

Tidying data

Data Science in a Box

datasciencebox.org



We...

have data organised in an unideal way for our analysis

want to reorganise the data to carry on with our analysis



Data: Sales

We have...

```
## # A tibble: 2 x 4
##   customer_id item_1 item_2      item_3
##         <dbl> <chr>  <chr>    <chr>
## 1           1   bread  milk     banana
## 2           2   milk   toilet paper <NA>
```



Data: Sales

We have...

```
## # A tibble: 2 x 4
##   customer_id item_1 item_2     item_3
##         <dbl> <chr> <chr>   <chr>
## 1             1 bread  milk    banana
## 2             2 milk   toilet paper <NA>
```

We want...

```
## # A tibble: 6 x 3
##   customer_id item_no item
##         <dbl> <chr> <chr>
## 1             1 item_1 bread
## 2             1 item_2 milk
## 3             1 item_3 banana
## 4             2 item_1 milk
## 5             2 item_2 toilet paper
## 6             2 item_3 <NA>
```



A grammar of data tidying



The goal of tidyr is to help you tidy your data via

- pivoting for going between wide and long data
- splitting and combining character columns
- nesting and unnesting columns
- clarifying how NAs should be treated



Pivoting data



Not this...



but this!

wide

id	x	y	z
1	a	c	e
2	b	d	f



Wider vs. longer

wider

more columns

```
## # A tibble: 2 x 4
##   customer_id item_1 item_2      item_3
##   <dbl> <chr> <chr>    <chr>
## 1         1     bread milk     banana
## 2         2     milk toilet paper <NA>
```



Wider vs. longer

wider

more columns

```
## # A tibble: 2 x 4
##   customer_id item_1 item_2     item_3
##   <dbl> <chr> <chr>     <chr>
## 1         1     bread  milk     banana
## 2         2     milk  toilet paper <NA>
```

longer

more rows

```
## # A tibble: 6 x 3
##   customer_id item_no item
##   <dbl> <chr> <chr>
## 1         1     item_1 bread
## 2         1     item_2 milk
## 3         1     item_3 banana
## 4         2     item_1 milk
## 5         2     item_2 toilet paper
## 6         2     item_3 <NA>
```



pivot_longer()

- data (as usual)

```
pivot_longer(  
  data,  
  cols,  
  names_to = "name",  
  values_to = "value"  
)
```



pivot_longer()

- data (as usual)
- cols: columns to pivot into longer format

```
pivot_longer(  
  data,  
  cols,  
  names_to = "name",  
  values_to = "value"  
)
```



pivot_longer()

- data (as usual)
- cols: columns to pivot into longer format
- names_to: name of the column where column names of pivoted variables go (character string)

```
pivot_longer(  
  data,  
  cols,  
  names_to = "name",  
  values_to = "value"  
)
```



pivot_longer()

- data (as usual)
- cols: columns to pivot into longer format
- names_to: name of the column where column names of pivoted variables go (character string)
- values_to: name of the column where data in pivoted variables go (character string)

```
pivot_longer(  
  data,  
  cols,  
  names_to = "name",  
  values_to = "value"  
)
```



Customers → purchases

```
purchases <- customers %>%  
  pivot_longer(  
    cols = item_1:item_3, # variables item_1 to item_3  
    names_to = "item_no", # column names -> new column called item_no  
    values_to = "item" # values in columns -> new column called item  
  )
```

purchases

```
## # A tibble: 6 x 3  
##   customer_id item_no item  
##         <dbl> <chr>  <chr>  
## 1           1 item_1  bread  
## 2           1 item_2  milk  
## 3           1 item_3  banana  
## 4           2 item_1  milk  
## 5           2 item_2  toilet paper  
## 6           2 item_3  <NA>
```



Why pivot?

Most likely, because the next step of your analysis needs it



Why pivot?

Most likely, because the next step of your analysis needs it

```
prices
```

```
## # A tibble: 5 x 2
##   item      price
##   <chr>    <dbl>
## 1 avocado  0.5
## 2 banana  0.15
## 3 bread    1
## 4 milk    0.8
## 5 toilet paper 3
```

```
purchases %>%
  left_join(prices)
```

```
## # A tibble: 6 x 4
##   customer_id item_no item      price
##   <dbl> <chr> <chr>    <dbl>
## 1         1 item_1 bread      1
## 2         1 item_2 milk      0.8
## 3         1 item_3 banana  0.15
## 4         2 item_1 milk      0.8
## 5         2 item_2 toilet paper 3
## 6         2 item_3 <NA>    NA
```



Purchases → customers

- data (as usual)
- `names_from`: which column in the long format contains the what should be column names in the wide format
- `values_from`: which column in the long format contains the what should be values in the new columns in the wide format

```
purchases %>%  
  pivot_wider(  
    names_from = item_no,  
    values_from = item  
  )
```

```
## # A tibble: 2 x 4  
##   customer_id item_1 item_2      item_3  
##         <dbl> <chr> <chr>    <chr>  
## 1           1 bread  milk     banana  
## 2           2 milk   toilet paper <NA>
```

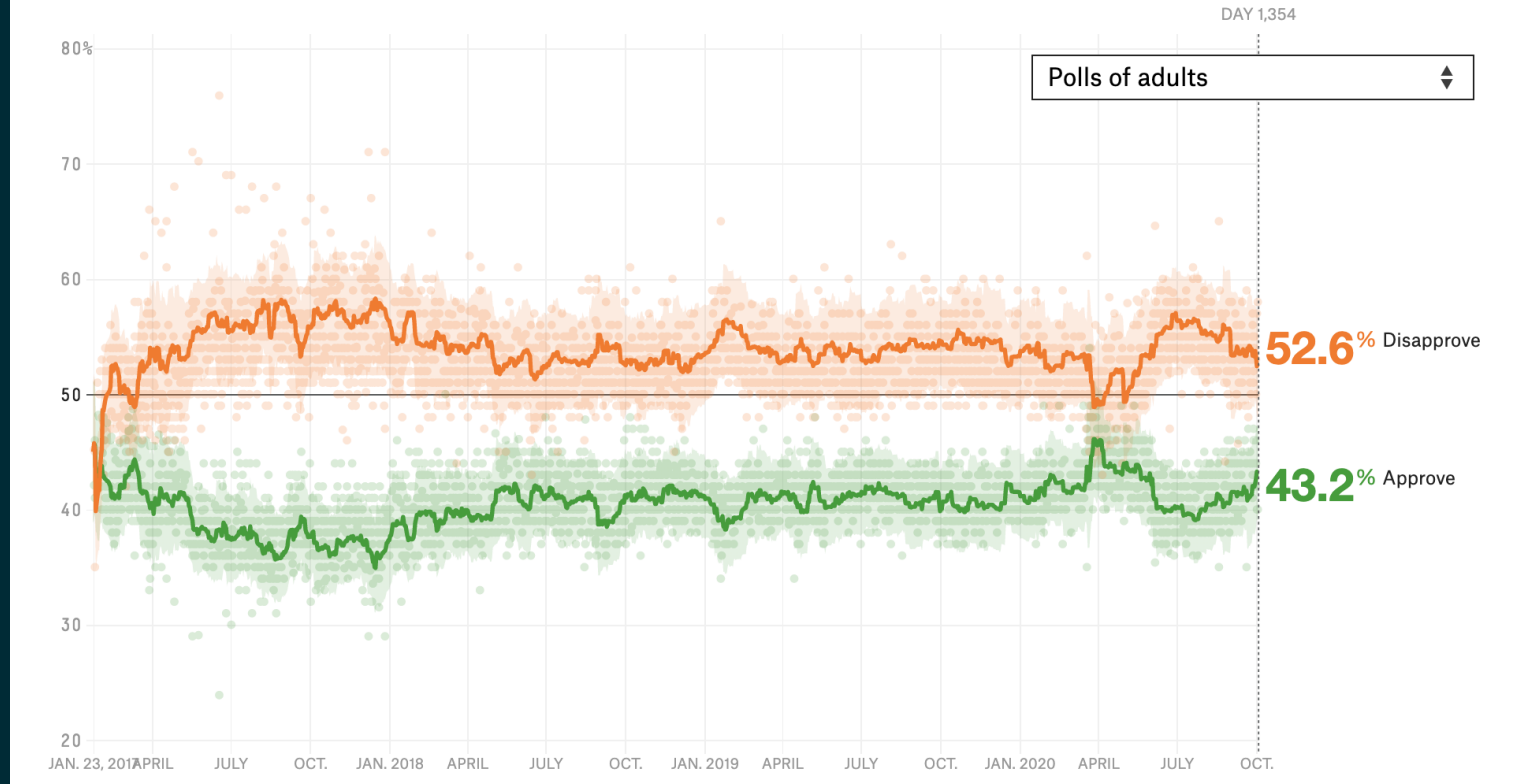


Case study: Approval rating of Donald Trump



How **unpopular** is Donald Trump?

An updating calculation of the president's approval rating, accounting for each poll's quality, recency, sample size and partisan lean. [How this works »](#)



Source: FiveThirtyEight



Data

```
trump
```

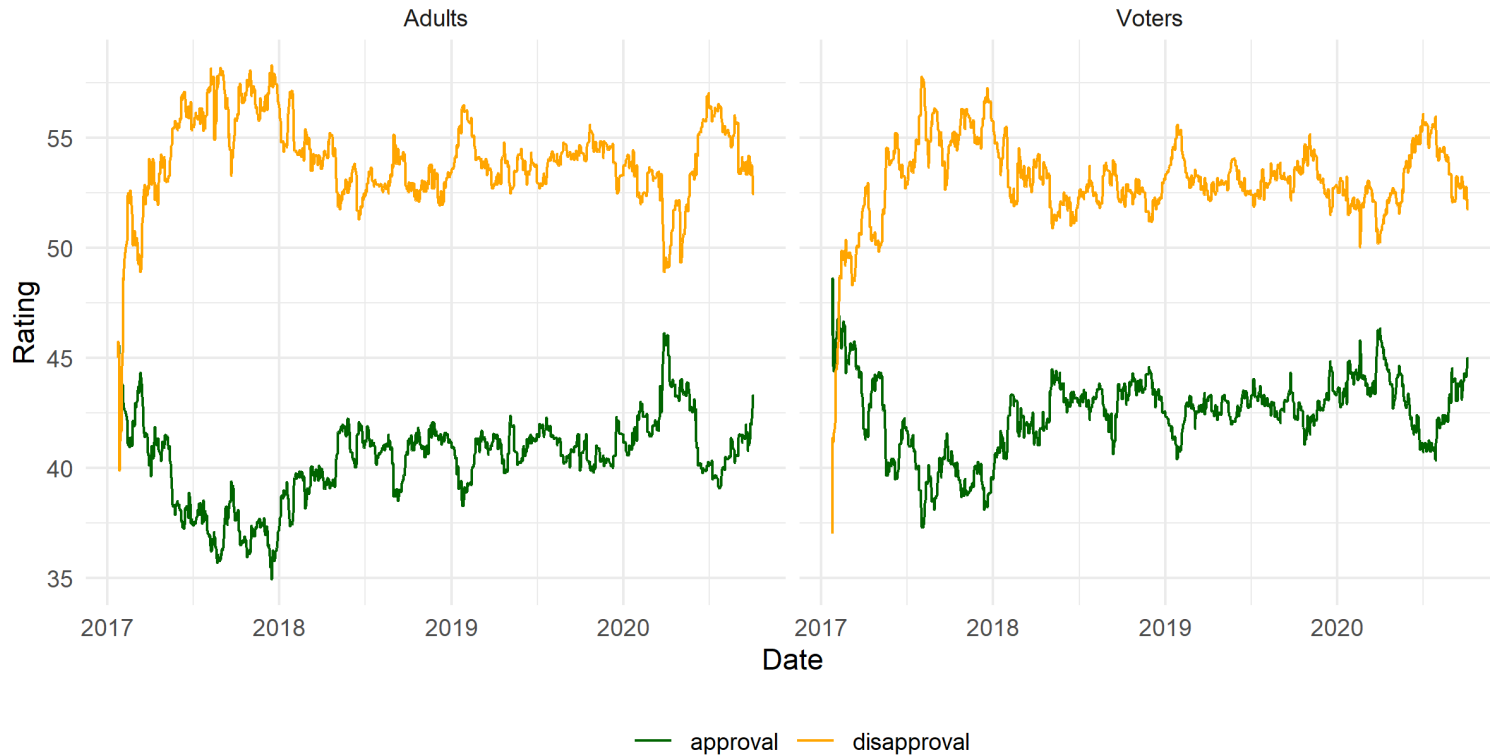
```
## # A tibble: 2,702 x 4
##   subgroup date      approval disapproval
##   <chr>    <date>      <dbl>      <dbl>
## 1 Voters   2020-10-04    44.7        52.2
## 2 Adults   2020-10-04    43.2        52.6
## 3 Adults   2020-10-03    43.2        52.6
## 4 Voters   2020-10-03    45.0        51.7
## 5 Adults   2020-10-02    43.3        52.4
## 6 Voters   2020-10-02    44.5        52.1
## 7 Voters   2020-10-01    44.1        52.8
## 8 Adults   2020-10-01    42.7        53.3
## 9 Adults   2020-09-30    42.2        53.7
## 10 Voters  2020-09-30    44.2        52.7
## # ... with 2,692 more rows
```



Goal

How (un)popular is Donald Trump?

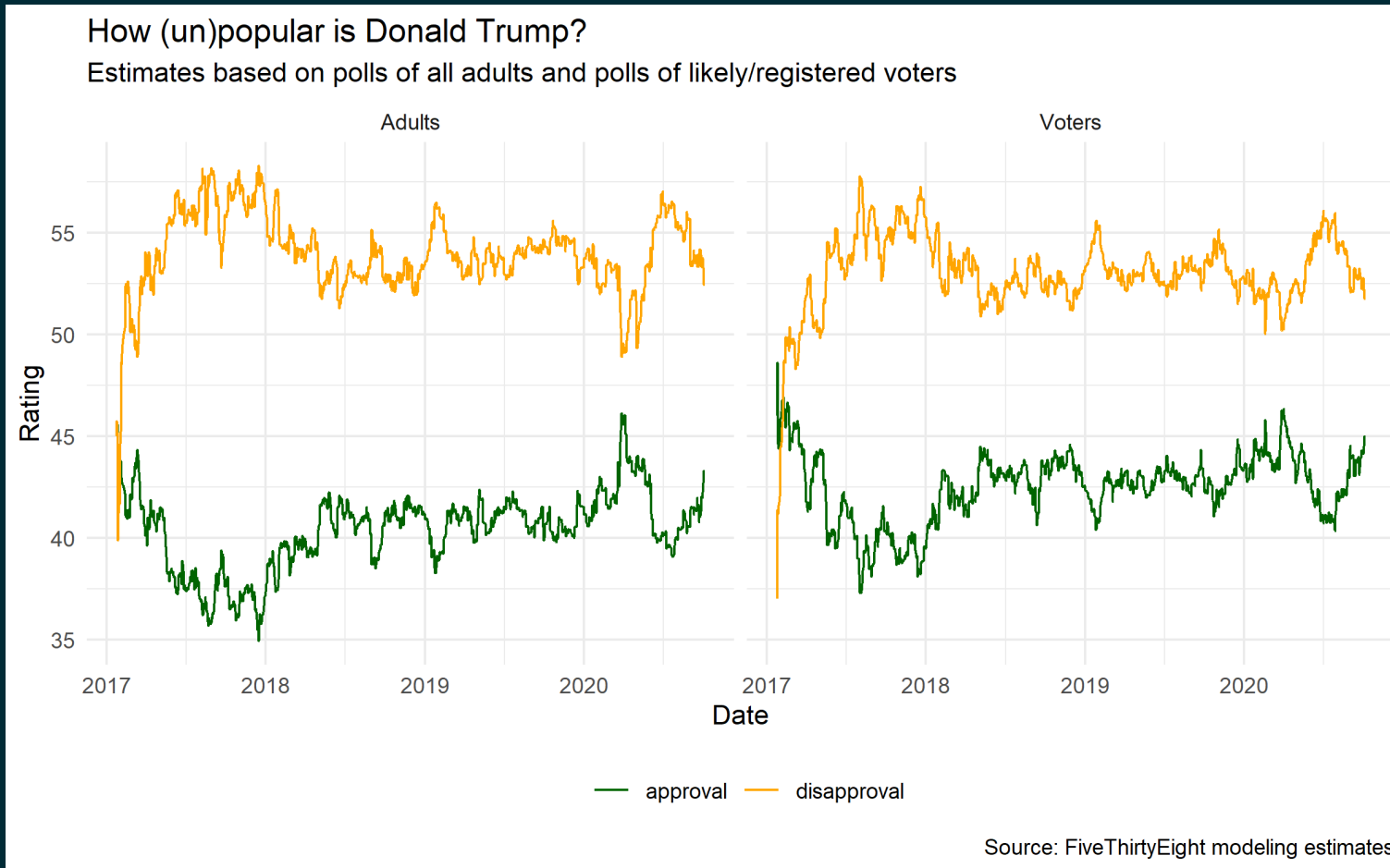
Estimates based on polls of all adults and polls of likely/registered voters



Source: FiveThirtyEight modeling estimates



Goal



Aesthetic mappings:

- ✓ x = date
- ✗ y = rating_value
- ✗ color = rating_type

Facet:

- ✓ subgroup (Adults and Voters)

Pivot

```
trump_longer <- trump %>%  
  pivot_longer(  
    cols = c(approval, disapproval),  
    names_to = "rating_type",  
    values_to = "rating_value"  
  )  
  
trump_longer
```

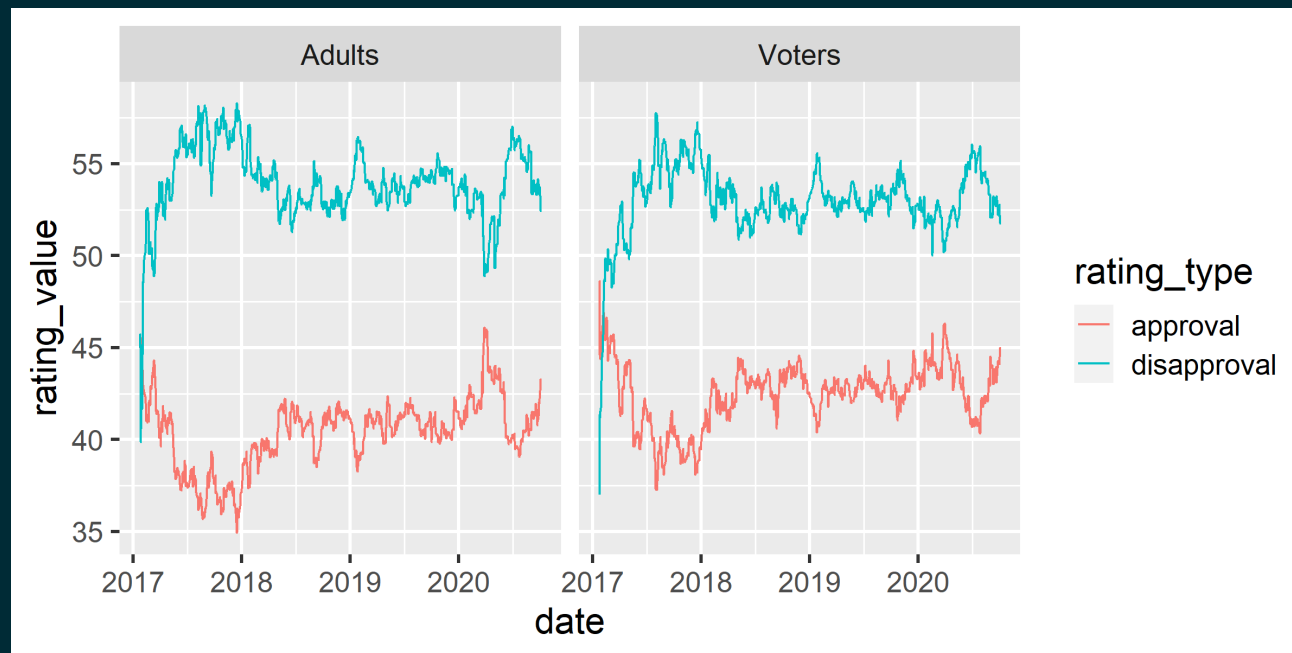
```
## # A tibble: 5,404 x 4  
##   subgroup date      rating_type rating_value  
##   <chr>    <date>    <chr>         <dbl>  
## 1 Voters  2020-10-04 approval      44.7  
## 2 Voters  2020-10-04 disapproval    52.2  
## 3 Adults  2020-10-04 approval      43.2  
## 4 Adults  2020-10-04 disapproval    52.6  
## 5 Adults  2020-10-03 approval      43.2  
## 6 Adults  2020-10-03 disapproval    52.6  
## 7 Voters  2020-10-03 approval      45.0  
## 8 Voters  2020-10-03 disapproval    51.7
```

...



Plot

```
ggplot(trump_longer,  
       aes(x = date, y = rating_value, color = rating_type, group = rating_type)) +  
  geom_line() +  
  facet_wrap(~ subgroup)
```



Code

Plot

```
ggplot(trump_longer,  
       aes(x = date, y = rating_value,  
           color = rating_type, group = rating_type)) +  
  geom_line() +  
  facet_wrap(~ subgroup) +  
  scale_color_manual(values = c("darkgreen", "orange")) +  
  labs(  
    x = "Date", y = "Rating",  
    color = NULL,  
    title = "How (un)popular is Donald Trump?",  
    subtitle = "Estimates based on polls of all adults and polls of likely/registered voters",  
    caption = "Source: FiveThirtyEight modeling estimates"  
  )
```

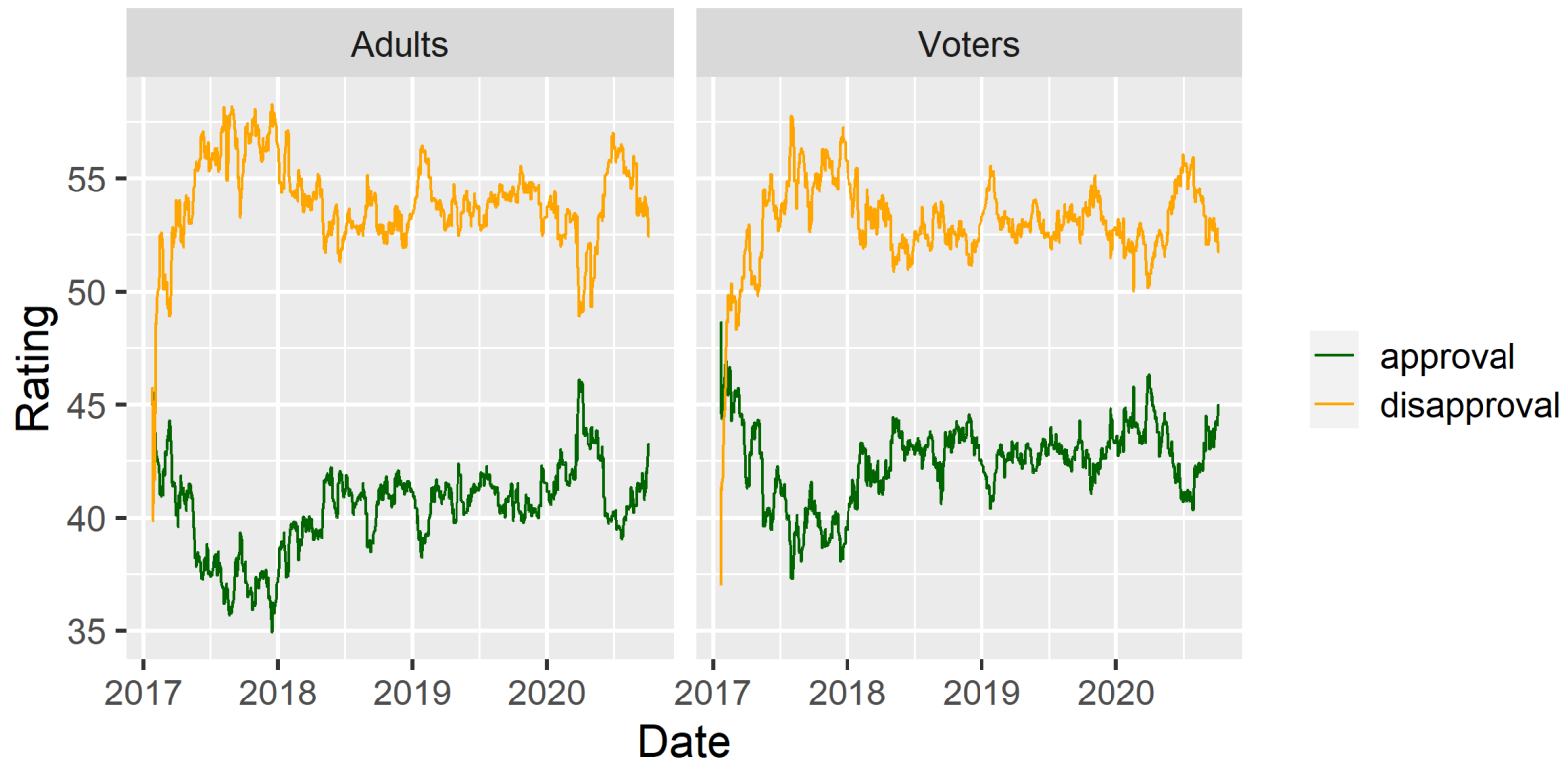


Code

Plot

How (un)popular is Donald Trump?

Estimates based on polls of all adults and polls of likely/registered voters



Source: FiveThirtyEight modeling estimates



Code

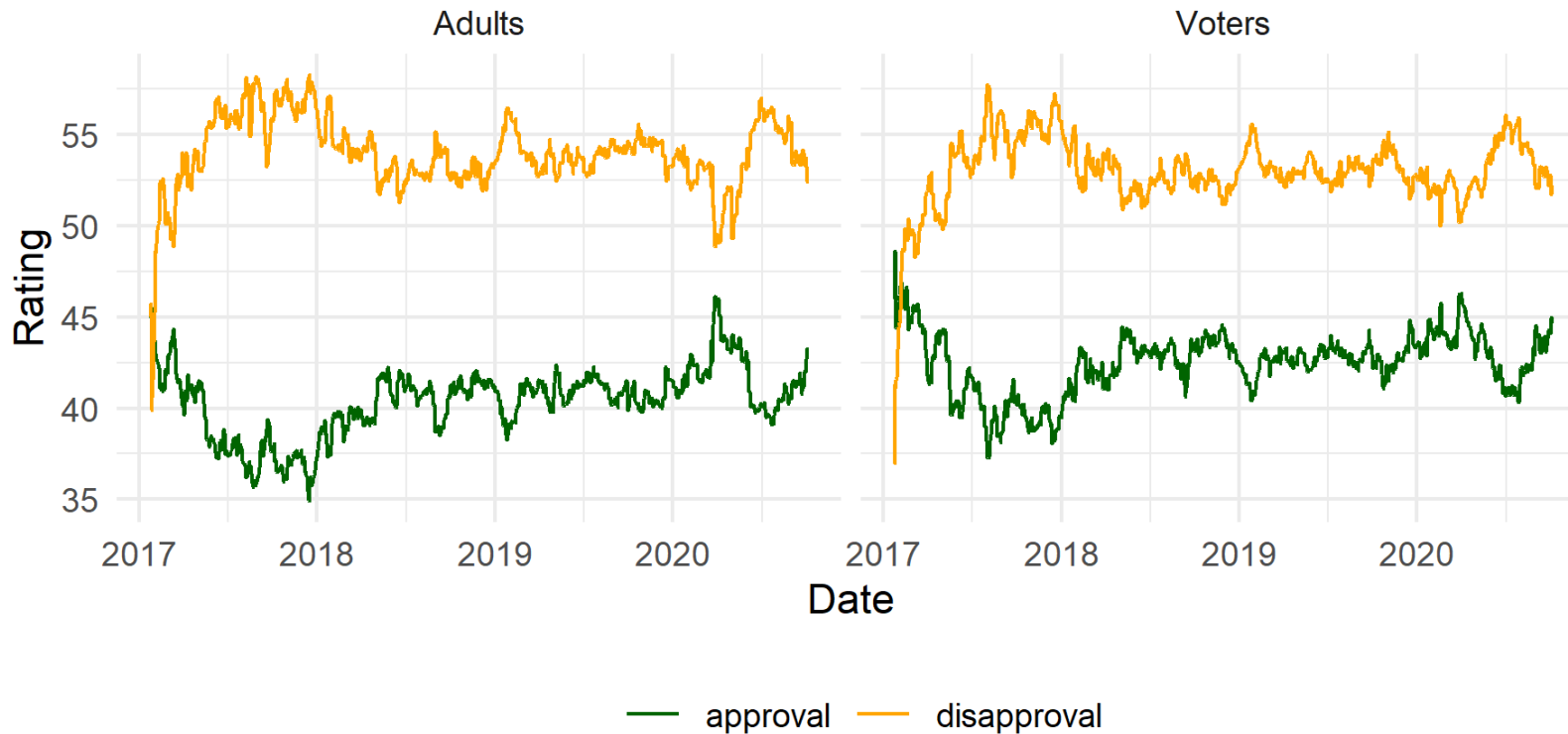
Plot

```
ggplot(trump_longer,  
       aes(x = date, y = rating_value,  
           color = rating_type, group = rating_type)) +  
  geom_line() +  
  facet_wrap(~ subgroup) +  
  scale_color_manual(values = c("darkgreen", "orange")) +  
  labs(  
    x = "Date", y = "Rating",  
    color = NULL,  
    title = "How (un)popular is Donald Trump?",  
    subtitle = "Estimates based on polls of all adults and polls of likely/registered voters",  
    caption = "Source: FiveThirtyEight modeling estimates"  
  ) +  
  theme_minimal() +  
  theme(legend.position = "bottom")
```



How (un)popular is Donald Trump?

Estimates based on polls of all adults and polls of likely/registered voters



Source: FiveThirtyEight modeling estimates