Tidying data

Reorganise data

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The following content is based on Mine Çetinkaya-Rundel's excellent book Data Science in a Box

We...

have *data organised in an unideal way for our analysis*

want *to reorganise the data to carry on with our analysis*

Data: Sales

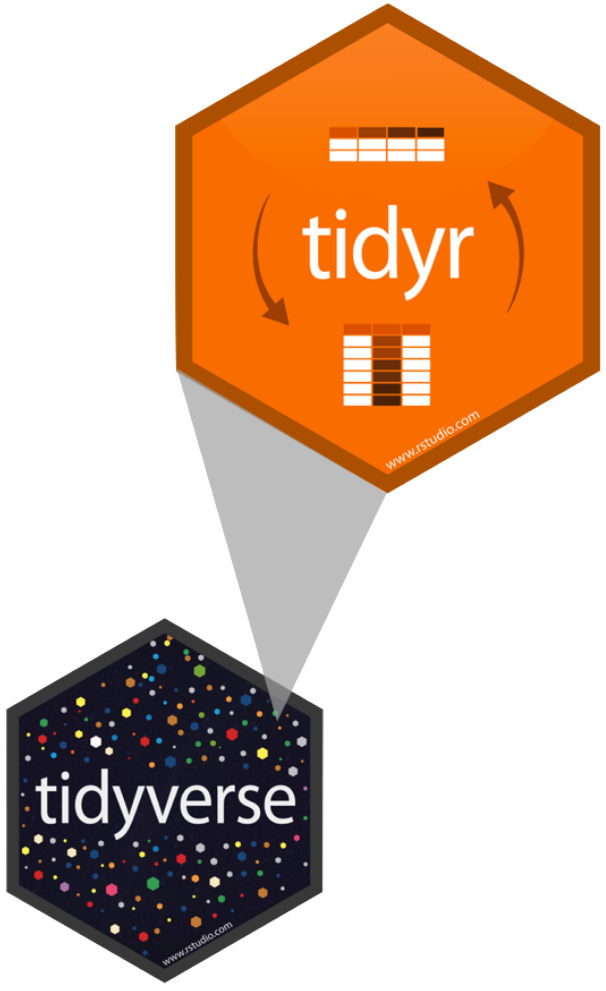
We have...

```
## # 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>
```

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

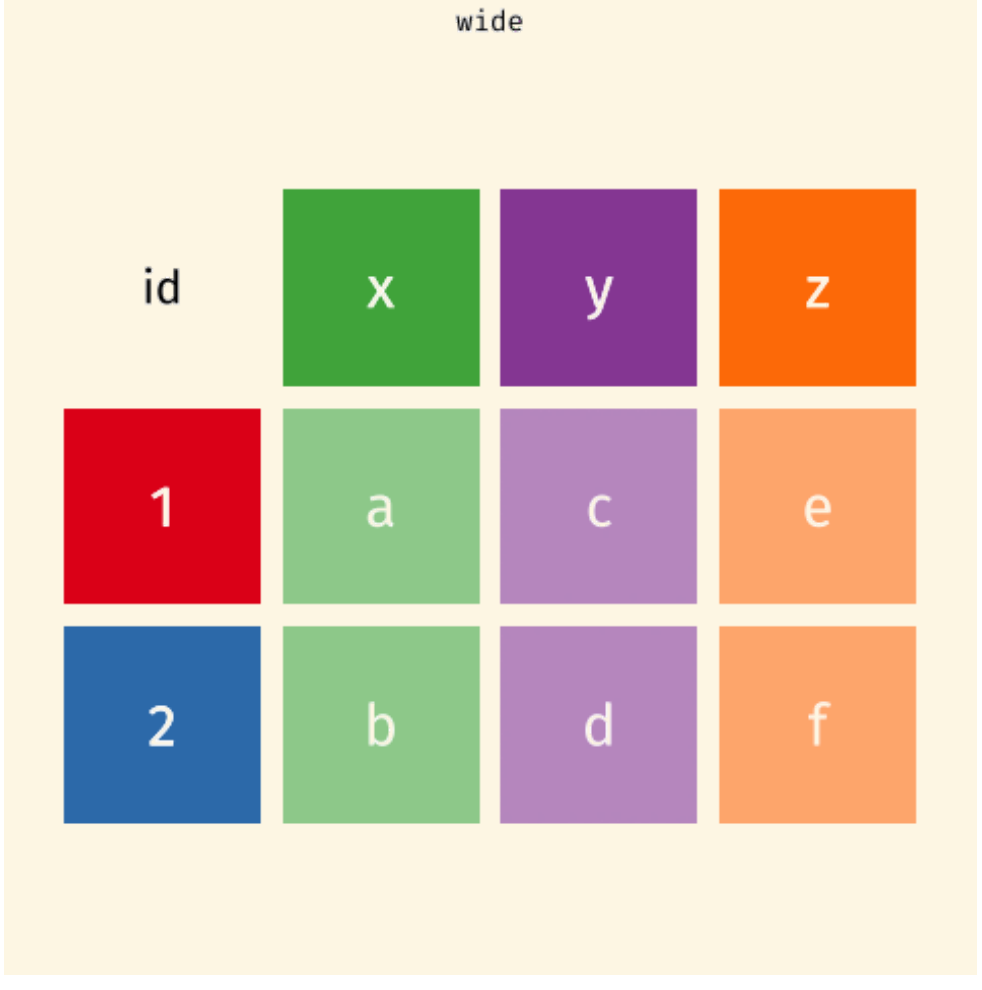


The goal of tidyr is to help you tidy your data via

- 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

Pivoting data



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

```
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

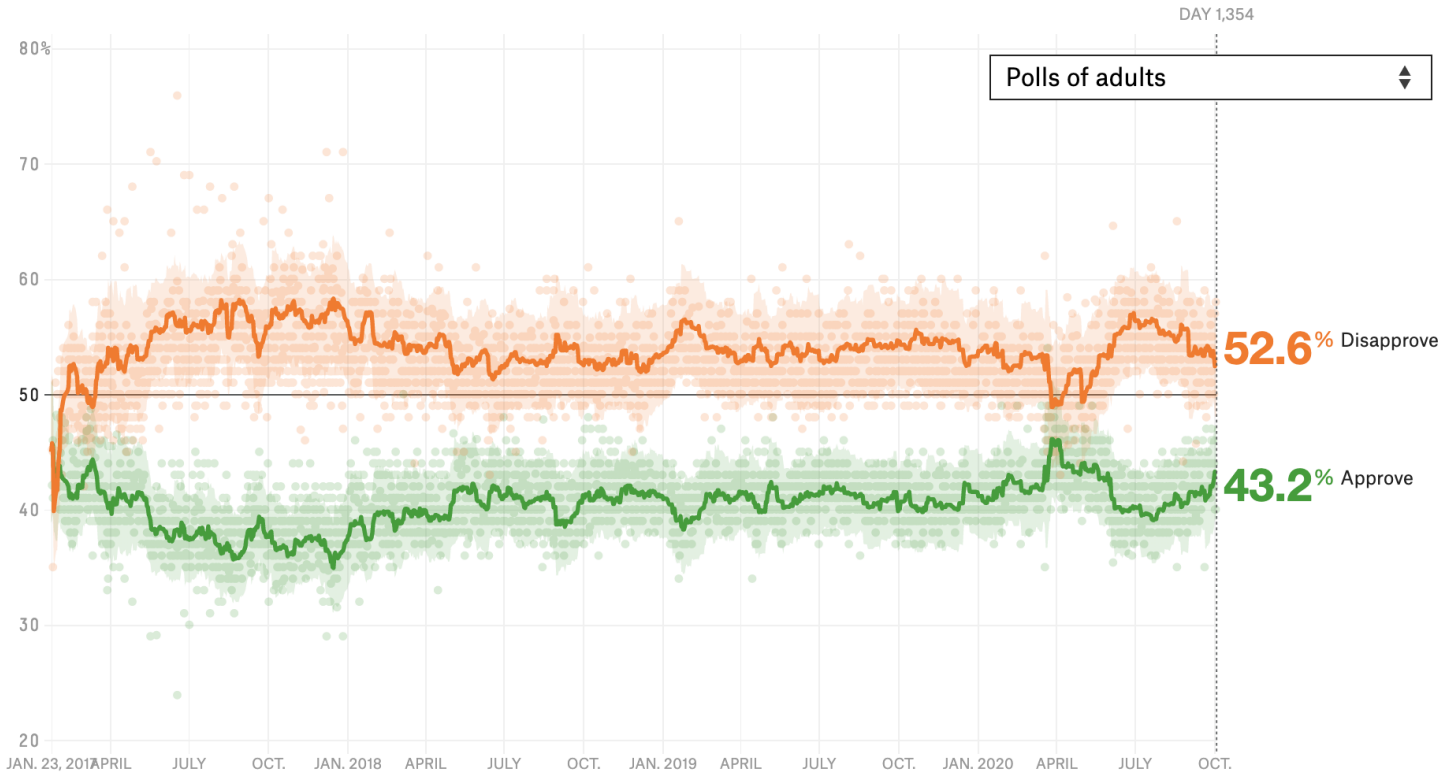
```
purchases %>%
  pivot_wider(
    names_from = item_no,
    values_from = item
  )
```

```
## # 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 »



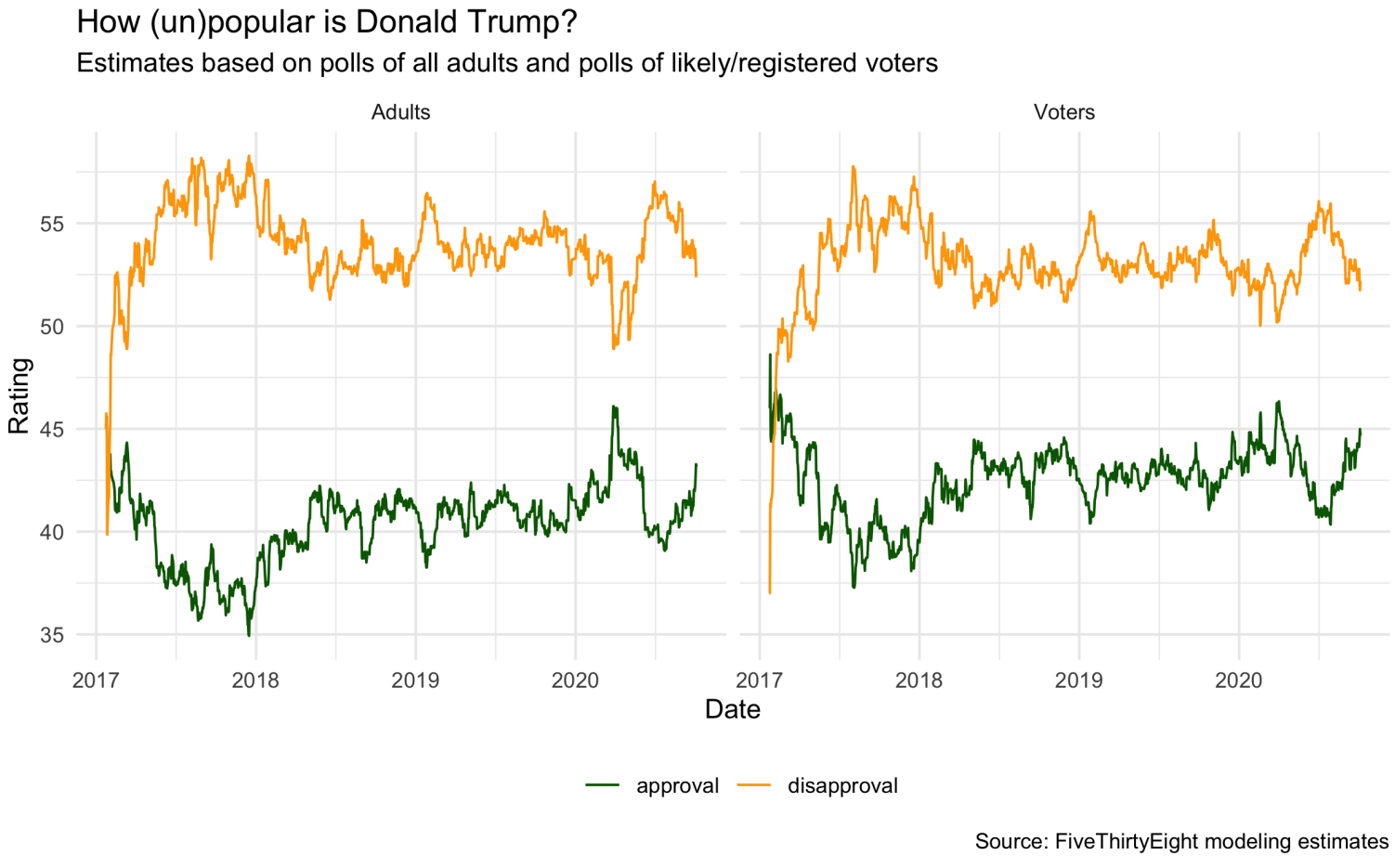
Source: FiveThirtyEight

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



Aesthetic mappings:

✅ x = `date`

❌ y = `rating_value`

❌ color = `rating_type`

Facet:

✅ `subgroup` (Adults and Voters)

Pivot

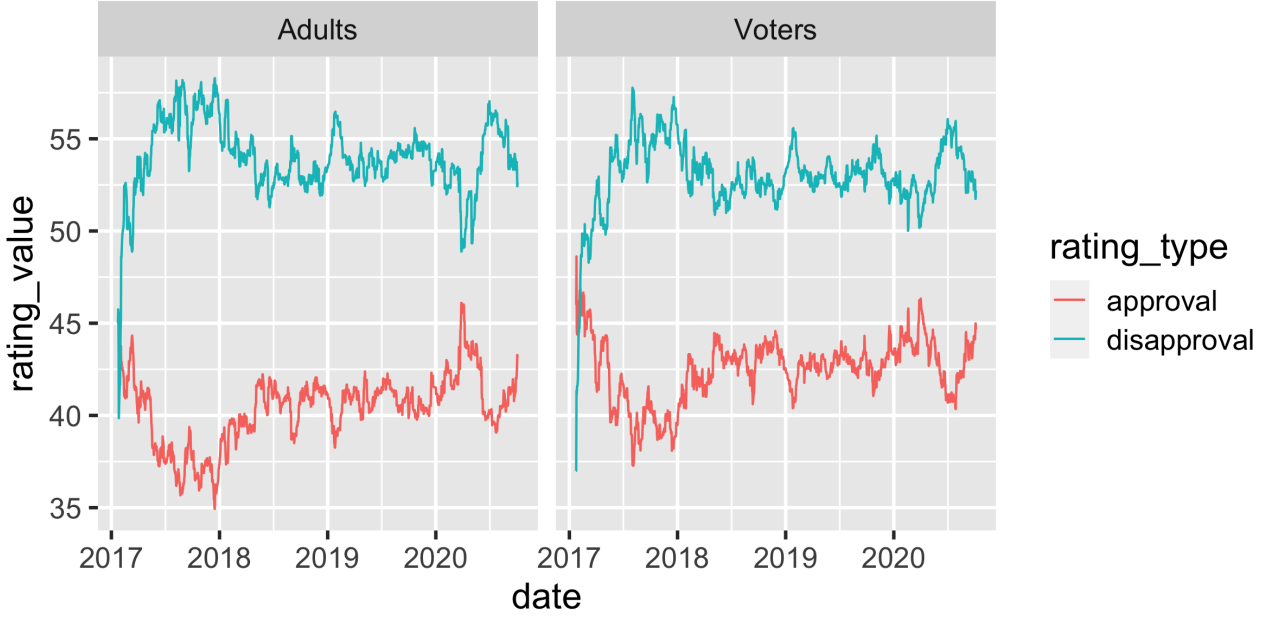
```
trump_longer <- trump %>%
  pivot_longer(
    cols = c(approval, disapproval),
    names_to = "rating_type",
    values_to = "rating_value"
  )

trump_longer
```

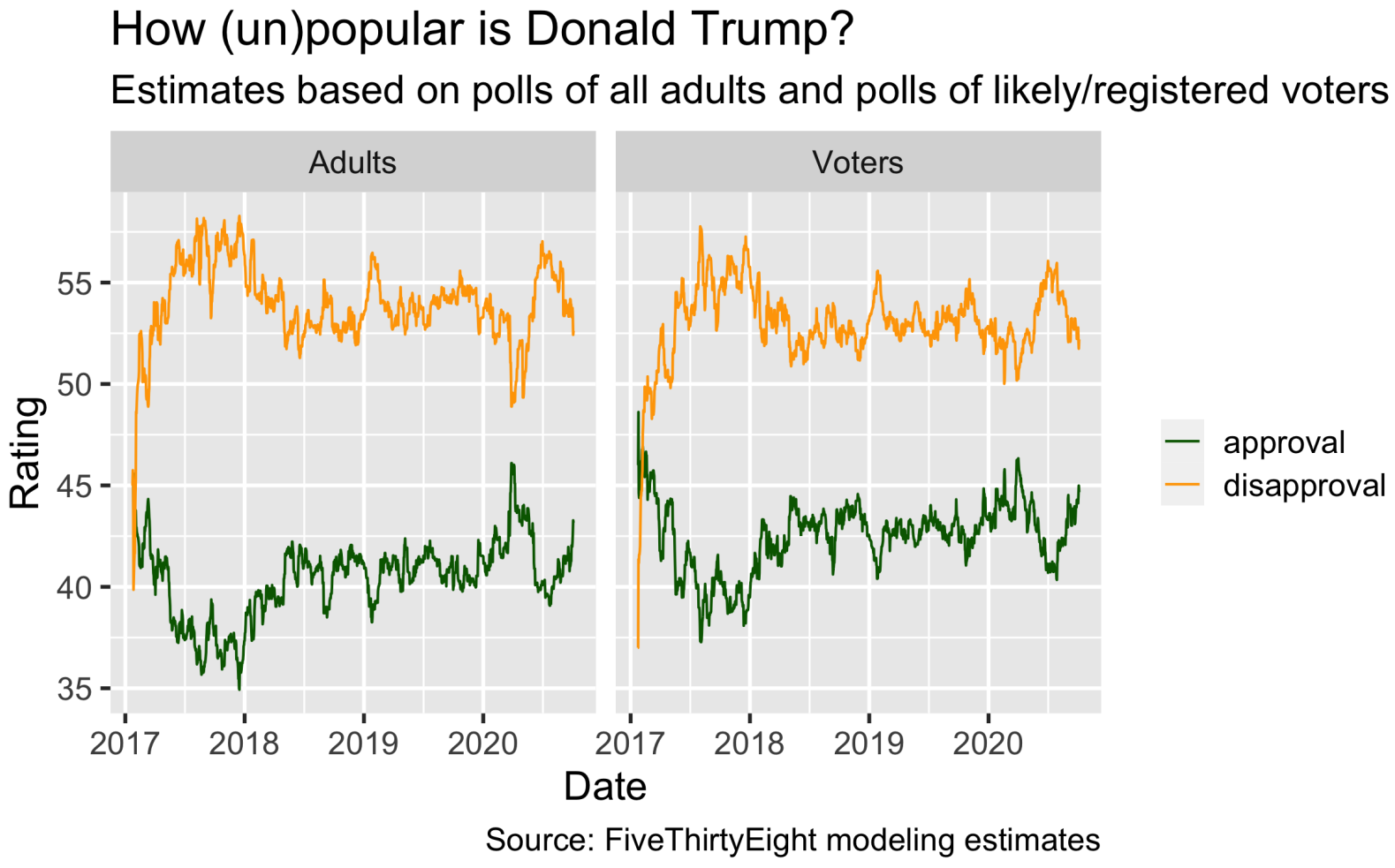
```
## # A tibble: 5,404 x 4
##    subgroup date       rating_type rating_value
##    <chr>    <date>     <chr>              <dbl>
##  1 Voters   2020-10-04 approval            44.7
##  2 Voters   2020-10-04 disapproval         52.2
##  3 Adults   2020-10-04 approval            43.2
##  4 Adults   2020-10-04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

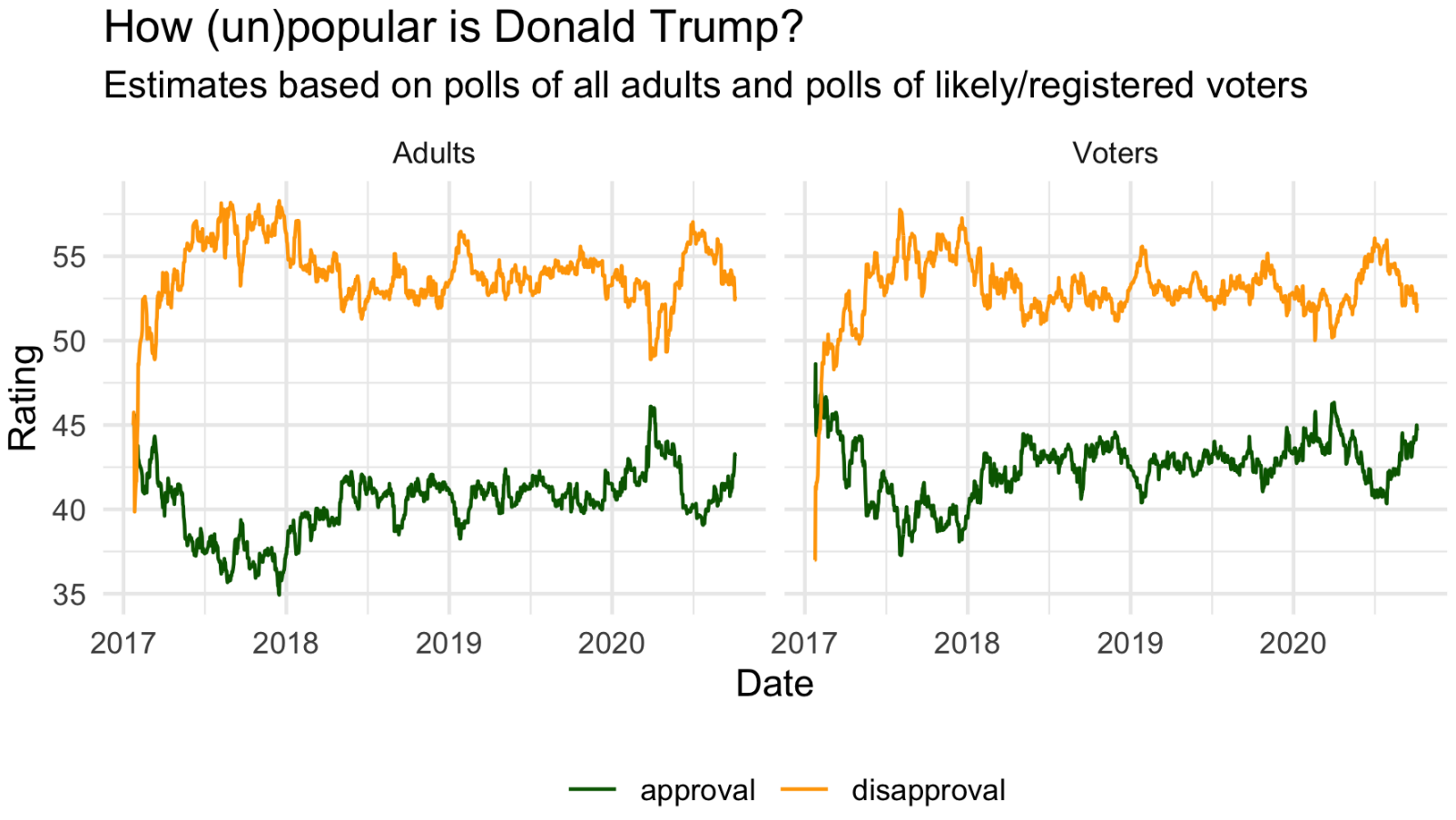
```
ggplot(trump_longer,
       aes(x = date, y = rating_value, color = rating_type, group = rating_type)) +
  geom_line() +
  facet_wrap(~ subgroup)
```



Code Plot


How (un)popular is Donald Trump?
Estimates based on polls of all adults and polls of likely/registered voters
Adults
Voters
Rating
55
50
45
40
35
2017
2018
2019
2020
Date
approval
disapproval
Source: FiveThirtyEight modeling estimates

Code Plot


How (un)popular is Donald Trump?
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55
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45
40
35
2017
2018
2019
2020
Date
approval
disapproval
Source: FiveThirtyEight modeling estimates