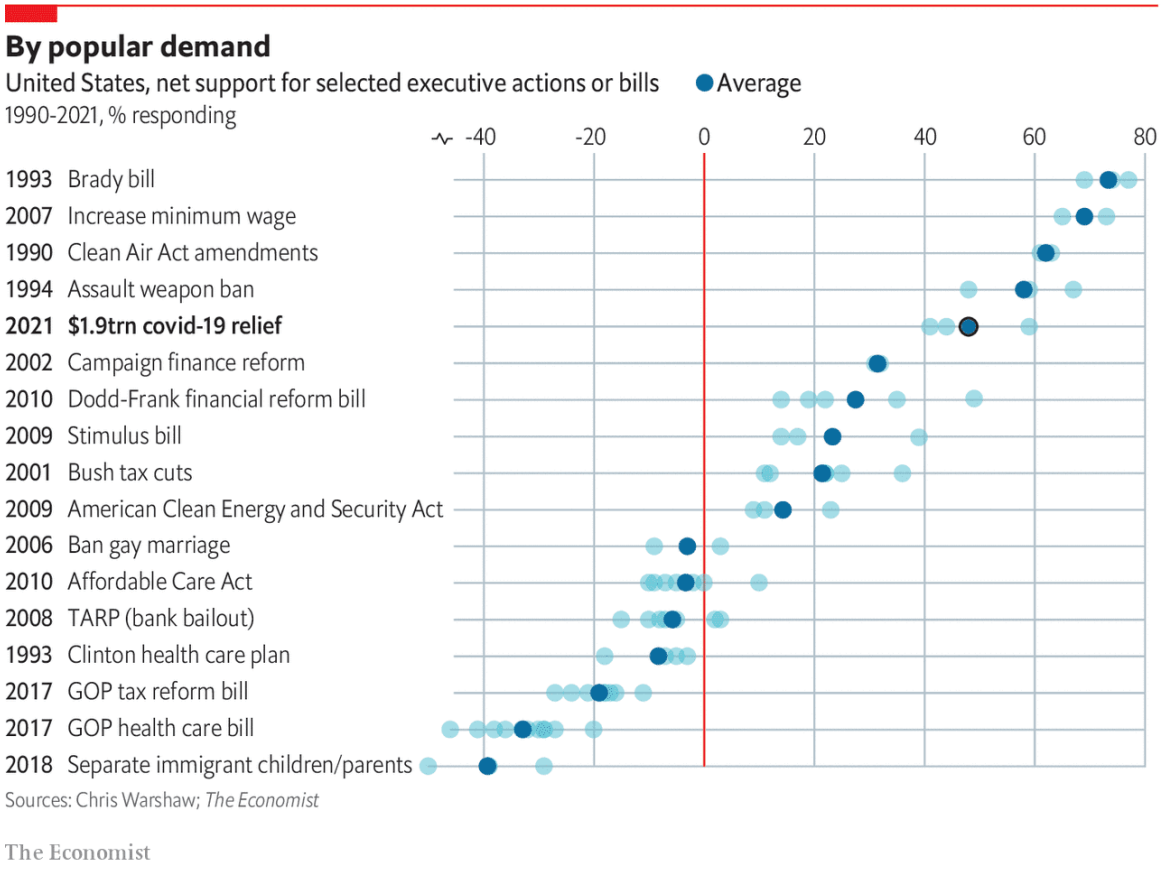
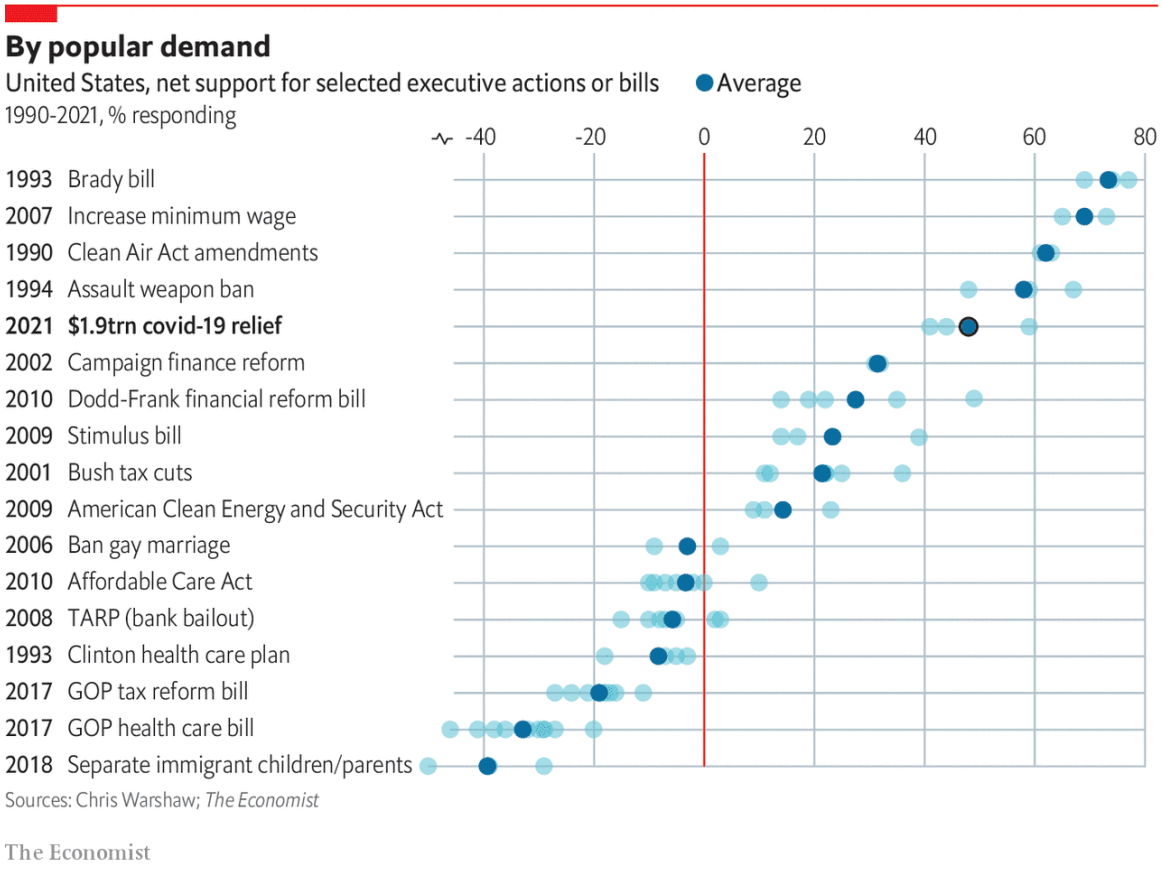


- Positive: micro/macro readings possible (each vs. all bills)

Source: The Economist, Feb 26, 2021 (https://www.economist.com/graphic-detail/2021/02/26/joe-bidens-19trn-stimulus-package-is-one-of-the-most-popular-bills-in-decades)

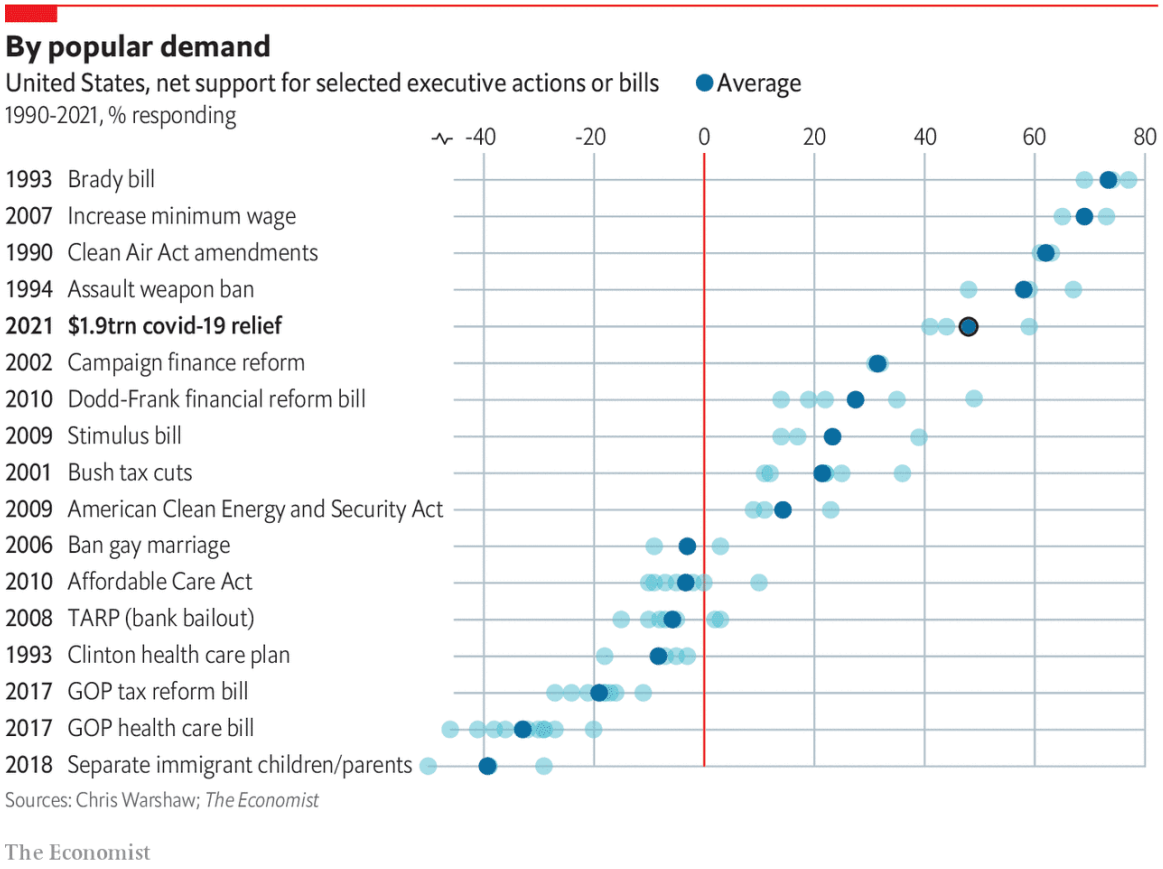
Critique of the existing visualization



- Positive: micro/macro readings possible (each vs. all bills)
- Reader not informed about meaning of individual dots

Source: The Economist, Feb 26, 2021 (https://www.economist.com/graphic-detail/2021/02/26/joe-bidens-19trn-stimulus-package-is-one-of-the-most-popular-bills-in-decades)

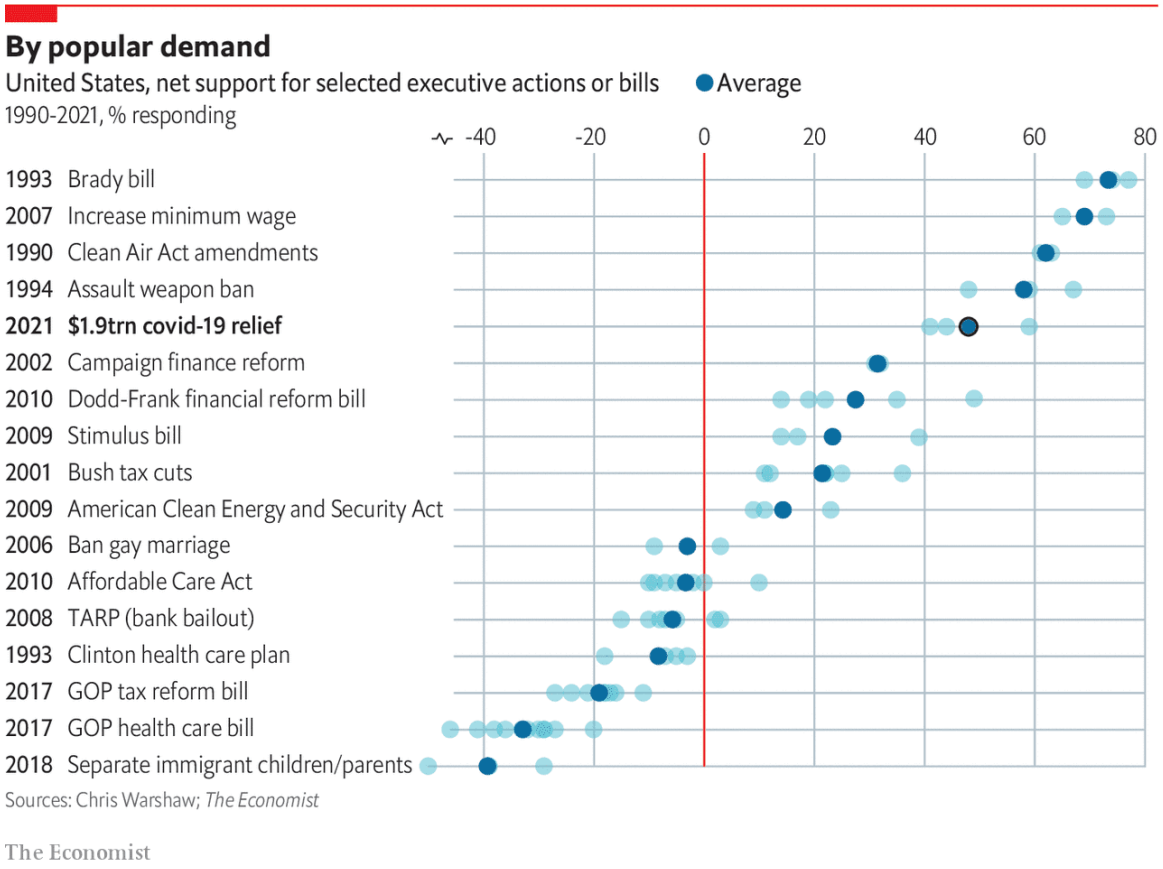
Critique of the existing visualization



- Positive: micro/macro readings possible (each vs. all bills)
- Reader not informed about meaning of individual dots
- Statement that 70% of public supports the bill is not visualized

Source: The Economist, Feb 26, 2021 (https://www.economist.com/graphic-detail/2021/02/26/joe-bidens-19trn-stimulus-package-is-one-of-the-most-popular-bills-in-decades)

Critique of the existing visualization

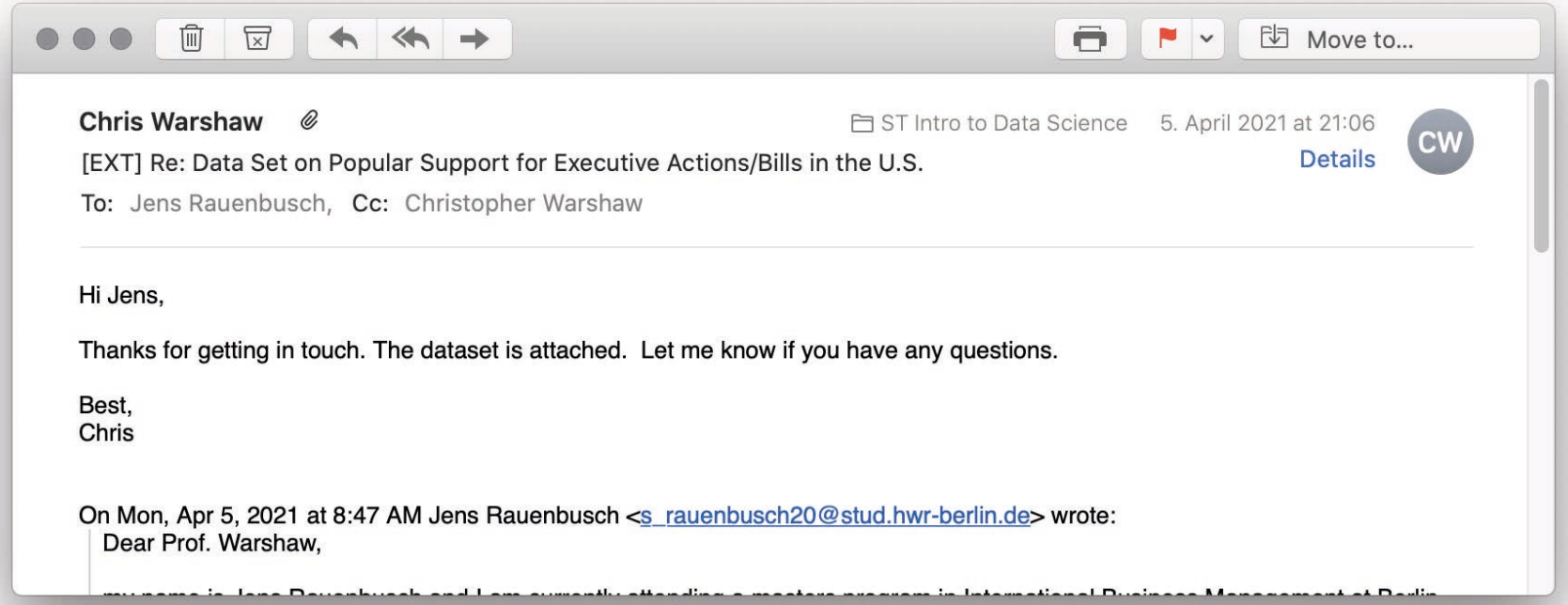


- Positive: micro/macro readings possible (each vs. all bills)
- Reader not informed about meaning of individual dots
- Statement that 70% of public supports the bill is not visualized
- Lack of disclosure of data transformation/visualization process

Source: The Economist, Feb 26, 2021 (https://www.economist.com/graphic-detail/2021/02/26/joe-bidens-19trn-stimulus-package-is-one-of-the-most-popular-bills-in-decades)

Obtain and understand the data

Obtain and understand the data



Move to...

Chris Warshaw ST Intro to Data Science 5. April 2021 at 21:06

[EXT] Re: Data Set on Popular Support for Executive Actions/Bills in the U.S.

Details

CW

To: Jens Rauenbusch, Cc: Christopher Warshaw

Hi Jens,

Thanks for getting in touch. The dataset is attached. Let me know if you have any questions.

Best,
Chris

On Mon, Apr 5, 2021 at 8:47 AM Jens Rauenbusch <s_rauenbusch20@stud.hwr-berlin.de> wrote:

> Dear Prof. Warshaw,

Obtain and understand the data

major_legislation_polls

	Bill	Year	PollingFirm	support	oppose	margin
1	Affordable Care Act (2009)	2009	ABC News/Washington Post	46	48	-2
4	Affordable Care Act (2009)	2009	CBS News/NY Times	40	45	-5
5	Affordable Care Act (2009)	2009	CNN	49	49	0
6	Affordable Care Act (2009)	2009	Fox News	38	48	-10
13	Affordable Care Act (2009)	2009	NBC News	53	43	10
15	Affordable Care Act (2009)	2009	Pew Foundation	37	46	-9
16	Affordable Care Act (2009)	2009	Quinnipiac	40	47	-7
19	American Clean Energy and Security Act (2009)	2009	ABC News/Washington Post	52	43	9
23	American Clean Energy and Security Act (2009)	2009	CNN	60	37	23
33	American Clean Energy and Security Act (2009)	2009	Pew Foundation	50	39	11
37	Assault Weapon Ban (1994)	1994	ABC News/Washington Post	83	16	67
40	Assault Weapon Ban (1994)	1994	CBS News/NY Times	78	19	59
46	Assault Weapon Ban (1994)	1994	LA Times	72	24	48
55	Ban Gay Marriage (2006)	2006	ABC News/Washington Post	42	51	-9
61	Ban Gay Marriage (2006)	2006	Gallup	50	47	3
73	Brady Bill (1993)	1993	ABC News/Washington Post	84	15	69
76	Brady Bill (1993)	1993	CBS News/NY Times	85	11	74
79	Brady Bill (1993)	1993	Gallup	88	11	77
91	Bush Tax Cuts (2001)	2001	ABC News/Washington Post	58	36	22
94	Bush Tax Cuts (2001)	2001	CBS News/NY Times	67	31	36
95	Bush Tax Cuts (2001)	2001	CNN	51	40	11

Obtain and understand the data

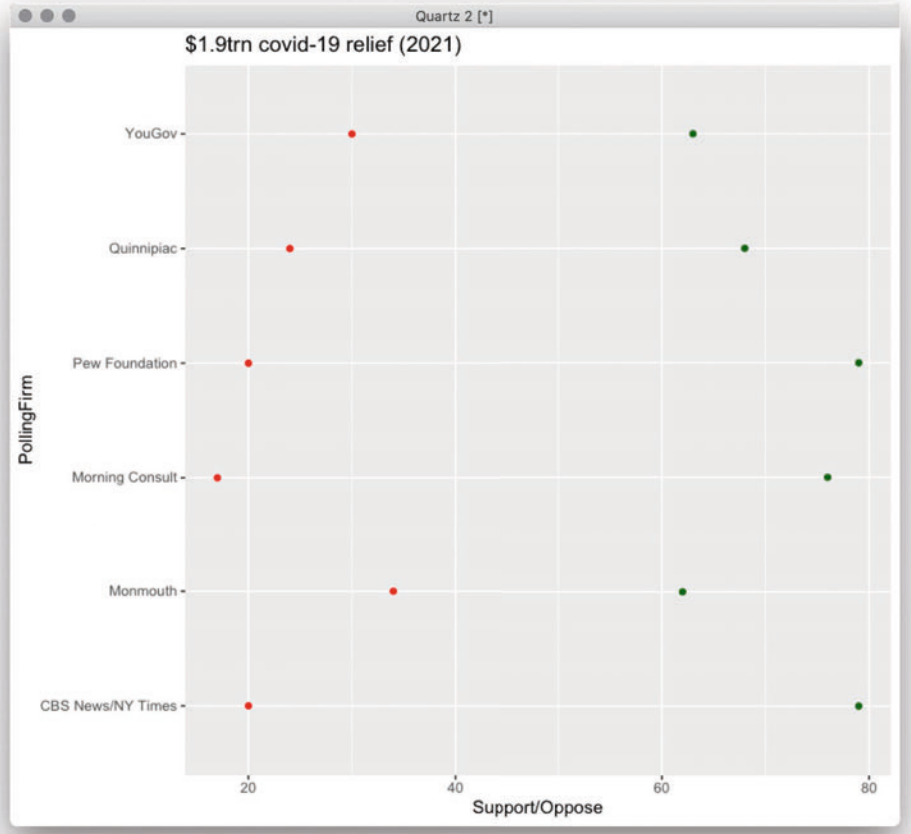
```
> polls <- read.csv("major_legislation_polls.csv")
> str(polls)
'data.frame': 79 obs. of  7 variables:
 $ X          : int  1 4 5 6 13 15 16 19 23 33 ...
 $ Bill       : chr  "Affordable Care Act (2009)" "Affordable Care Act (2009)" "Affordable Care Act (2009)" "Affordable Care Act (2009)" ...
 $ Year       : int  2009 2009 2009 2009 2009 2009 2009 2009 2009 2009 ...
 $ PollingFirm: chr  "ABC News/Washington Post" "CBS News/NY Times" "CNN" "Fox News" ...
 $ support    : int  46 40 49 38 53 37 40 52 60 50 ...
 $ oppose     : int  48 45 49 48 43 46 47 43 37 39 ...
 $ margin     : int  -2 -5 0 -10 10 -9 -7 9 23 11 ...
```

Rebuild the visualization

Visualize one bill: $1.9trn COVID-19 relief (2021)

Visualize support/oppose by each polling firm

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_point(aes(x=support,y=PollingFirm),color="darkgreen")
+ geom_point(aes(x=oppose,y=PollingFirm),color="red") +     xlab("Support/
Oppose") + ggtitle("$1.9trn covid-19 relief (2021)")
```

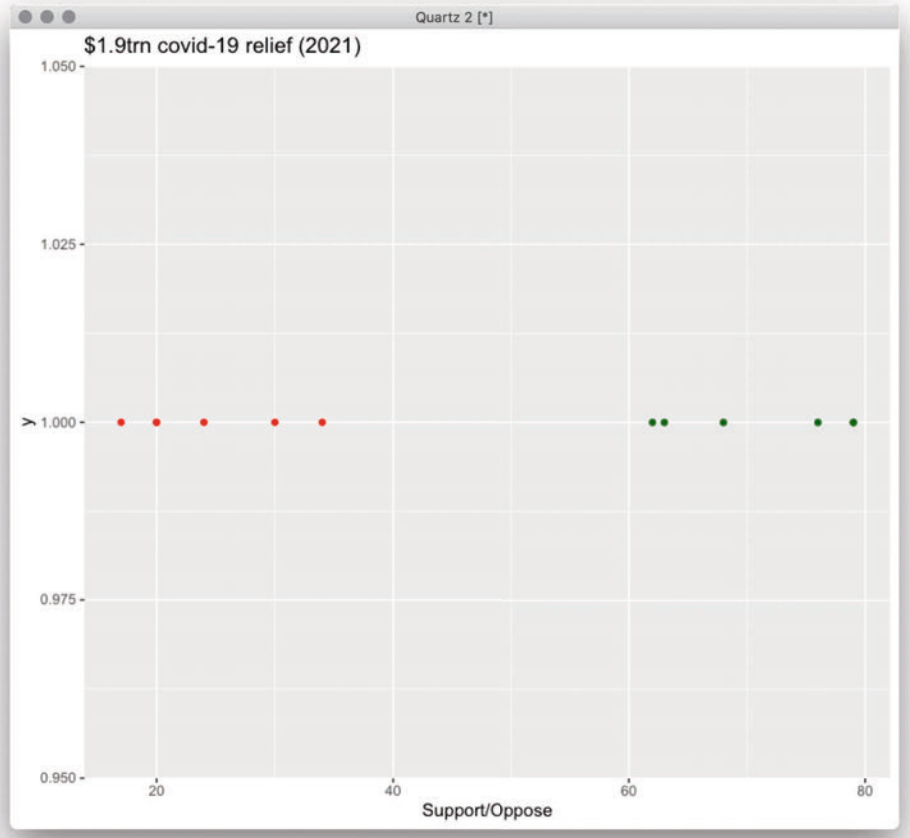


- % oppose
- % support

Visualize one bill: $1.9trn COVID-19 relief (2021)

Reduced to one line

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_point(aes(x=support,y=1),color="darkgreen") +
geom_point(aes(x=oppose,y=1),color="red") + xlab("Support/Oppose")     +
ggtitle("$1.9trn covid-19 relief (2021)")
```



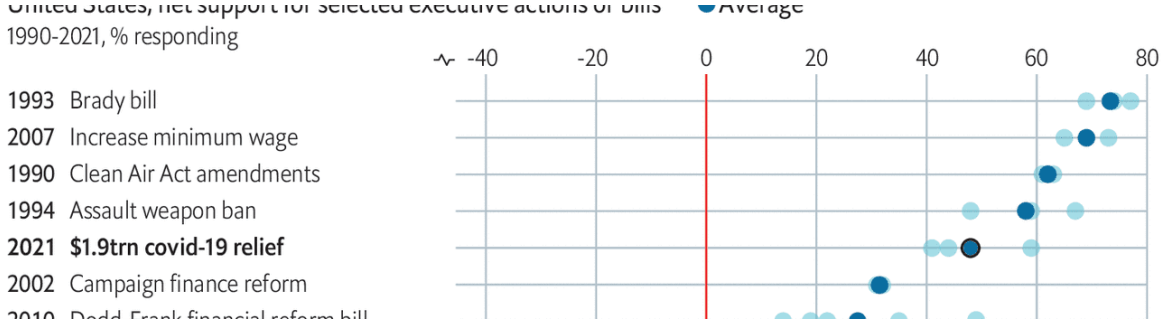
- % oppose
- % support

Verify the point made in the article

Calculation

- Supporting the article (“With 70% of the public behind him, Mr Biden may not have to listen”)
- Shows that the statement in the article is true; however, only looks at % of people supporting and ignores those that oppose

```
> mean(polls[34:39,"support"]) # Mean of support
[1] 71.16667

> mean(polls[34:39,"margin"]) Mean of net support:
[1] 47
```

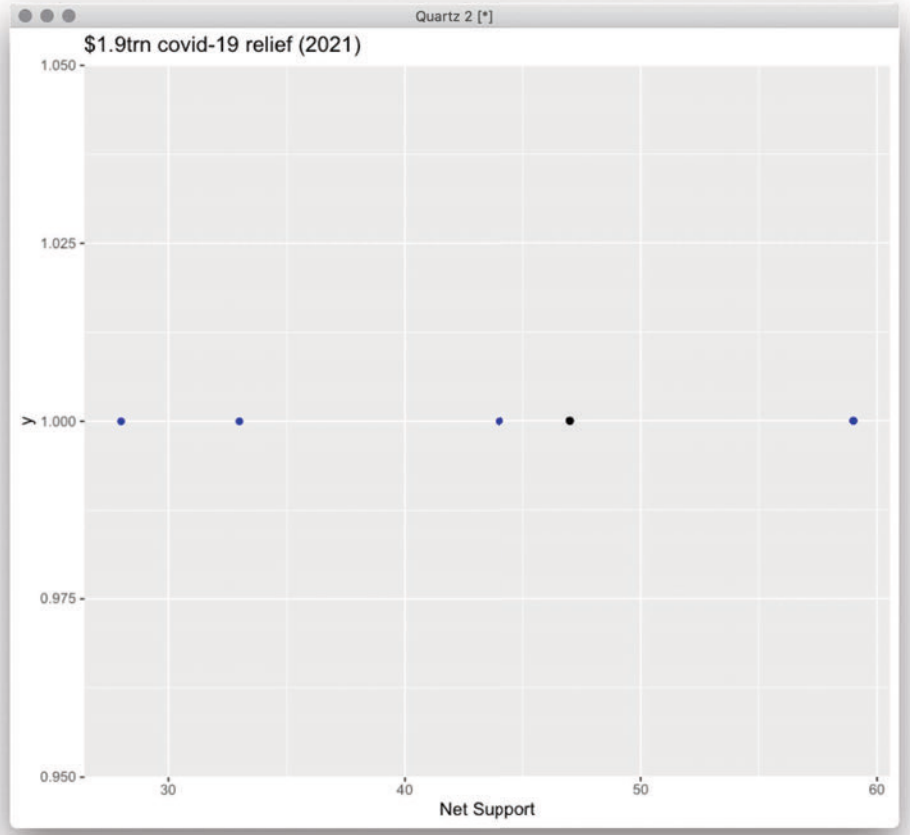


Verify the point made in the article

Visualization: net support

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_point(aes(x=margin,y=1),color="blue") + xlab("Net
Support") + ggtitle("$1.9trn covid-19 relief (2021)") +
geom_point(aes(x=mean(polls[34:39,]$margin),y=1))
```

- This is the same as in The Economist
- Still does not prove the point in the article (“70% of the public behind him”)

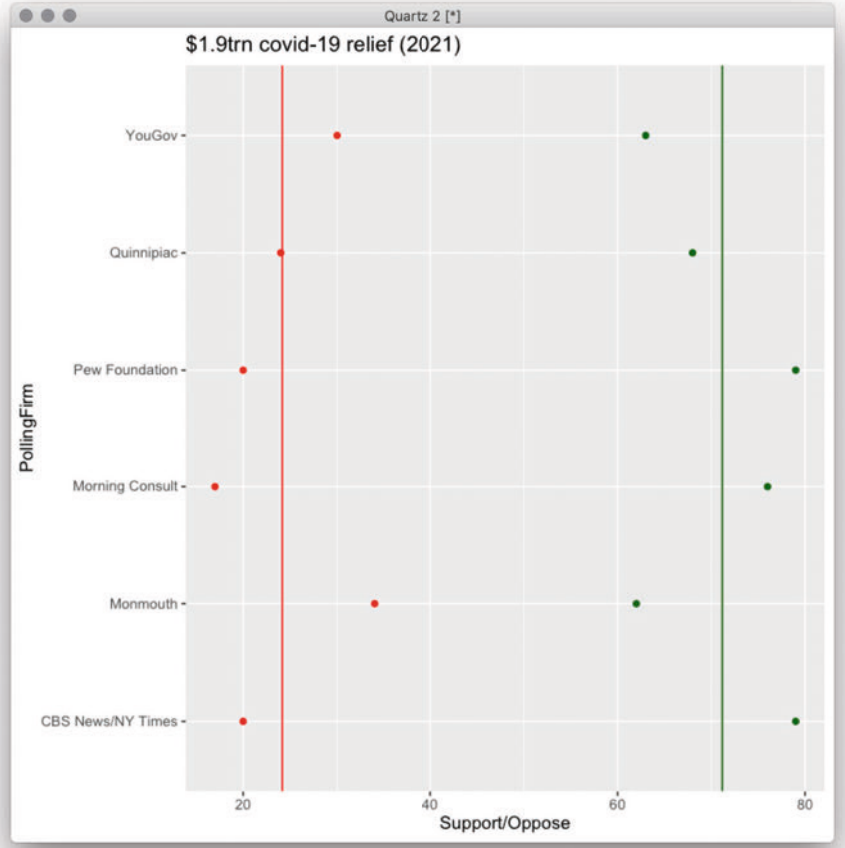


- net support per poll
- average net support

Verify the point made in the article

Visualization: add average support / oppose

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_point(aes(x=support,y=PollingFirm),color="darkgreen") +
geom_point(aes(x=oppose,y=PollingFirm),color="red") +      xlab("Support/Oppose")
+ ggtitle("$1.9trn covid-19 relief (2021)")     +
geom_vline(xintercept=mean(polls[34:39,"oppose"]), color="red") +
geom_vline(xintercept=mean(polls[34:39,"support"]),color="darkgreen")
```

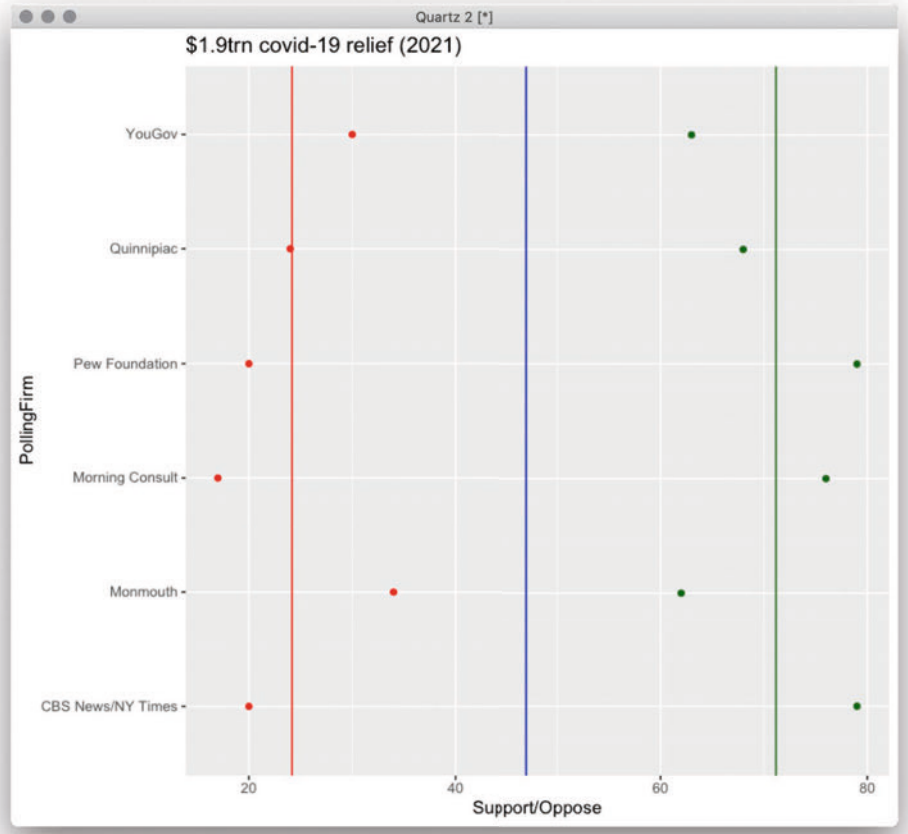


— net support
— average oppose
— average support

Process $1.9trn covid-19 relief (2021)

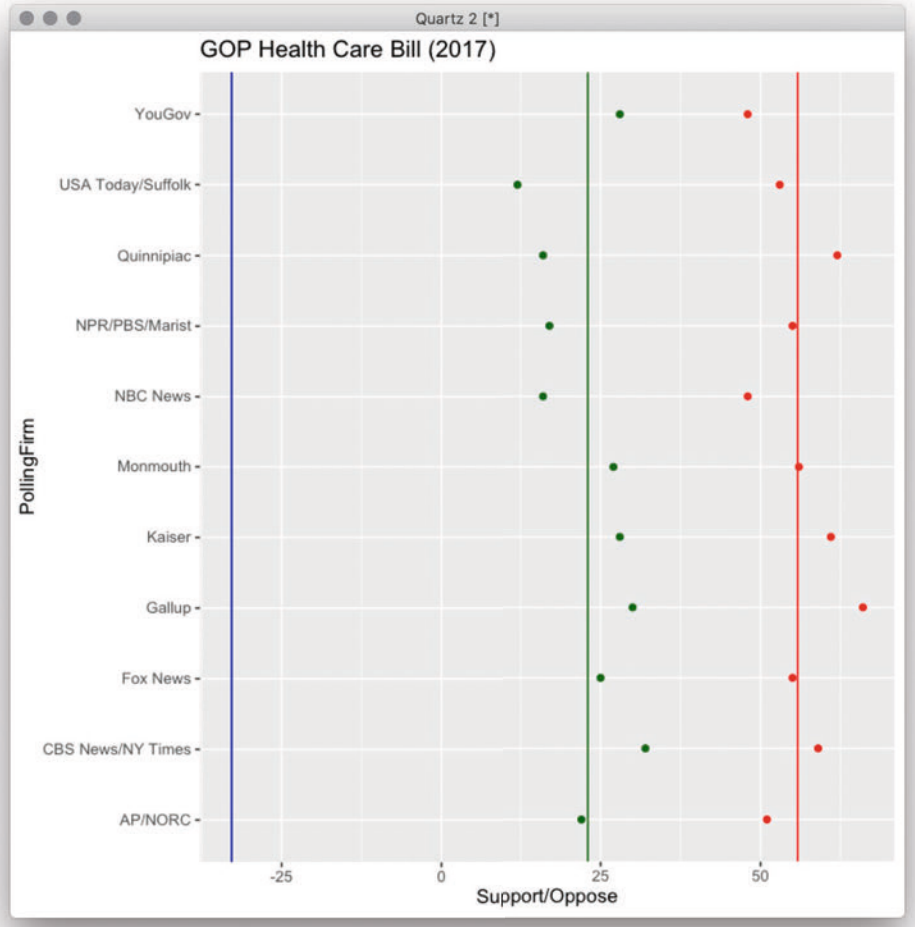
Add net support

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> meansupport_cov <- mean(polls[34:39,"support"])
> meanoppose_cov <- mean(polls[34:39,"oppose"])
> netsupport_cov <- meansupport_cov - meanoppose_cov
> plot_covrelief + geom_point(aes(x=support,y=PollingFirm),color="darkgreen") +
            geom_point(aes(x=oppose,y=PollingFirm),color="red") +
xlab("Support/Oppose") + ggtitle("$1.9trn covid-19 relief (2021)")     +
geom_vline(xintercept=meanoppose_cov, color="red") +
geom_vline(xintercept=meansupport_cov,color="darkgreen") +
geom_vline(xintercept=netsupport_cov,color="blue")
```



- net support
- average oppose
- average support

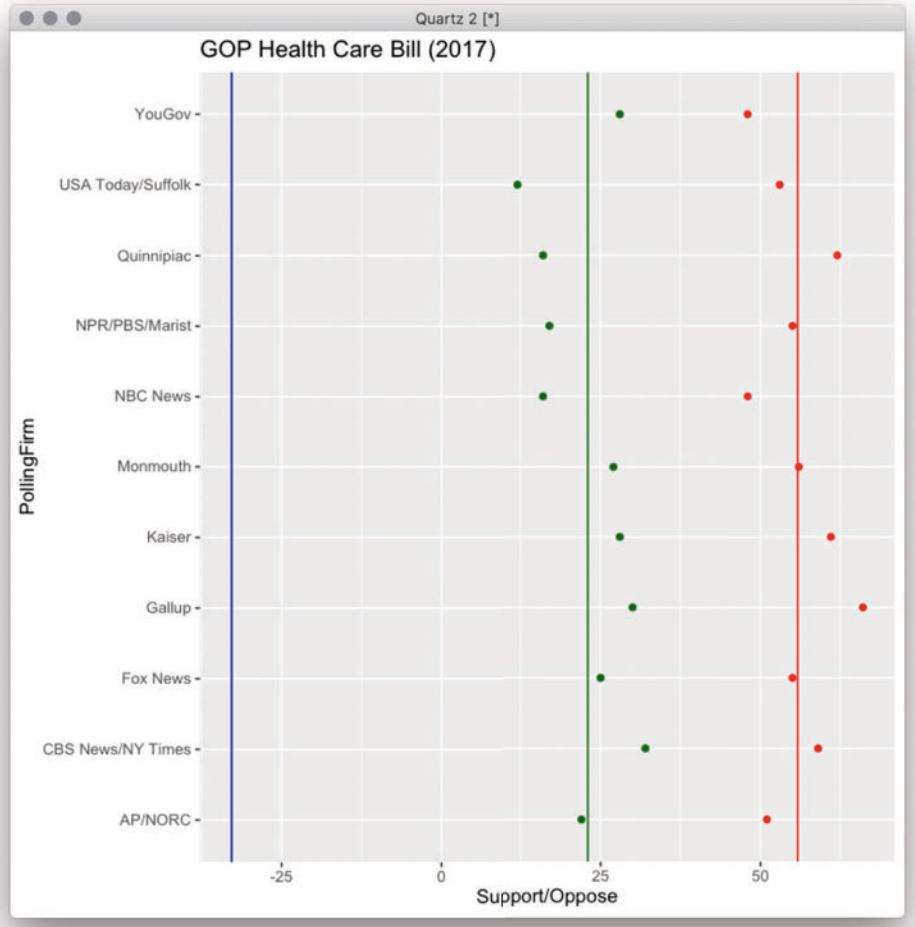
Question



- net support
- average oppose
- average support

Question

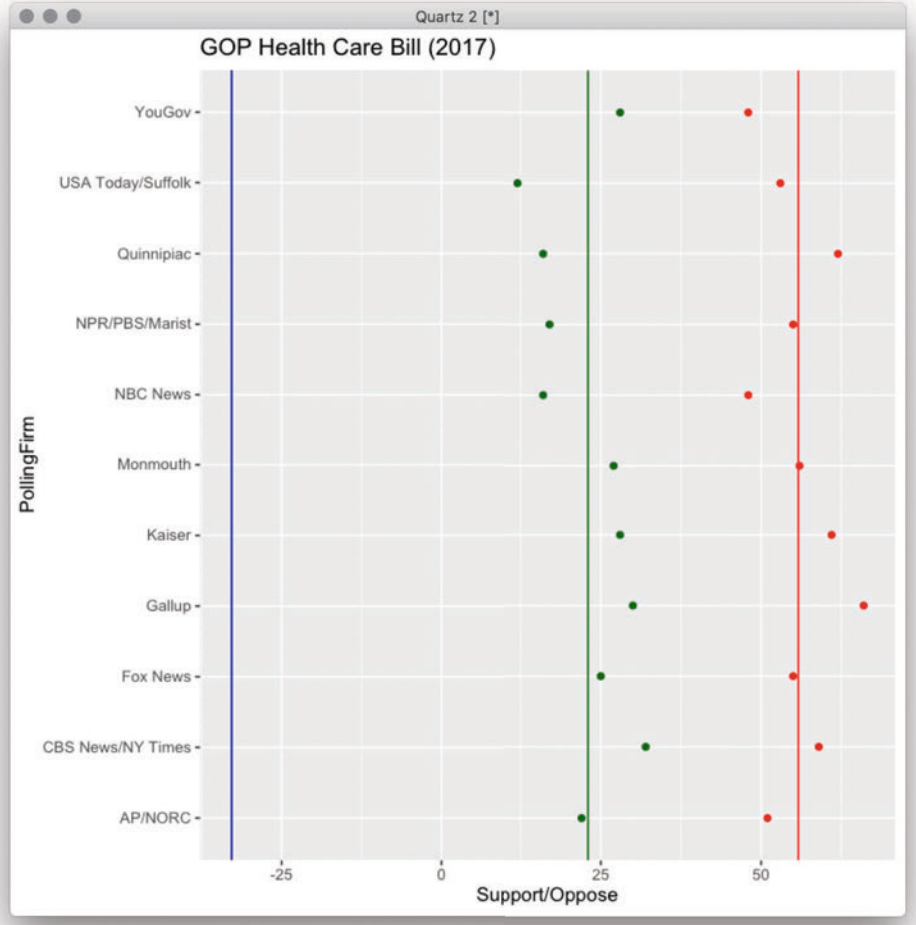
What is the problem here (Process GOP Health Care Bill, 2017)?



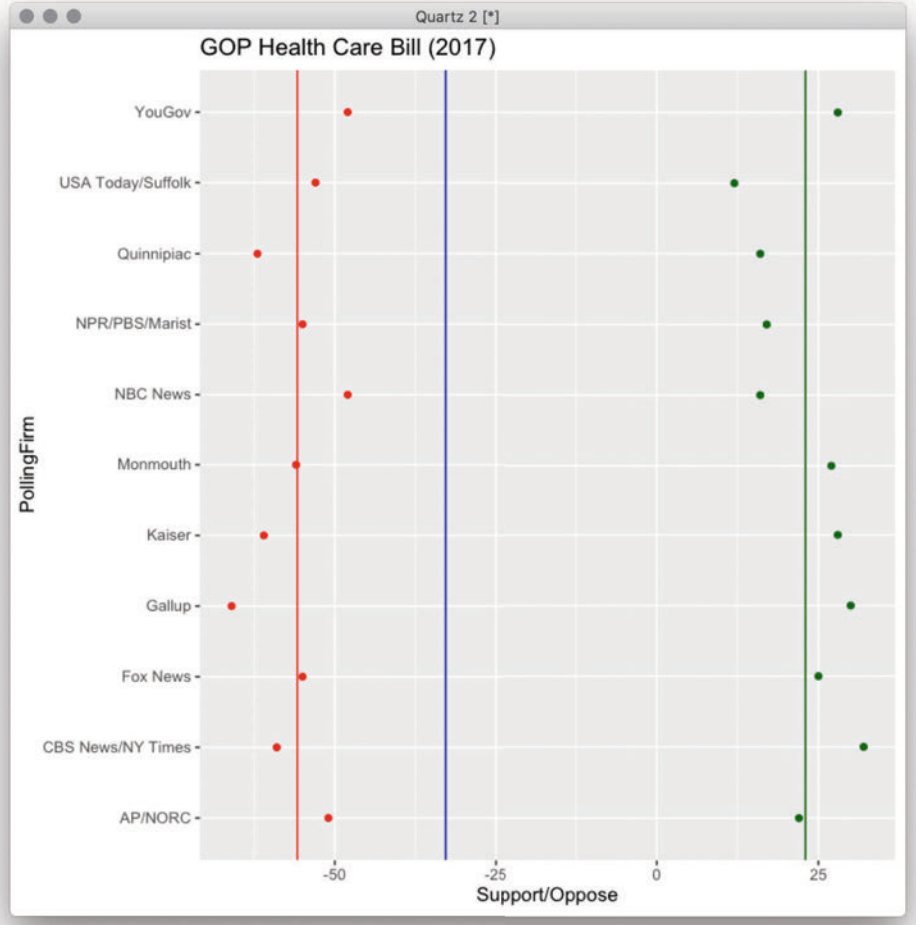
- net support
- average oppose
- average support

Answer

Use negative “oppose” values



Positive “oppose” values

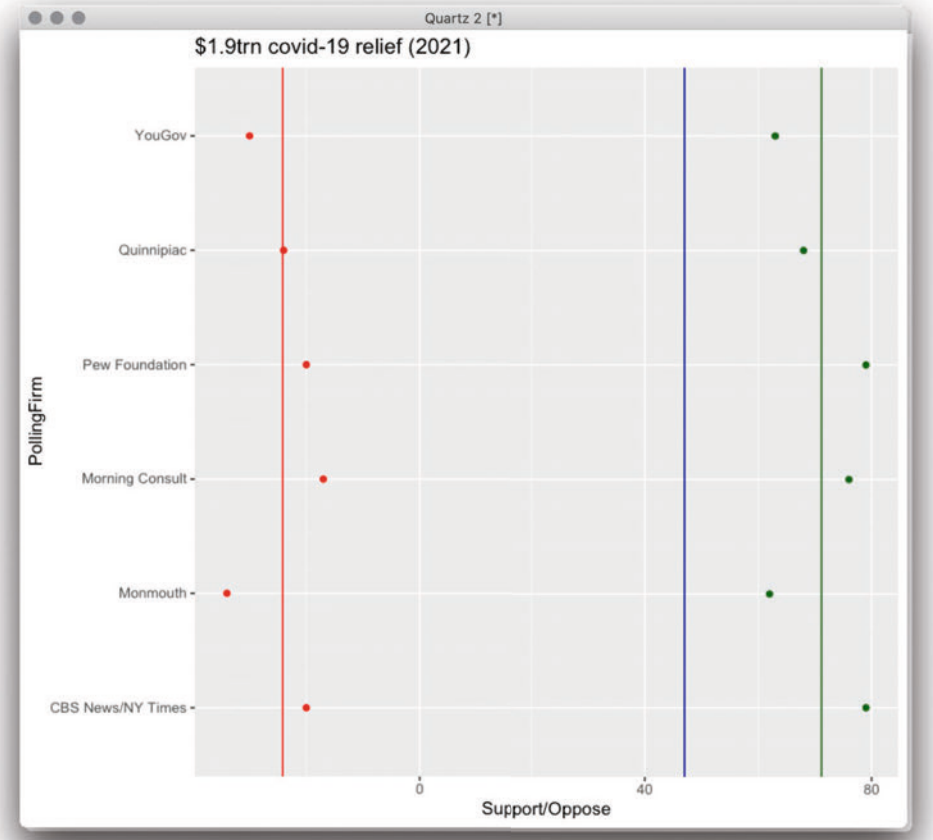


Negative “oppose” values

Process $1.9trn covid-19 relief (2021)

Use negative “oppose” values

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> meansupport_cov <- mean(polls[34:39,"support"])
> meanoppose_cov <- -mean(polls[34:39,"oppose"])
> netsupport_cov <- meansupport_cov + meanoppose_cov
> plot_covrelief + geom_point(aes(x=support,y=PollingFirm),color="darkgreen") +
            geom_point(aes(x=-oppose,y=PollingFirm),color="red") +
xlab("Support/Oppose") + ggtitle("$1.9trn covid-19 relief (2021)")     +
geom_vline(xintercept=meanoppose_cov, color="red") +
geom_vline(xintercept=meansupport_cov,color="darkgreen") +
geom_vline(xintercept=netsupport_cov,color="blue")
```

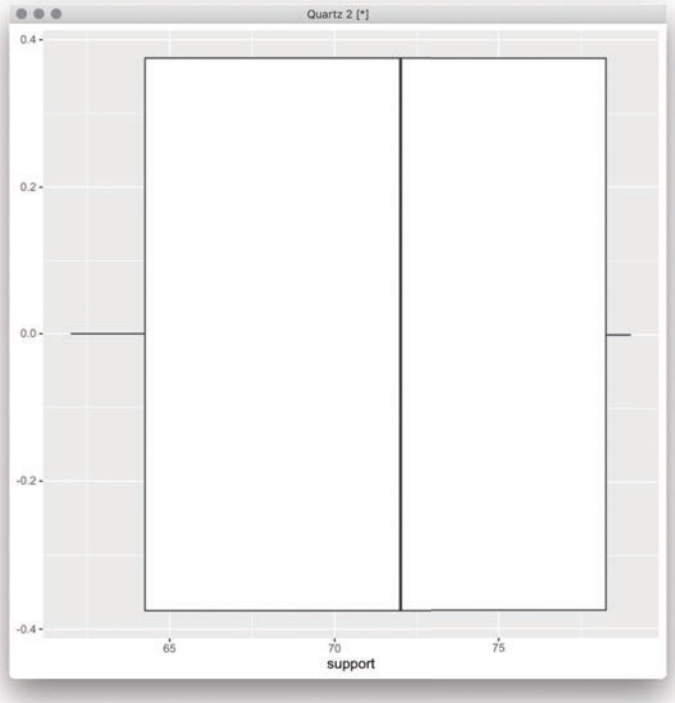


- net support
- average oppose
- average support

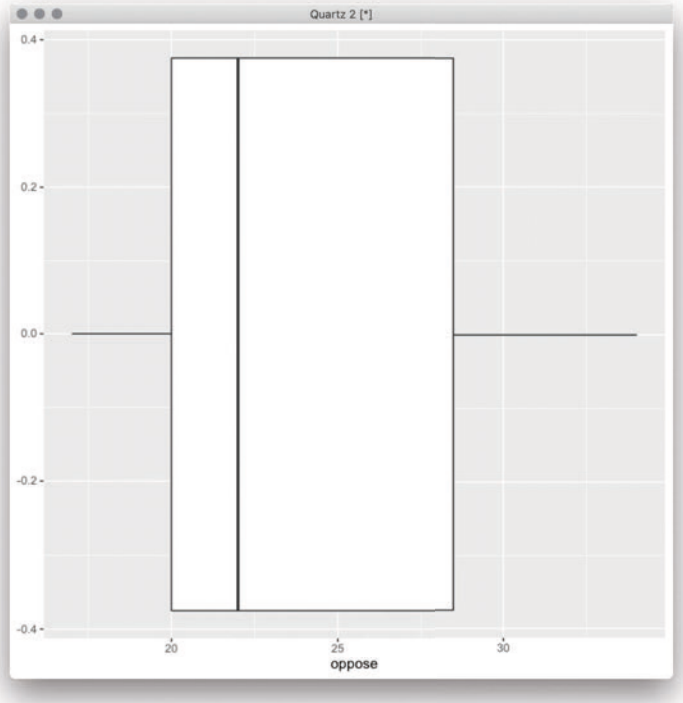
Box plots

Create box plots for support (left) and oppose (right)

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_boxplot(aes(x=support))
```

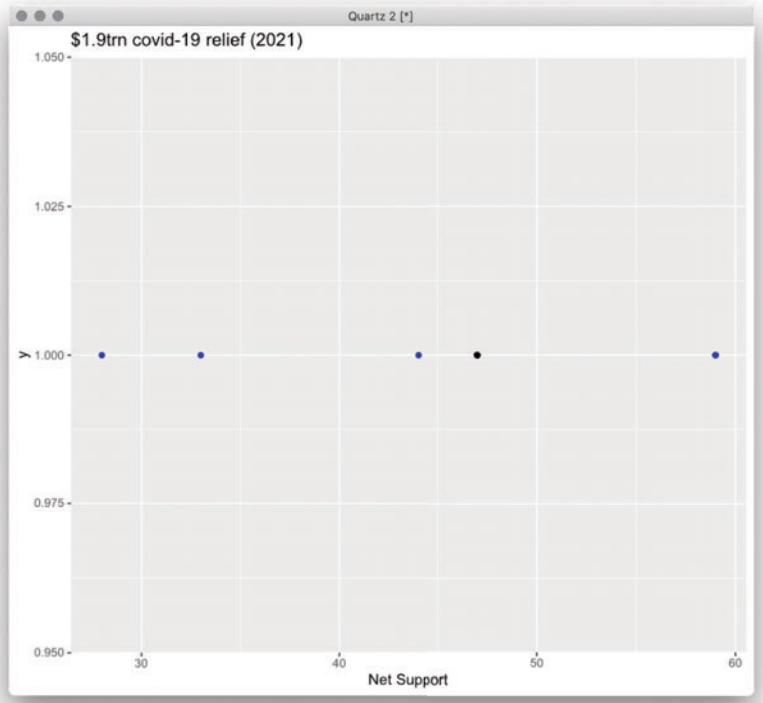



```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_boxplot(aes(x=oppose))
```



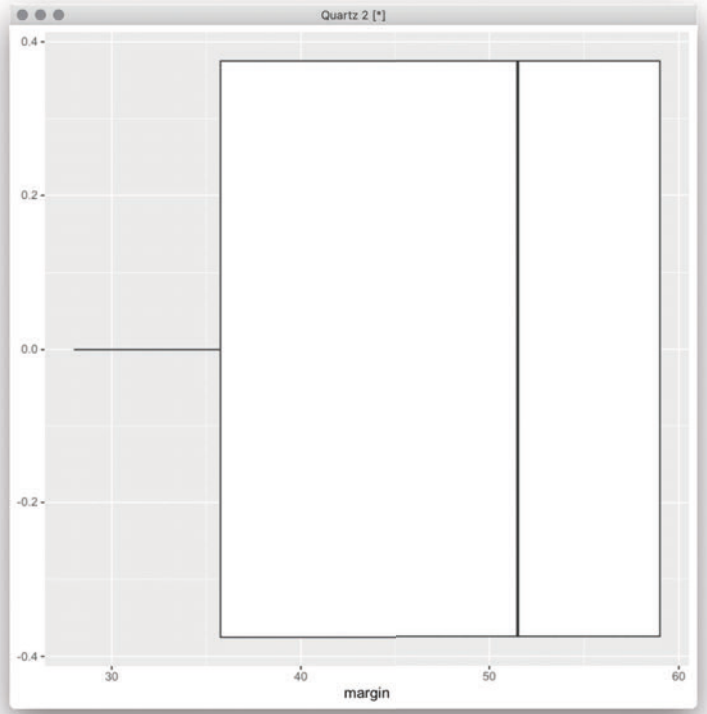
Poll: Which one do you like better?

Visualizing net support



A

B



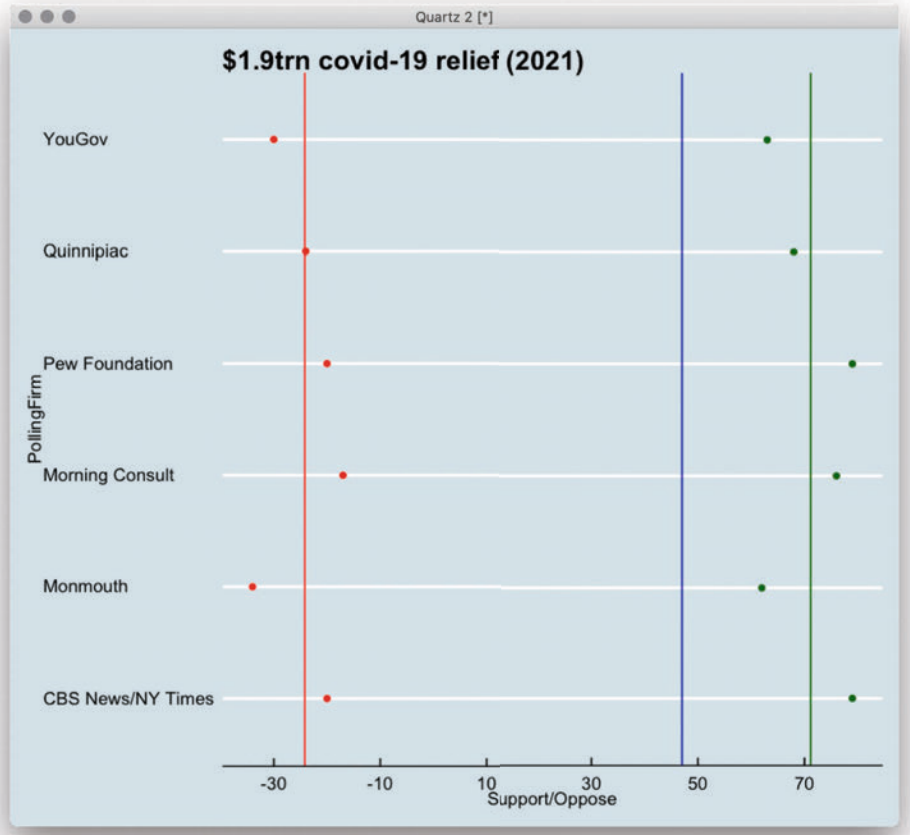

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_point(aes(x=margin,y=1),color="blue") +
xlab("Net   Support") + ggtitle("$1.9trn covid-19 relief (2021)") +
            geom_point(aes(x=mean(polls[34:39,]$margin),y=1))
```

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_boxplot(aes(x=margin))
```

Process $1.9trn covid-19 relief (2021)

Add Economist Theme

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> meansupport_cov <- mean(polls[34:39,"support"])
> meanoppose_cov <- -mean(polls[34:39,"oppose"])
> netsupport_cov <- meansupport_cov + meanoppose_cov
> plot_covrelief + geom_point(aes(x=support,y=PollingFirm),color="darkgreen") +
            geom_point(aes(x=-oppose,y=PollingFirm),color="red") +
xlab("Support/Oppose") + ggtitle("$1.9trn covid-19 relief (2021)")     +
geom_vline(xintercept=meanoppose_cov, color="red") +
geom_vline(xintercept=meansupport_cov,color="darkgreen") +
geom_vline(xintercept=netsupport_cov,color="blue") +       theme_economist() +
scale_x_continuous(breaks=seq(-50,100,by=20))
```

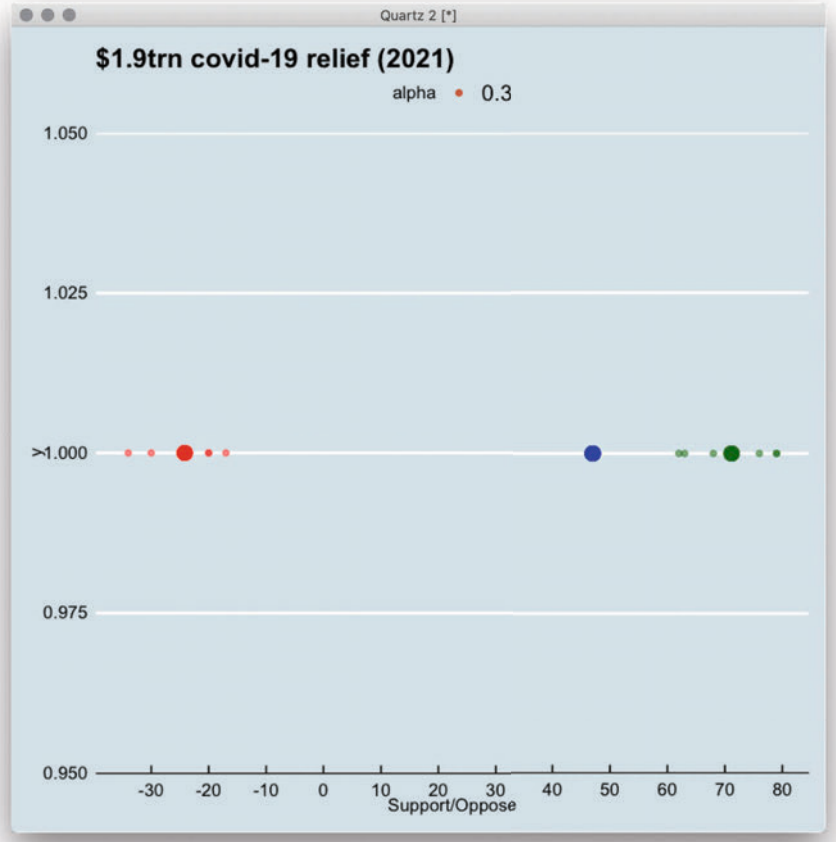


- net support
- average oppose
- average support

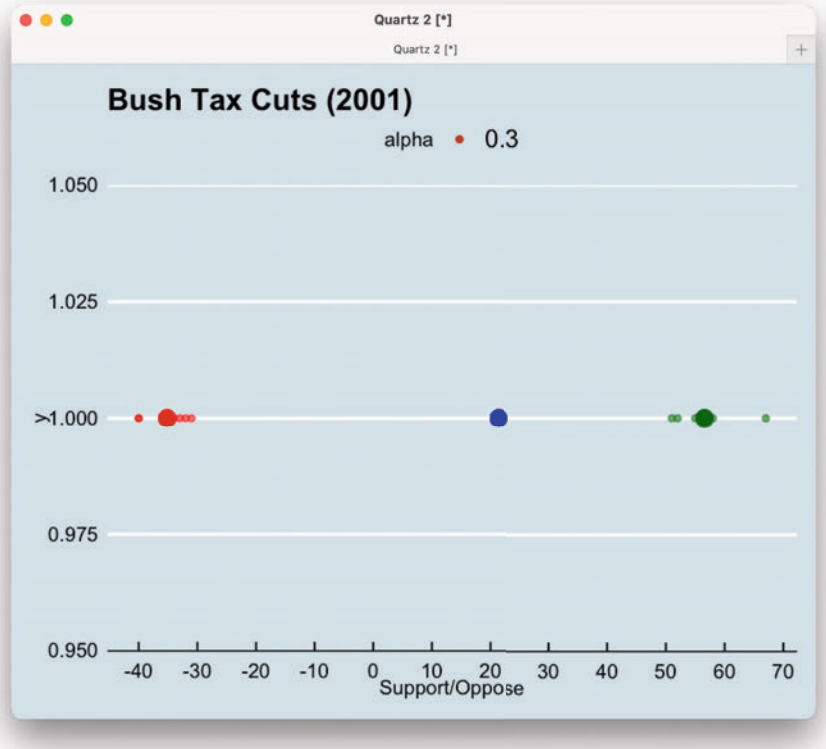
Process $1.9trn covid-19 relief (2021)

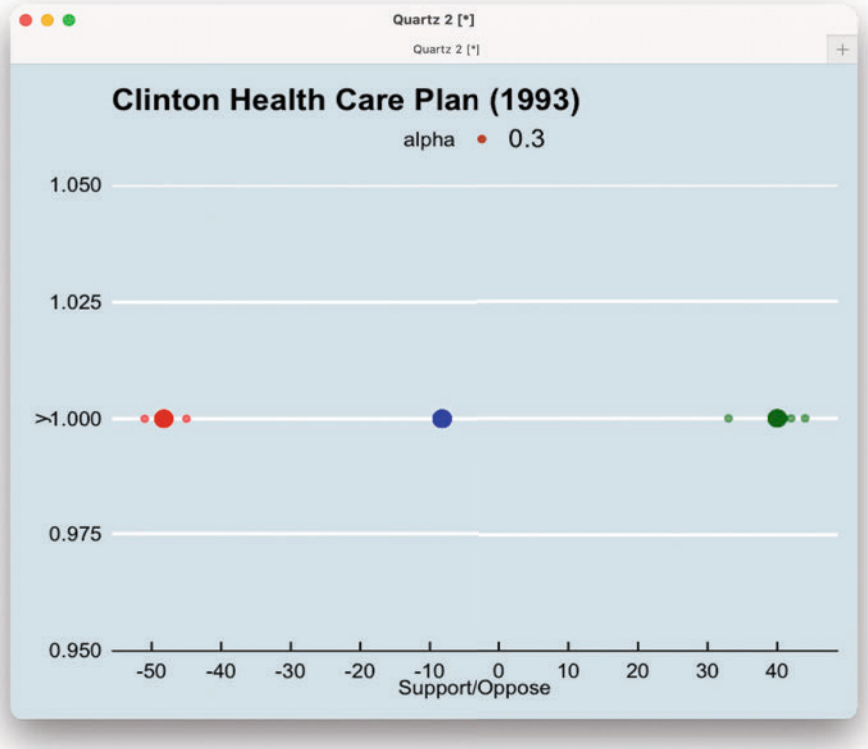
Reduce to one line for this bill

```
> plot_covrelief <- ggplot(data=polls[34:39,])
> plot_covrelief + geom_point(aes(x=support,y=1, alpha=0.3),color="darkgreen")
+ geom_point(aes(x=-oppose,y=1, alpha=0.3),color="red") +   xlab("Support/
Oppose") + ggtitle("$1.9trn covid-19 relief (2021)")       +
geom_point(aes(x=meanoppose_cov,y=1), size=4, color="red") +
geom_point(aes(x=meansupport_cov, y=1), size=4, color="darkgreen")     +
geom_point(aes(x=netsupport_cov,y=1),size=4,color="blue") +
theme_economist() + scale_x_continuous(breaks=seq(-50,100,by=10))
```



Repeat Dot Plot on other Bills





Final result

Final result

```
aver_table<-econdata%>%select(Bill,support,oppose,margin)
mean_support<-aggregate(x=new_table$support,by=list(new_table$Bill),FUN=mean)
means_table<-mean_support
merge(mean_support,mean_oppose,mean_margin,by="Bill")
colnames(mean_support)<-c("Bill","Average Support")
```

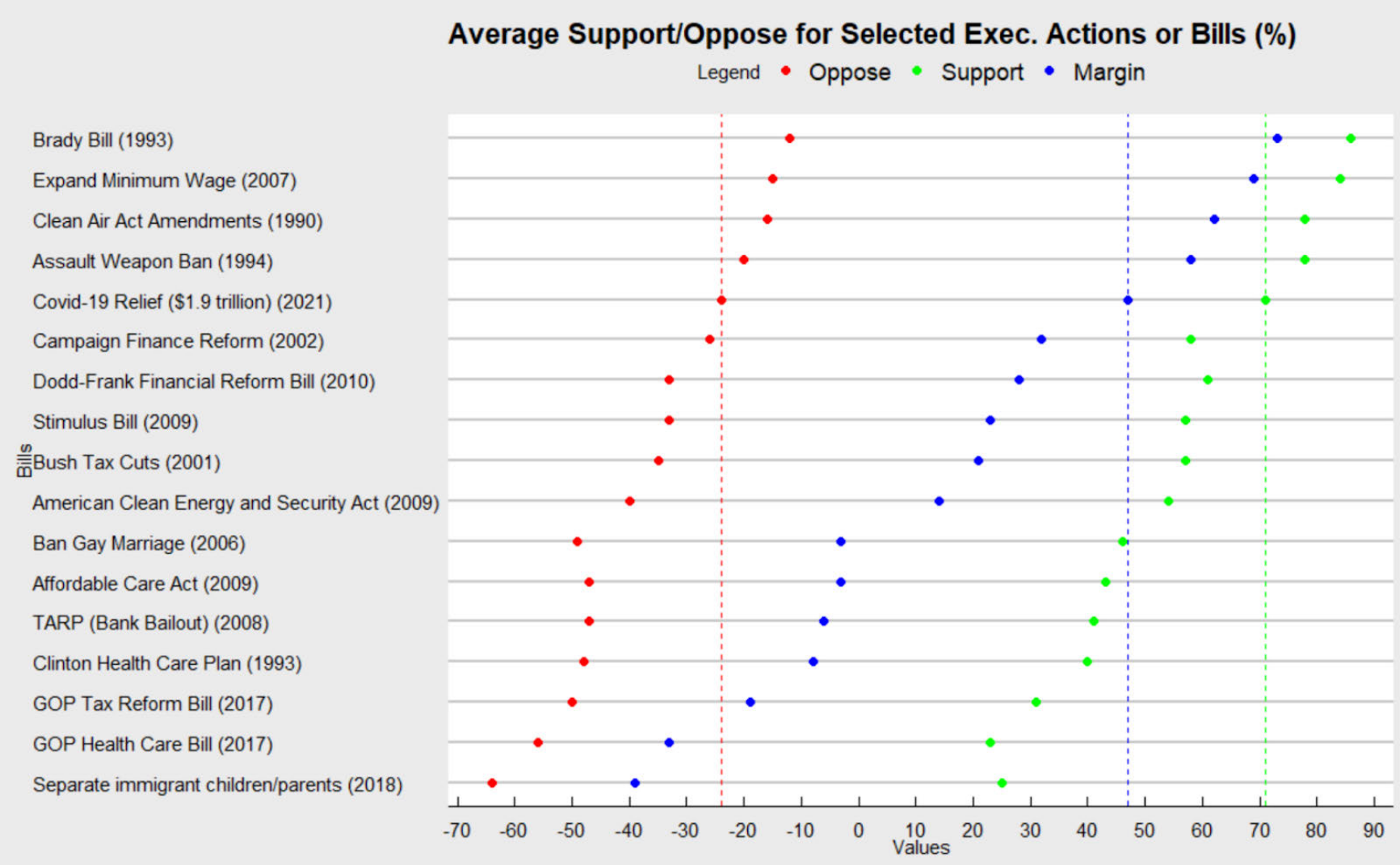
	Bill	Average Support	Average Oppose	Average Margin
15	Separate immigrant children/parents (2018)	25	64	-39.2
13	GOP Health Care Bill (2017)	23	56	-32.8
14	GOP Tax Reform Bill (2017)	31	50	-19.0
9	Clinton Health Care Plan (1993)	40	48	-8.2
17	TARP (Bank Bailout) (2008)	41	47	-5.7
1	Affordable Care Act (2009)	43	47	-3.3
4	Ban Gay Marriage (2006)	46	49	-3.0
2	American Clean Energy and Security Act (2009)	54	40	14.3
6	Bush Tax Cuts (2001)	57	35	21.4
16	Stimulus Bill (2009)	57	33	23.3
11	Dodd-Frank Financial Reform Bill (2010)	61	33	27.8
7	Campaign Finance Reform (2002)	58	26	31.5
10	Covid-19 Relief ($1.9 trillion) (2021)	71	24	47.0
3	Assault Weapon Ban (1994)	78	20	58.0
8	Clean Air Act Amendments (1990)	78	16	62.0
12	Expand Minimum Wage (2007)	84	14	69.0
5	Brady Bill (1993)	86	12	73.3

Final result

One big ggplot2 code

```
ggplot(aver_table, aes(y=aver_table$Bill))[1]
+geom_point(aes(x=aver_table$`Average Margin`, color="red"), size=2)
+geom_point(aes(x=aver_table$`Average Support`, colour ="green"), size=2)
+geom_point(aes(x=aver_table$`Average Oppose`, colour ='blue'), size=2)[2]
+labs(x="Values",y="Bills",colour="Legend")[3]
+scale_x_continuous(breaks = seq(-100, 100, by = 10))[4]
+ggtitle("AverageSupport/Oppose for Selected Exec. Actionsor Bills (%)")[5]
+geom_vline(xintercept=71,col="green",linetype=2)
+geom_vline(xintercept=-24,col="red",linetype=2)
+geom_vline(xintercept=47,col="blue",linetype=2)[5]
+theme_economist_white()[6]
+scale_colour_manual(labels = c("Oppose", "Support","Margin"),
values = c("red", "green","blue"))[7]
```

Theme white

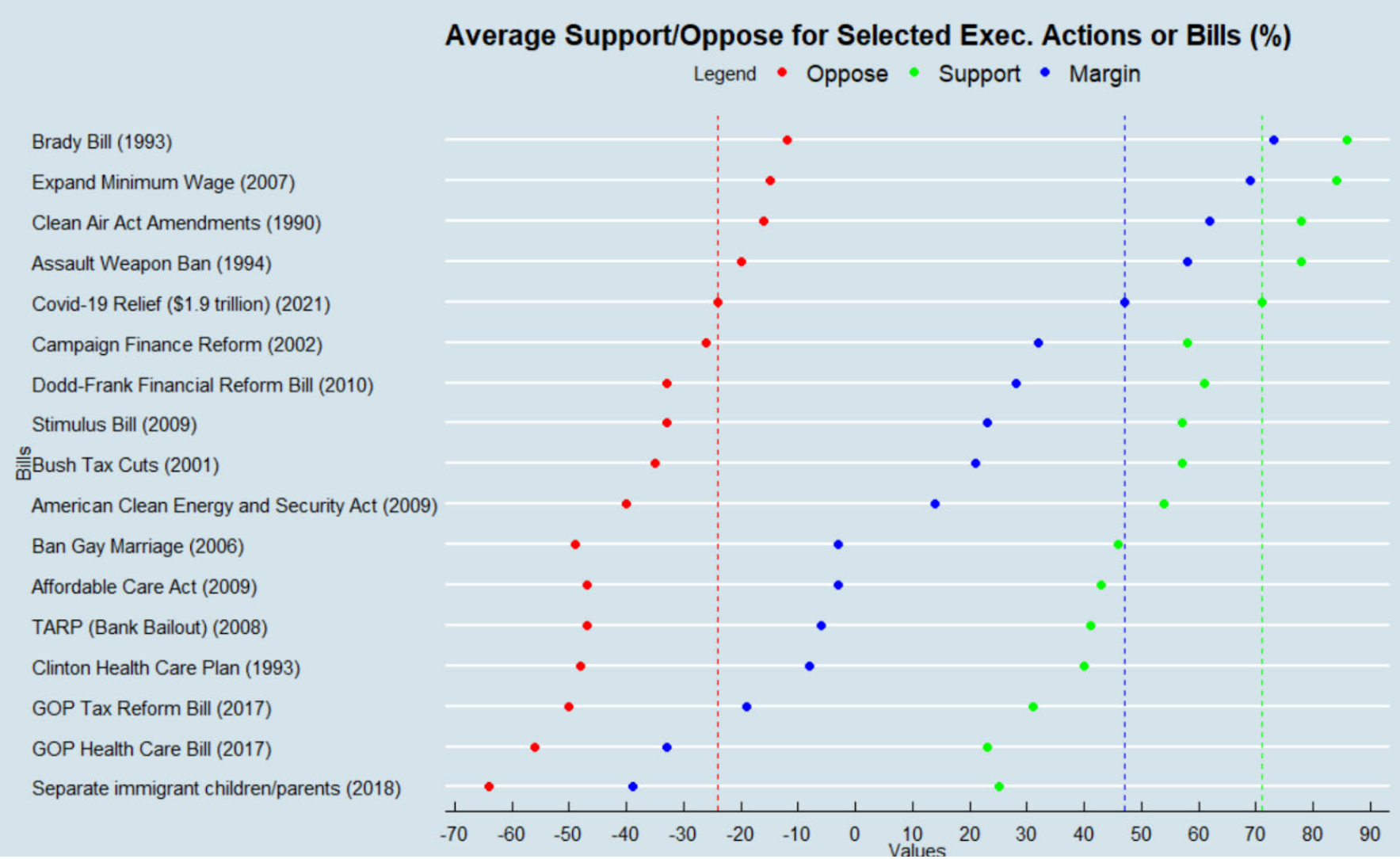

Average Support/Oppose for Selected Exec. Actions or Bills (%)
Legend
Oppose
Support
Margin
Brady Bill (1993)
Expand Minimum Wage (2007)
Clean Air Act Amendments (1990)
Assault Weapon Ban (1994)
Covid-19 Relief ($1.9 trillion) (2021)
Campaign Finance Reform (2002)
Dodd-Frank Financial Reform Bill (2010)
Stimulus Bill (2009)
Bush Tax Cuts (2001)
American Clean Energy and Security Act (2009)
Ban Gay Marriage (2006)
Affordable Care Act (2009)
TARP (Bank Bailout) (2008)
Clinton Health Care Plan (1993)
GOP Tax Reform Bill (2017)
GOP Health Care Bill (2017)
Separate immigrant children/parents (2018)
Bills
-70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90
Values

Final result

Change in Theme

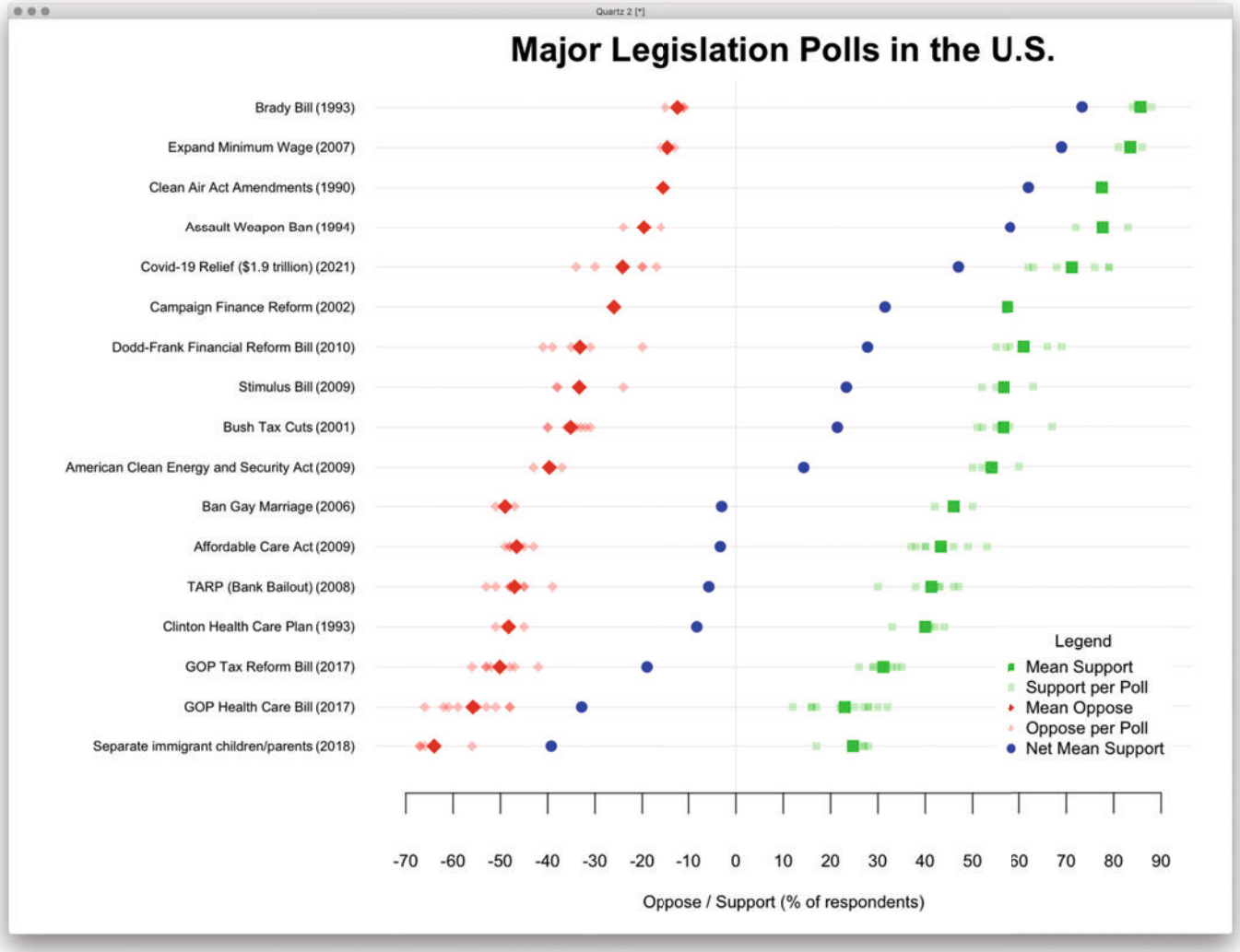
```
ggplot(aver_table, aes(y=aver_table$Bill))[1]
+geom_point(aes(x=aver_table$`Average Margin`, color="red"), size=2)
+geom_point(aes(x=aver_table$`Average Support`, colour ="green"), size=2)
+geom_point(aes(x=aver_table$`Average Oppose`, colour ='blue'), size=2)[2]
+labs(x="Values",y="Bills",colour="Legend")[3]
+scale_x_continuous(breaks = seq(-100, 100, by = 10))[4]
+ggtitle("AverageSupport/Oppose for Selected Exec. Actionsor Bills (%)")[5]
+geom_vline(xintercept=71,col="green",linetype=2)
+geom_vline(xintercept=-24,col="red",linetype=2)
+geom_vline(xintercept=47,col="blue",linetype=2)[5]
+theme_economist()[6]
+scale_colour_manual(labels = c("Oppose", "Support","Margin"),
values = c("red", "green","blue"))[7]
```

Theme blue


Average Support/Oppose for Selected Exec. Actions or Bills (%)
Legend
Oppose
Support
Margin
Brady Bill (1993)
Expand Minimum Wage (2007)
Clean Air Act Amendments (1990)
Assault Weapon Ban (1994)
Covid-19 Relief ($1.9 trillion) (2021)
Campaign Finance Reform (2002)
Dodd-Frank Financial Reform Bill (2010)
Stimulus Bill (2009)
Bush Tax Cuts (2001)
American Clean Energy and Security Act (2009)
Ban Gay Marriage (2006)
Affordable Care Act (2009)
TARP (Bank Bailout) (2008)
Clinton Health Care Plan (1993)
GOP Tax Reform Bill (2017)
GOP Health Care Bill (2017)
Separate immigrant children/parents (2018)
Bills
-70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90
Values

There is more …

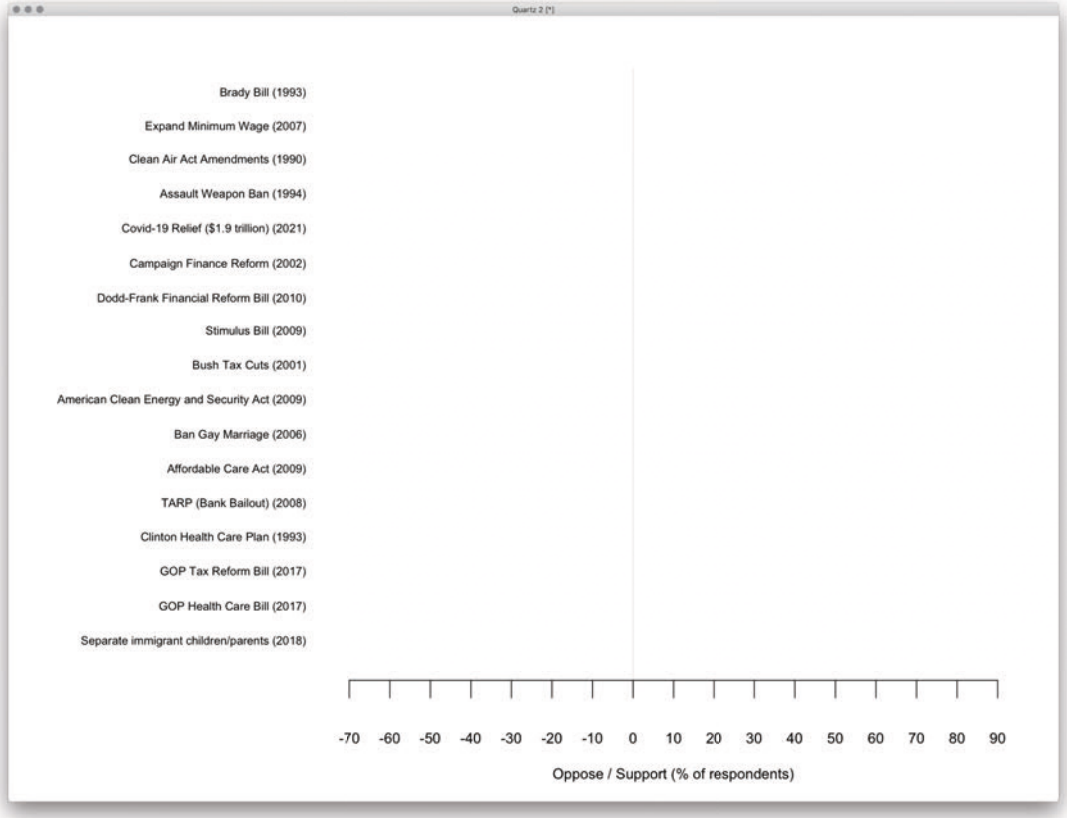
Final result with plot()



Final result with plot()

Set up the plot

```
> # Create a new quartz device (mac only) for more space and higher
resolution of graph
> quartz(width=6,height=4.5,dpi=300)

> # Set margin (bottom,left,top,right)
> par(mar = c(3, 9, 1.5, 1))

> # Set up the plot
> plot(NULL, xlim=c(-70,90), ylim=c(0,17), cex.lab=0.7, yaxt='n', xaxt=,n‘,
ylab="", xlab="",axes=FALSE)
> abline(v=0,col=rgb(0.9,0.9,0.9),lwd=0.5)
> axis(side=2,at=c(1:17),cex.axis=0.4, las=2,
labels=factor(bills_index$Bill,bills_index$Bill),tick=FALSE,line=-0.5)
> axis(side=1,cex.axis=0.5,at=seq(-70,90,by=10),lwd=0.5,line=-0.5)
> title(xlab="Oppose / Support (% of respondents)", line=1.5, cex.lab=0.5)
```



Final result with plot()

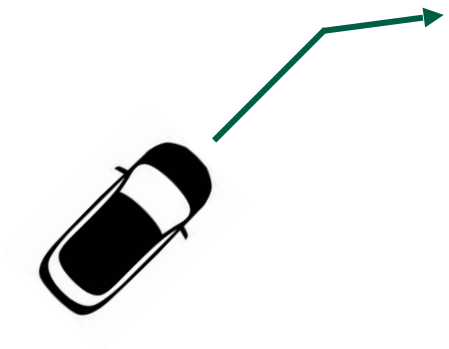
Excursion: For-loop

1. **Drive 20m ahead**
2. **Turn right by 45°**
3. **Drive 10m ahead**

Icon: Car by Alexander Skowalsky from the Noun Project

Final result with plot()

Excursion: For-loop



1. **Drive 20m ahead**
2. **Turn right by 45°**
3. **Drive 10m ahead**

Icon: Car by Alexander Skowalsky from the Noun Project

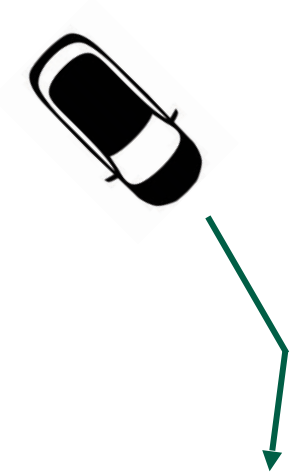
Final result with plot()

Excursion: For-loop

Icon: Car by Alexander Skowalsky from the Noun Project

Final result with plot()

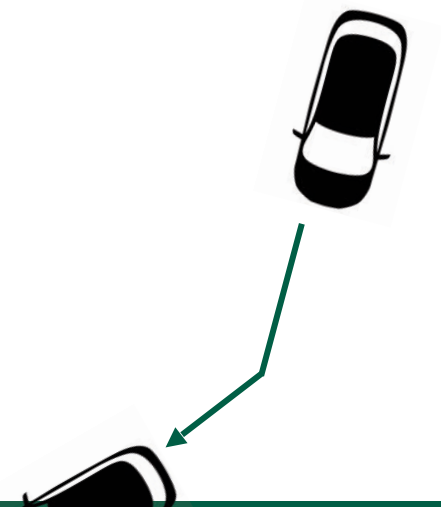
Excursion: For-loop



Icon: Car by Alexander Skowalsky from the Noun Project

Final result with plot()

Excursion: For-loop



Icon: Car by Alexander Skowalsky from the Noun Project

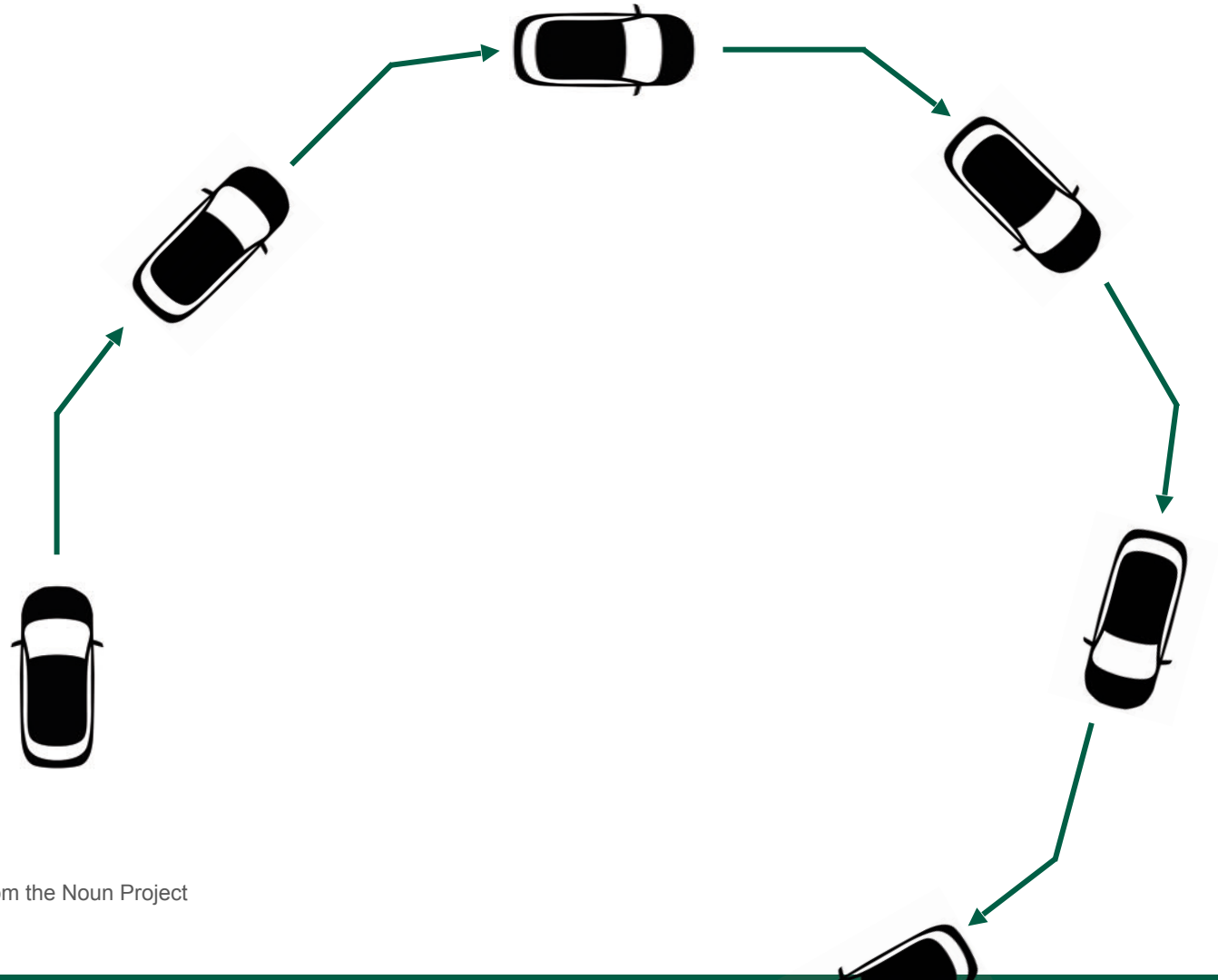
Final result with plot()

Excursion: For-loop

Icon: Car by Alexander Skowalsky from the Noun Project

Final result with plot()

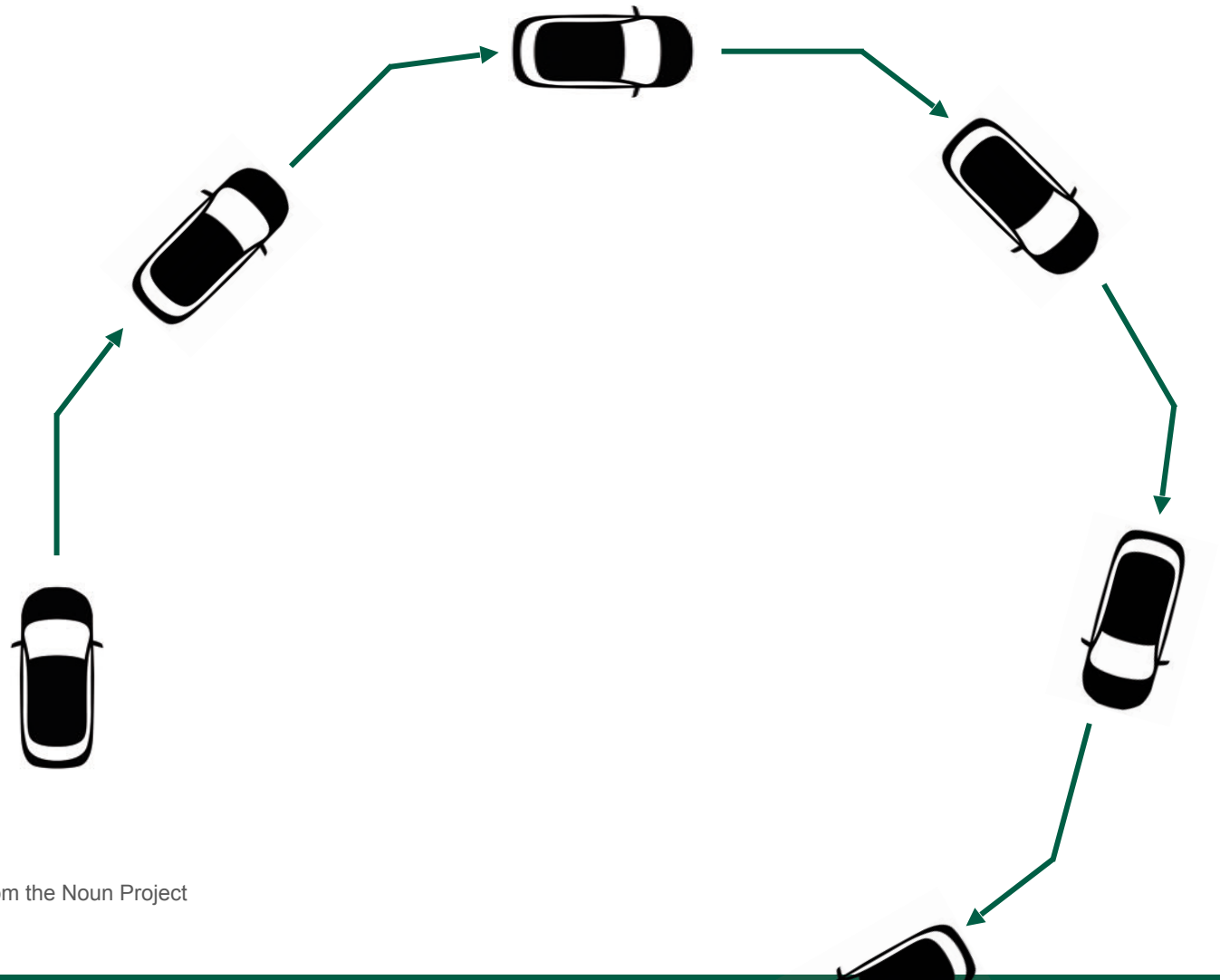
Excursion: For-loop



Icon: Car by Alexander Skowalsky from the Noun Project

Final result with plot()

Excursion: For-loop



```
> for (i in 1:5) {
+           drive(20)
+           turn(45)
+           drive(10)
+ }
```

Icon: Car by Alexander Skowalsky from the Noun Project

Final result with plot()

Set up an index table

bills-index

Bill	Start	End	AverageMargin
Separate immigrant children/parents (2018)	66	69	-39
GOP Health Care Bill (2017)	47	57	-33
GOP Tax Reform Bill (2017)	58	65	-19
Clinton Health Care Plan (1993)	30	33	-8
TARP (Bank Bailout) (2008)	73	79	-6
Affordable Care Act (2009)	1	7	-3
Ban Gay Marriage (2006)	14	15	-3
American Clean Energy and Security Act (2009)	8	10	14
Bush Tax Cuts (2001)	19	25	21
Stimulus Bill (2009)	70	72	23
Dodd-Frank Financial Reform Bill (2010)	40	44	28
Campaign Finance Reform (2002)	26	27	32
Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
Assault Weapon Ban (1994)	11	13	58
Clean Air Act Amendments (1990)	28	29	62
Expand Minimum Wage (2007)	45	46	69
Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

Index table

Original dataset

Final result with plot()

Excursion: For-loop

Round 0: i = NA, j = NA

bills-index

	Bill	Start	End	AverageMargin
1	Separate immigrant children/parents (2018)	66	69	-39
2	GOP Health Care Bill (2017)	47	57	-33
3	GOP Tax Reform Bill (2017)	58	65	-19
4	Clinton Health Care Plan (1993)	30	33	-8
…	TARP (Bank Bailout) (2008)	73	79	-6
	Affordable Care Act (2009)	1	7	-3
	Ban Gay Marriage (2006)	14	15	-3
	American Clean Energy and Security Act (2009)	8	10	14
	Bush Tax Cuts (2001)	19	25	21
	Stimulus Bill (2009)	70	72	23
	Dodd-Frank Financial Reform Bill (2010)	40	44	28
	Campaign Finance Reform (2002)	26	27	32
	Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
	Assault Weapon Ban (1994)	11	13	58
	Clean Air Act Amendments (1990)	28	29	62
	Expand Minimum Wage (2007)	45	46	69
	Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

Index table (access with i)

Original dataset (access with j)

Final result with plot()

Excursion: For-loop

Round 1: i = 1, j = 66

bills-index

	Bill	Start	End	AverageMargin
1	Separate immigrant children/parents (2018)	66	69	-39
2	GOP Health Care Bill (2017)	47	57	-33
3	GOP Tax Reform Bill (2017)	58	65	-19
4	Clinton Health Care Plan (1993)	30	33	-8
…	TARP (Bank Bailout) (2008)	73	79	-6
	Affordable Care Act (2009)	1	7	-3
	Ban Gay Marriage (2006)	14	15	-3
	American Clean Energy and Security Act (2009)	8	10	14
	Bush Tax Cuts (2001)	19	25	21
	Stimulus Bill (2009)	70	72	23
	Dodd-Frank Financial Reform Bill (2010)	40	44	28
	Campaign Finance Reform (2002)	26	27	32
	Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
	Assault Weapon Ban (1994)	11	13	58
	Clean Air Act Amendments (1990)	28	29	62
	Expand Minimum Wage (2007)	45	46	69
	Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

Index table (access with i)

Original dataset (access with j)

Final result with plot()

Excursion: For-loop

Round 2: i = 1, j = 67

bills-index

	Bill	Start	End	AverageMargin
1	Separate immigrant children/parents (2018)	66	69	-39
2	GOP Health Care Bill (2017)	47	57	-33
3	GOP Tax Reform Bill (2017)	58	65	-19
4	Clinton Health Care Plan (1993)	30	33	-8
…	TARP (Bank Bailout) (2008)	73	79	-6
	Affordable Care Act (2009)	1	7	-3
	Ban Gay Marriage (2006)	14	15	-3
	American Clean Energy and Security Act (2009)	8	10	14
	Bush Tax Cuts (2001)	19	25	21
	Stimulus Bill (2009)	70	72	23
	Dodd-Frank Financial Reform Bill (2010)	40	44	28
	Campaign Finance Reform (2002)	26	27	32
	Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
	Assault Weapon Ban (1994)	11	13	58
	Clean Air Act Amendments (1990)	28	29	62
	Expand Minimum Wage (2007)	45	46	69
	Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

Index table (access with i)

Original dataset (access with j)

Final result with plot()

Excursion: For-loop

Round 3: i = 1, j = 68

bills-index

	Bill	Start	End	AverageMargin
1	Separate immigrant children/parents (2018)	66	69	-39
2	GOP Health Care Bill (2017)	47	57	-33
3	GOP Tax Reform Bill (2017)	58	65	-19
4	Clinton Health Care Plan (1993)	30	33	-8
…	TARP (Bank Bailout) (2008)	73	79	-6
	Affordable Care Act (2009)	1	7	-3
	Ban Gay Marriage (2006)	14	15	-3
	American Clean Energy and Security Act (2009)	8	10	14
	Bush Tax Cuts (2001)	19	25	21
	Stimulus Bill (2009)	70	72	23
	Dodd-Frank Financial Reform Bill (2010)	40	44	28
	Campaign Finance Reform (2002)	26	27	32
	Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
	Assault Weapon Ban (1994)	11	13	58
	Clean Air Act Amendments (1990)	28	29	62
	Expand Minimum Wage (2007)	45	46	69
	Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

Index table (access with i)

Original dataset (access with j)

Final result with plot()

Excursion: For-loop

Round 4: i = 1, j = 69

bills-index

	Bill	Start	End	AverageMargin
1	Separate immigrant children/parents (2018)	66	69	-39
2	GOP Health Care Bill (2017)	47	57	-33
3	GOP Tax Reform Bill (2017)	58	65	-19
4	Clinton Health Care Plan (1993)	30	33	-8
…	TARP (Bank Bailout) (2008)	73	79	-6
	Affordable Care Act (2009)	1	7	-3
	Ban Gay Marriage (2006)	14	15	-3
	American Clean Energy and Security Act (2009)	8	10	14
	Bush Tax Cuts (2001)	19	25	21
	Stimulus Bill (2009)	70	72	23
	Dodd-Frank Financial Reform Bill (2010)	40	44	28
	Campaign Finance Reform (2002)	26	27	32
	Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
	Assault Weapon Ban (1994)	11	13	58
	Clean Air Act Amendments (1990)	28	29	62
	Expand Minimum Wage (2007)	45	46	69
	Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

Index table (access with i)

Original dataset (access with j)

Final result with plot()

Excursion: For-loop

Round 5: i = 2, j = 47

bills-index

	Bill	Start	End	AverageMargin
1	Separate immigrant children/parents (2018)	66	69	-39
2	GOP Health Care Bill (2017)	47	57	-33
3	GOP Tax Reform Bill (2017)	58	65	-19
4	Clinton Health Care Plan (1993)	30	33	-8
…	TARP (Bank Bailout) (2008)	73	79	-6
	Affordable Care Act (2009)	1	7	-3
	Ban Gay Marriage (2006)	14	15	-3
	American Clean Energy and Security Act (2009)	8	10	14
	Bush Tax Cuts (2001)	19	25	21
	Stimulus Bill (2009)	70	72	23
	Dodd-Frank Financial Reform Bill (2010)	40	44	28
	Campaign Finance Reform (2002)	26	27	32
	Covid-19 Relief ($1.9 trillion) (2021)	34	39	47
	Assault Weapon Ban (1994)	11	13	58
	Clean Air Act Amendments (1990)	28	29	62
	Expand Minimum Wage (2007)	45	46	69
	Brady Bill (1993)	16	18	73

	GOP Tax Reform Bill (2017)	2017	YouGov	31	42	-11
66	Separate immigrant children/parents (2018)	2018	CBS News/NY Times	17	67	-50
67	Separate immigrant children/parents (2018)	2018	CNN	28	67	-39
68	Separate immigrant children/parents (2018)	2018	Ipsos	27	56	-29
69	Separate immigrant children/parents (2018)	2018	Quinnipiac	27	66	-39
	Stimulus Bill (2009)	2009	Associated Press	55	38	17

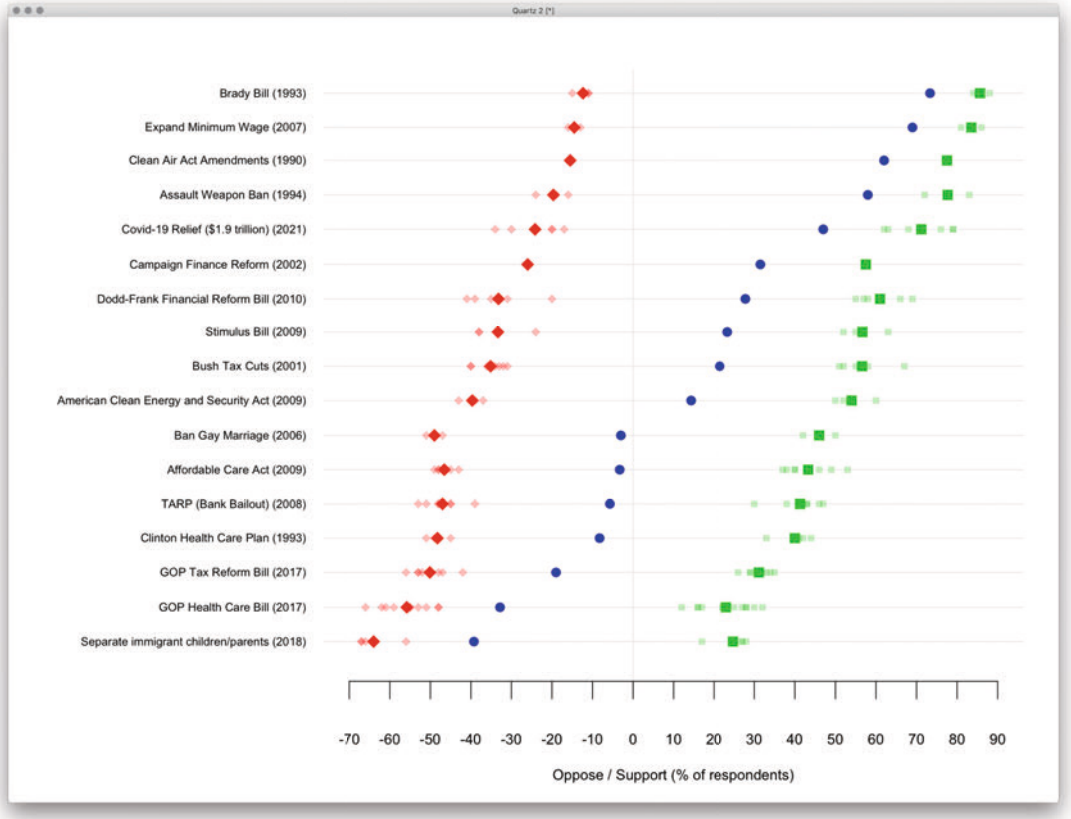
Index table (access with i)

Original dataset (access with j)

Final result with plot()

Draw the dots with two for-loops

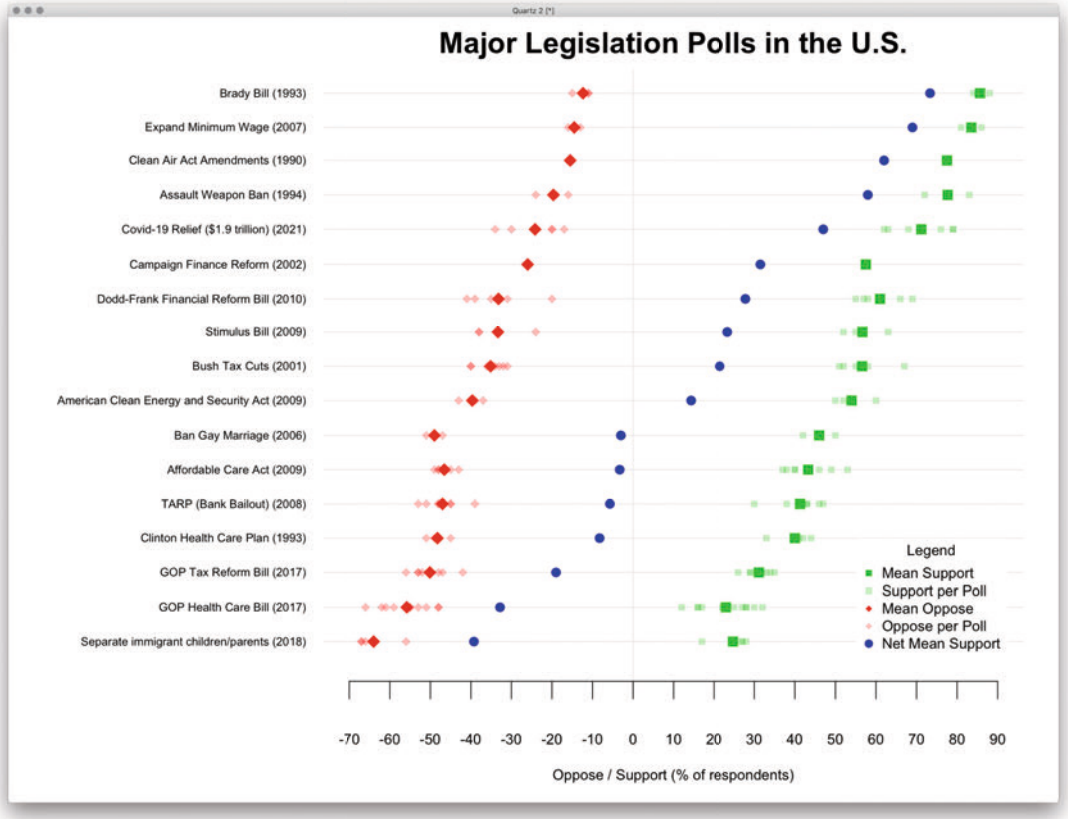
```
> for(i in 1:17) {
+           temp_meansupport <-
mean(polls$support[bills_index$Start[i]:bills_index$End[i]])
+           temp_meanoppose <-
mean(polls$oppose[bills_index$Start[i]:bills_index$End[i]])
+           temp_meanmargin <- temp_meansupport - temp_meanoppose
+           abline(h=i,col=rgb(0.9,0.9,0.9),lwd=0.5)

+           for(j in bills_index$Start[i]:bills_index$End[i]) {
+           points(polls$support[j],i,col=rgb(0,0.8,0,0.3),pch=15,cex=0.5)
+                       points(-
polls$oppose[j],i,col=rgb(1,0,0,0.3),pch=18,cex=0.7)
+           }

+           points(temp_meansupport,i,col=rgb(0,0.8,0,1),pch=15,cex=0.8)
+           points(-temp_meanoppose,i,col=rgb(1,0,0,1),pch=18,cex=1.0)
+           points(temp_meanmargin,i,col=rgb(0,0,1),pch=19,cex=0.6)
+ }
```



Final result with plot()

Add legend and title

```
> legend(55,4,legend=c("Mean Support","Support per Poll","Mean Oppose",
"Oppose per Poll", "Mean Net Support"), col=c(rgb(0,0.8,0,1),
rgb(0,0.8,0,0.3),rgb(1,0,0,1), rgb(1,0,0,0.3), rgb(0,0,1)),
pch=c(15,15,18,18,19), cex=0.5, bg="white",box.lty=0,title="Legend")
> title(main="Major Legislation Polls in the U.S.", cex.main=1)
```



Discussion

Discussion

ggplot()

- Theming available for ggplot()
- ggplot can be leaner (less code)

plot()

- plot() more intuitive than ggplot()
- With plot(), elements can be added to the plot after drawing it

- In this project, both require an extra table (plot() more so than ggplot())

Limitations & Reflection

- Access to original data but no capability to verify (use data as they are)
- Small dataset – project focuses on process
- Project somewhat narrow due to link to original article (data journalism)
- Do not know and likely do not have the same constraints as the original authors (e.g., time, editor's requirements, space, …)
- Beginner level of R

Take-aways

- Ask for the original dataset if you don’t have it
- Consider experimental approach (prototyping different graphs)
- Update regularly with the team to keep project on track

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