ggplot – groups, facets

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PLS 397 Analyzing and Visualizing Data
Fall 2023

Check-in and logistics

Today's quick check-in:

https://forms.gle/j9ahmPcaeiGF83Pz7

This should take about 5 minutes.

Logistics:

- In-class exercises are due the following morning at 9am.
- There will be no class the Wednesday before Thanksgiving.

This week's reading

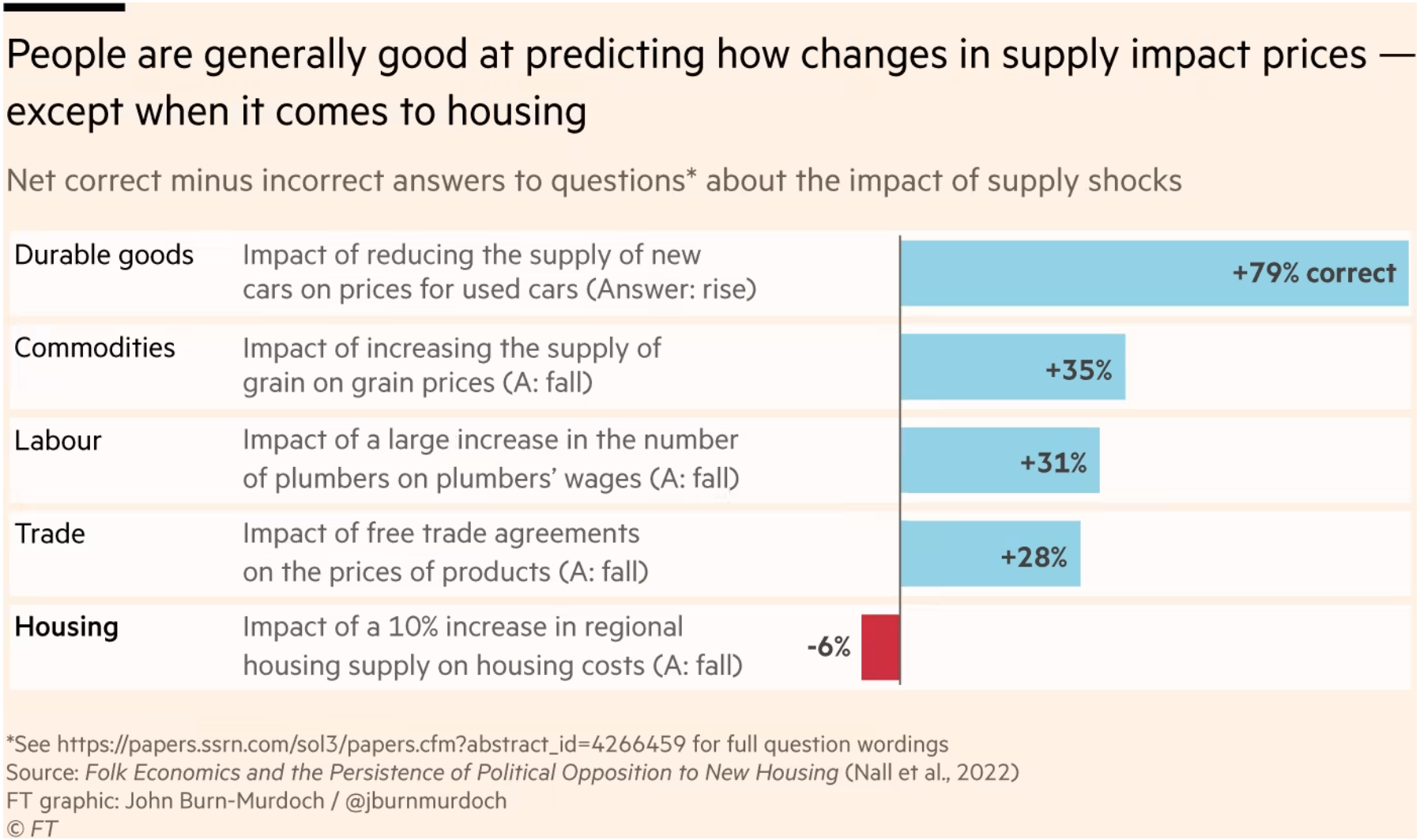
- Wednesday: 4.6, 4.7
- Following Monday: 5.2

Table of Contents

Housing costs in the US

- Housing costs are very high and increasing in the United States.
- It's clear that the issue is a lack of supply–relatively few houses get built, especially in larger cities.
- Debate: will building market rate housing decrease housing costs? Or do we need to build below market rate/subsidized housing to reduce prices?

Financial Times housing costs article

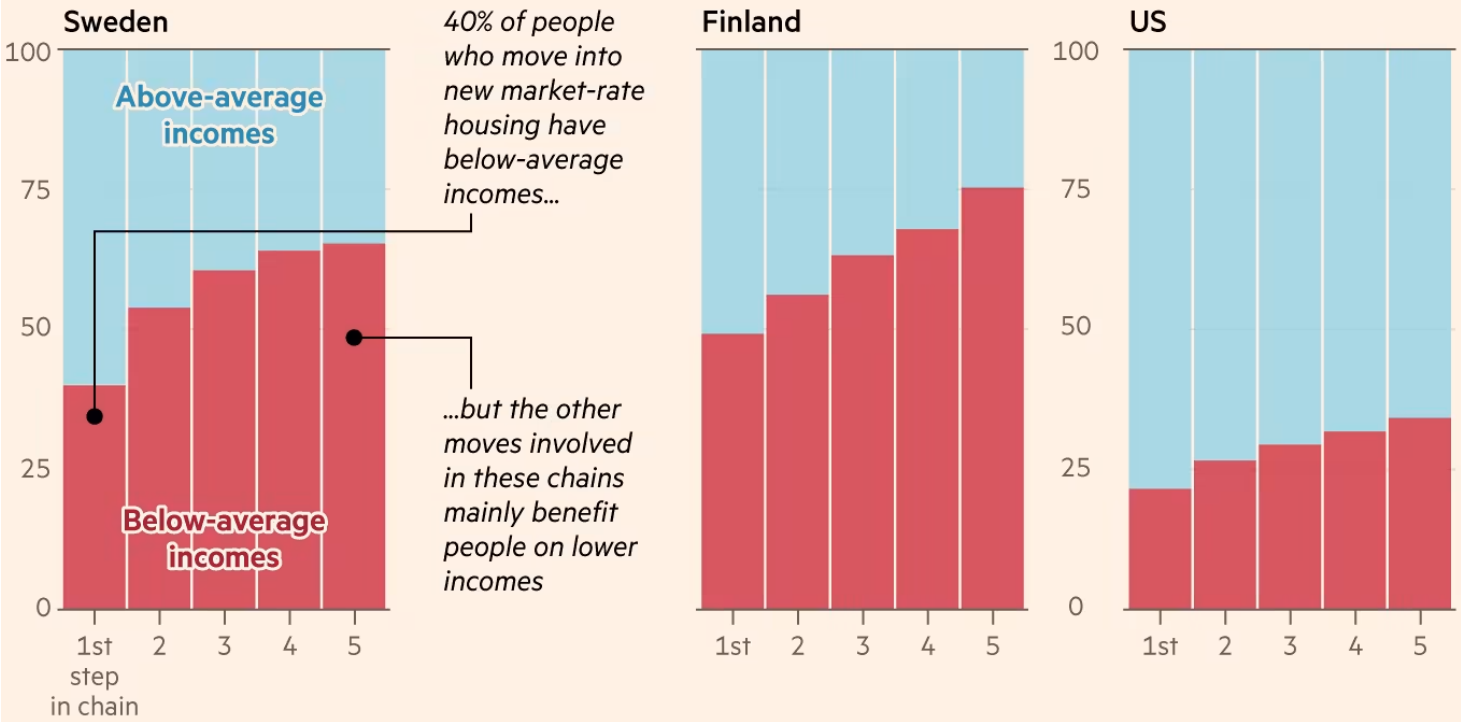



```
+ coord_flip()
```

Financial Times housing costs article

Most people who move into new market-rate housing are higher earners, but the chain of moves this triggers frees up homes for lower earners

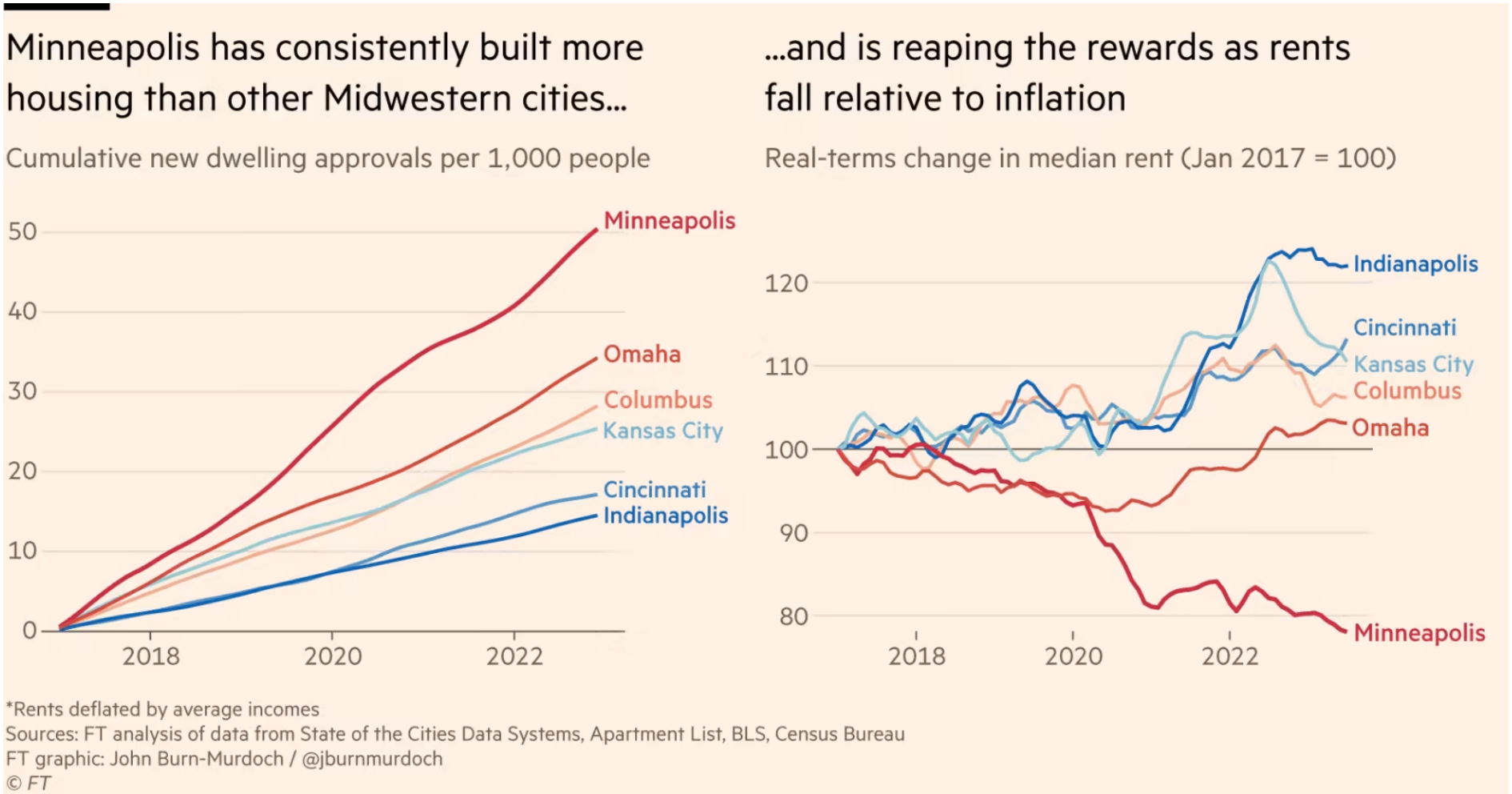
Income breakdown of in-moving residents at each stage of the chain triggered by moves into new market-rate housing



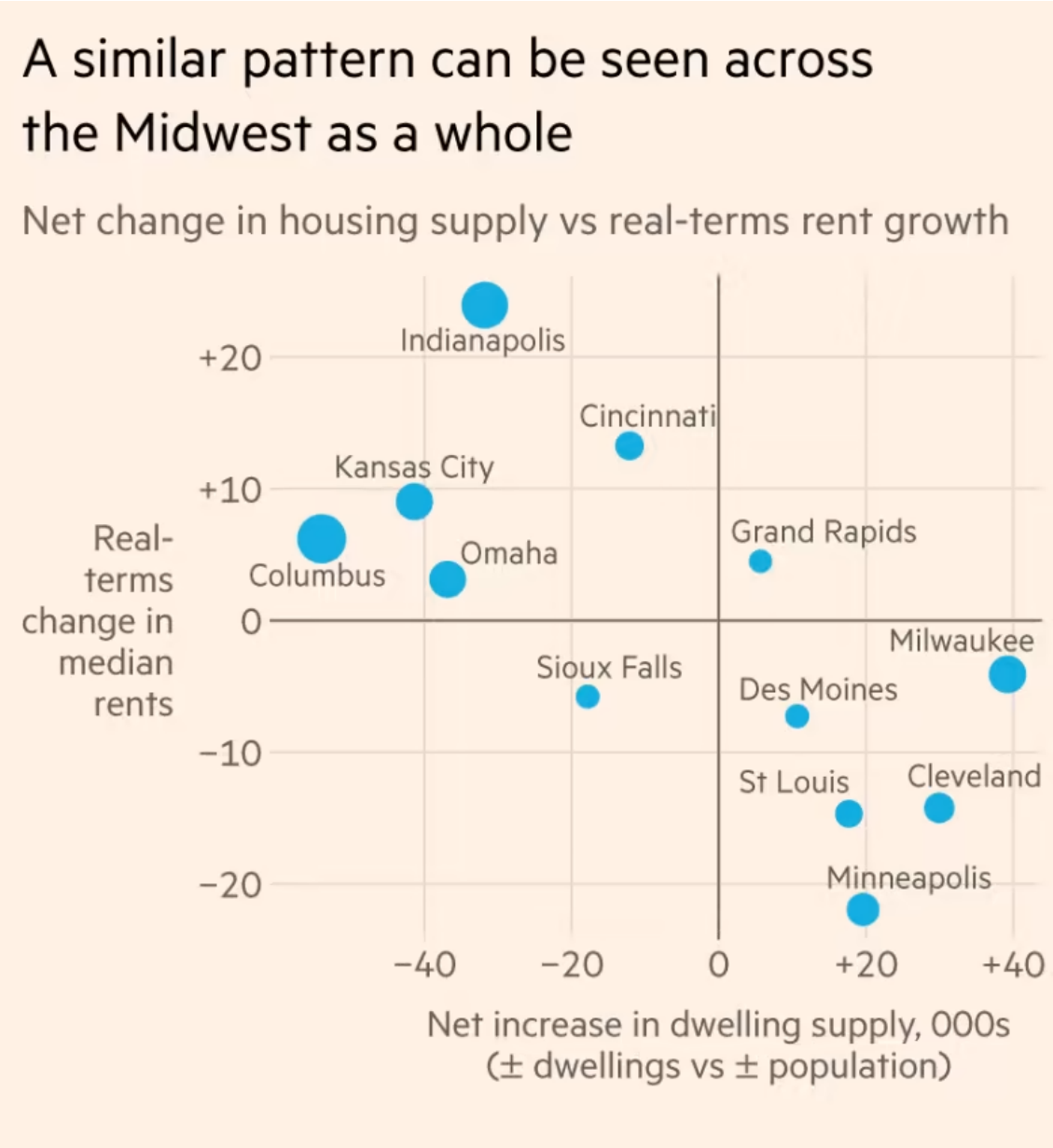
Sources: *City-wide effects of new housing supply: Evidence from moving chains* (Bratu et al., 2023); Uppsala University Urban Lab; *The Effect of New Market-Rate Housing Construction on the Low Income Housing Market* (Mast, 2001)
FT graphic: John Burn-Murdoch / @jburnmurdoch


```
+ position = "fill"
```

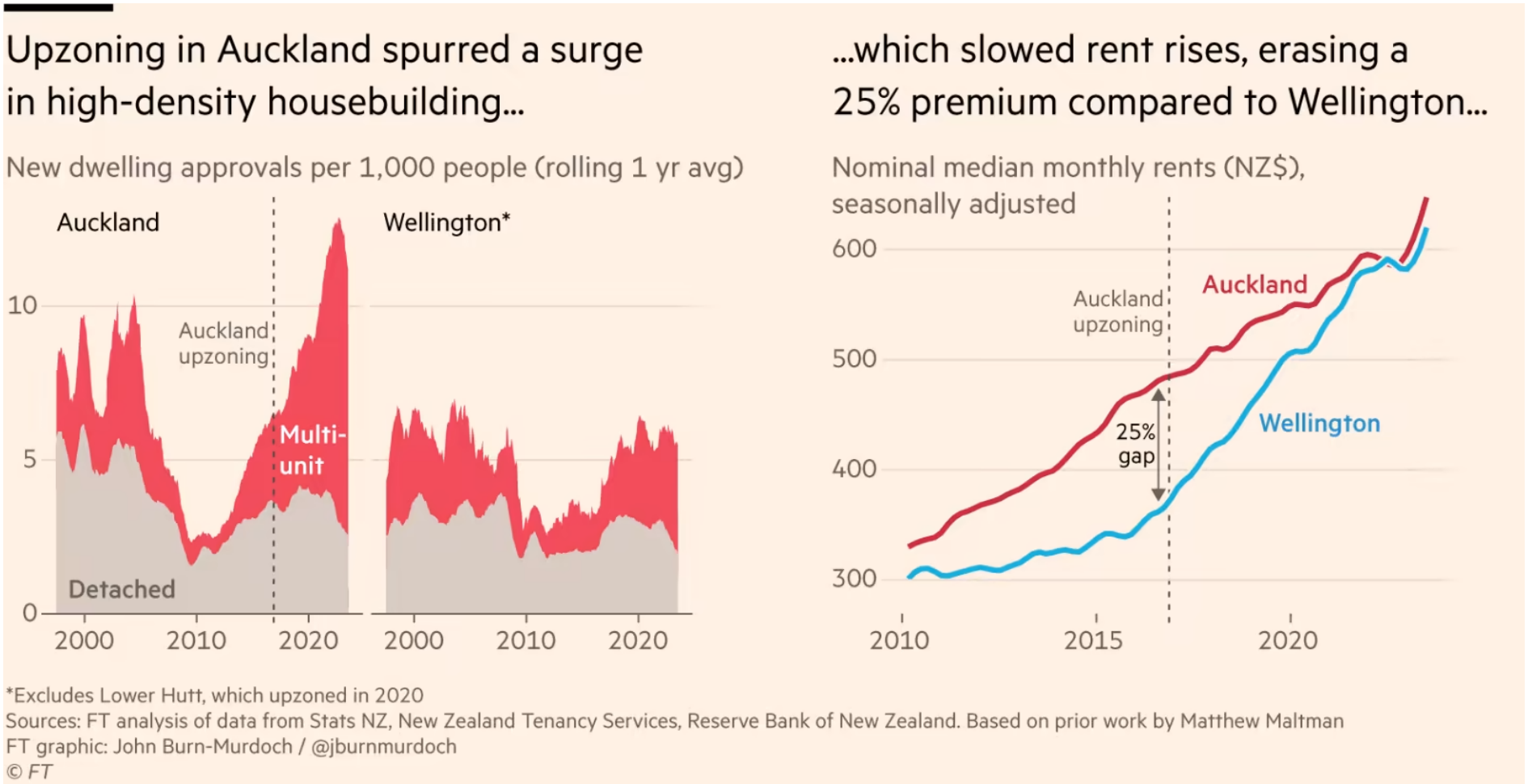
Financial Times housing costs article



Financial Times housing costs article



Financial Times housing costs article



Financial Times housing costs article

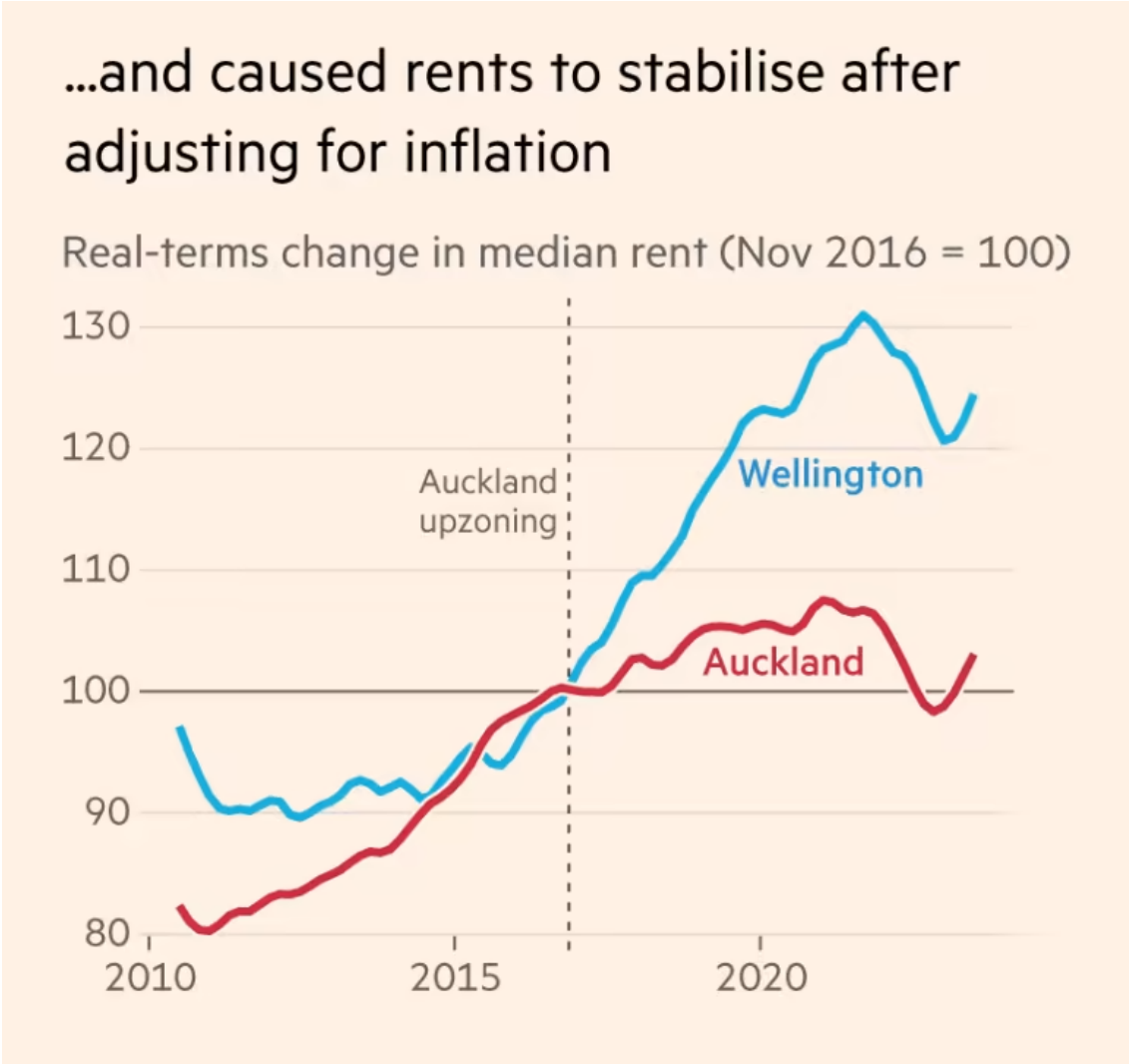
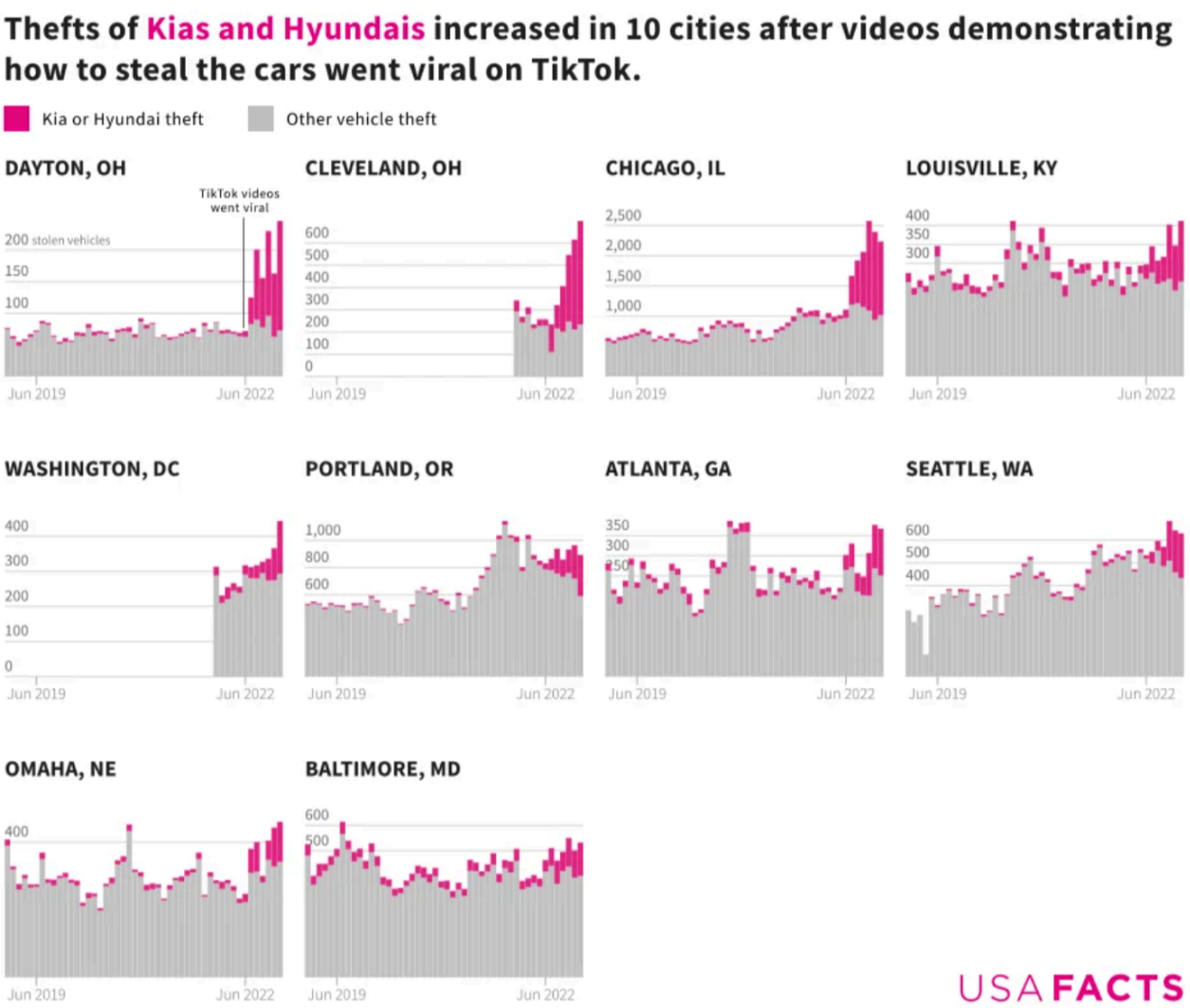


Table of Contents

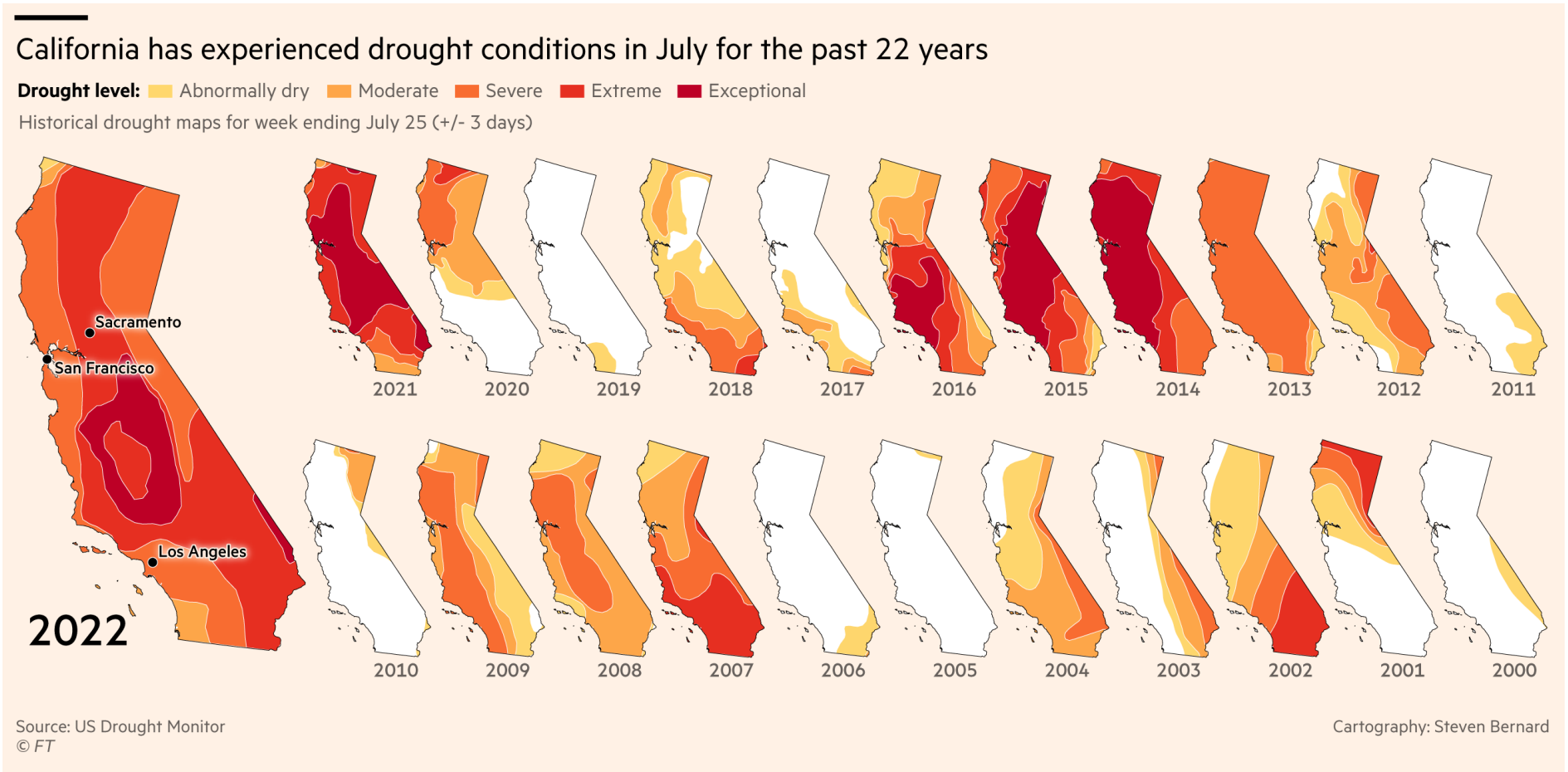
Small multiples



Charts from USAFacts (usafacts.org/data-projects/car-thefts)

Data from police departments in Atlanta; Baltimore; Chicago; Cleveland; Dayton; Louisville Metro; Omaha; Portland; Seattle and Washington, DC

Small multiples



Small multiples/facets

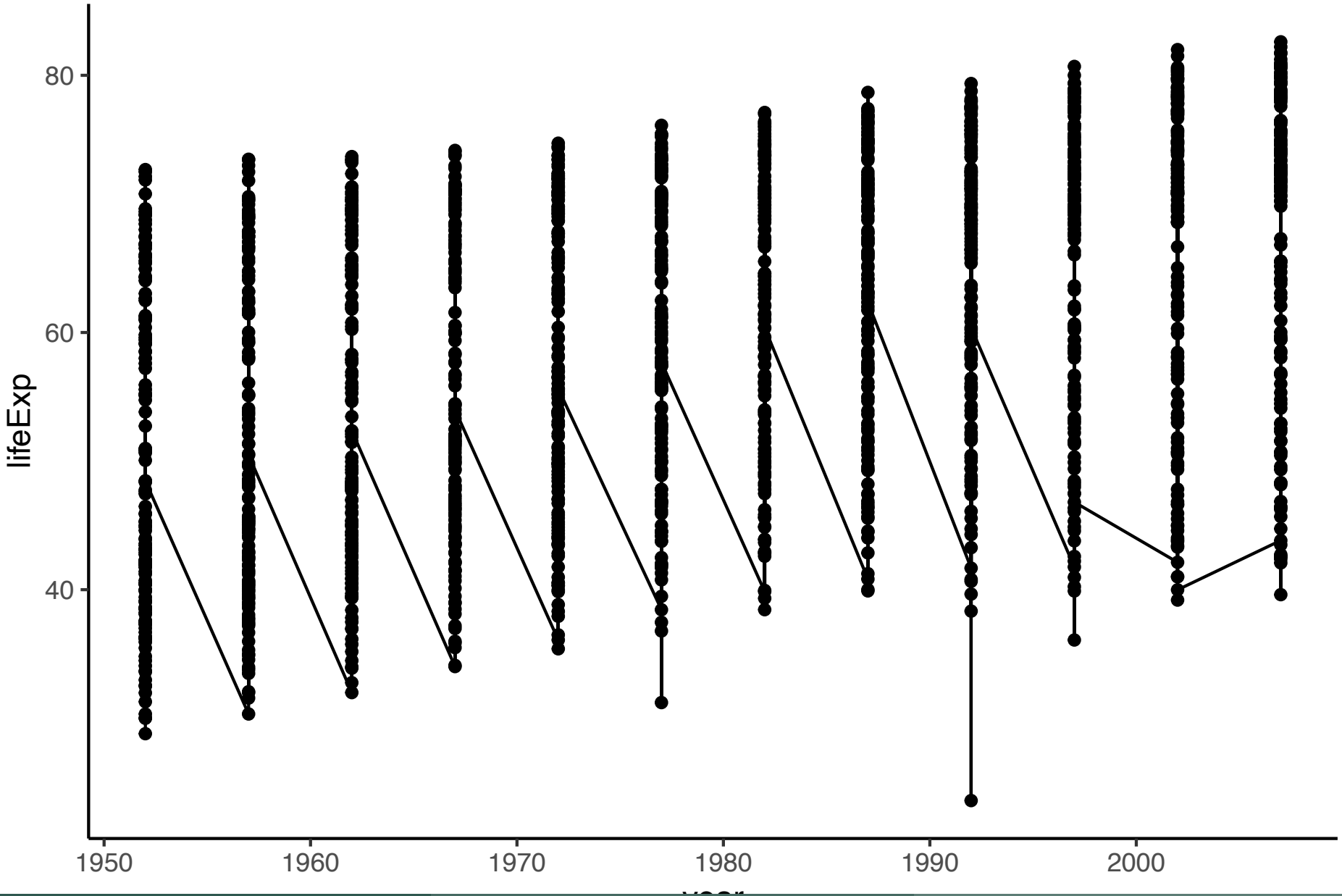
- “Small multiples" (Tufte) or faceted plots are a very useful tool:
  - Avoid cluttered plots
  - Easy way to compare across discrete variables
  - Cognitively easy: same basic plot, repeated.
- How do we do this in ggplot?
- Step 1: make sure our `aes` call includes our facetting variable
- `+ facet_wrap(~ variable)`
- Advanced use: if we have two facetting variables, we can use `+ facet_grid(var1 ~ var2)`

Groups

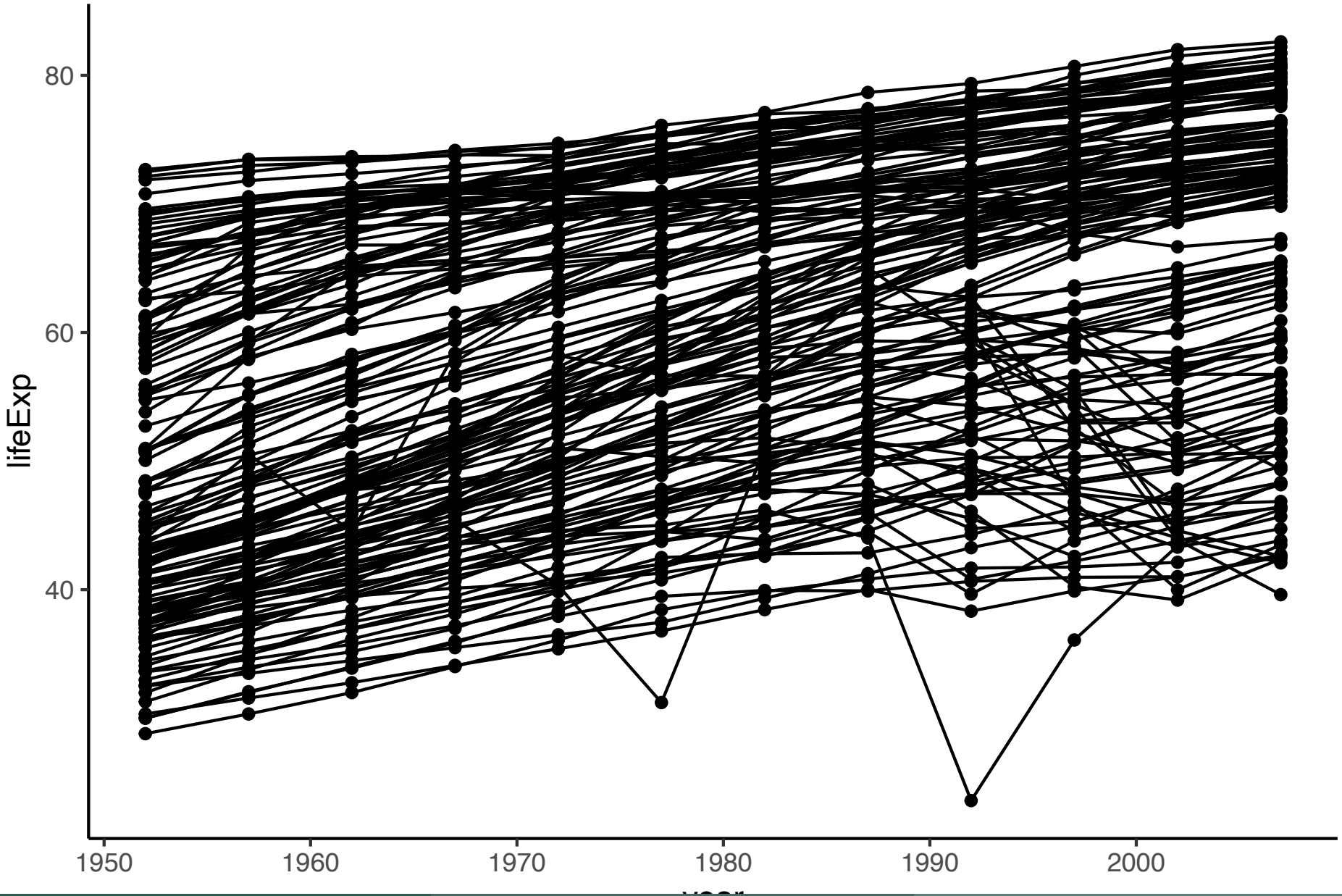
Let's start with a simple plot:

- Using the full gapminder dataset...
- ...make a line plot...
- ...with year as the x axis and life expectancy as the y axis

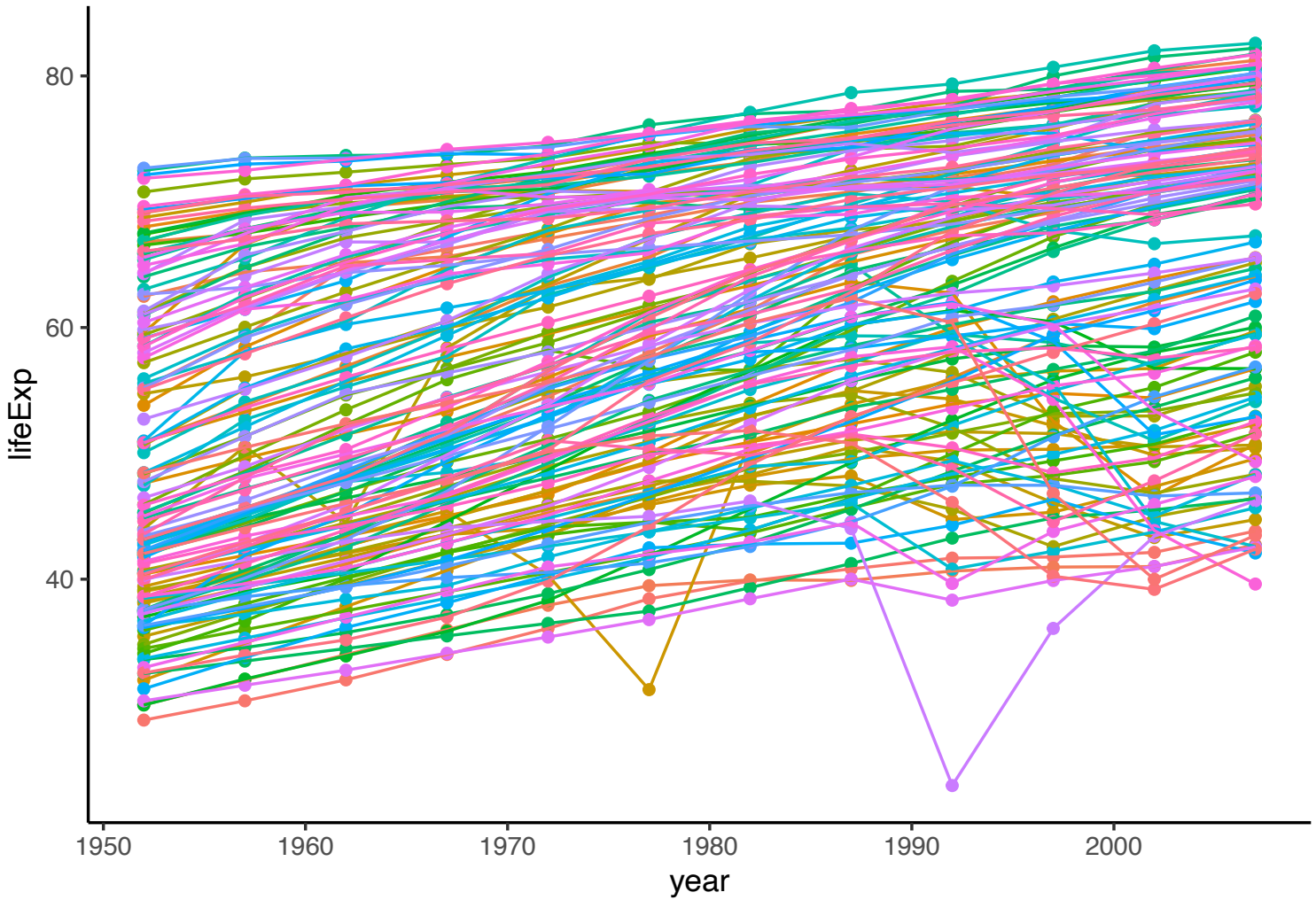
What's wrong?



Specifying `country` as the group

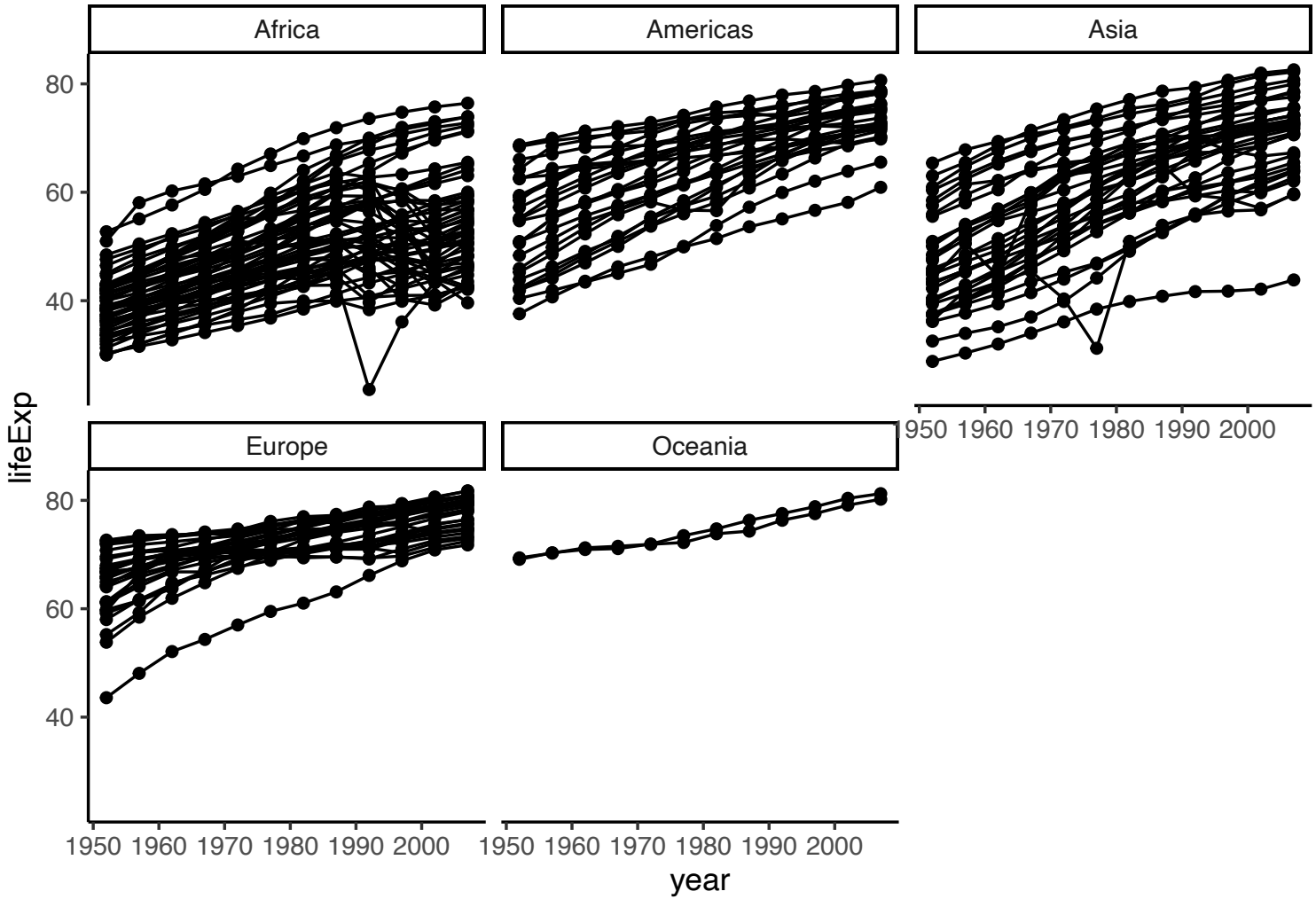


Setting the color also gives us a group

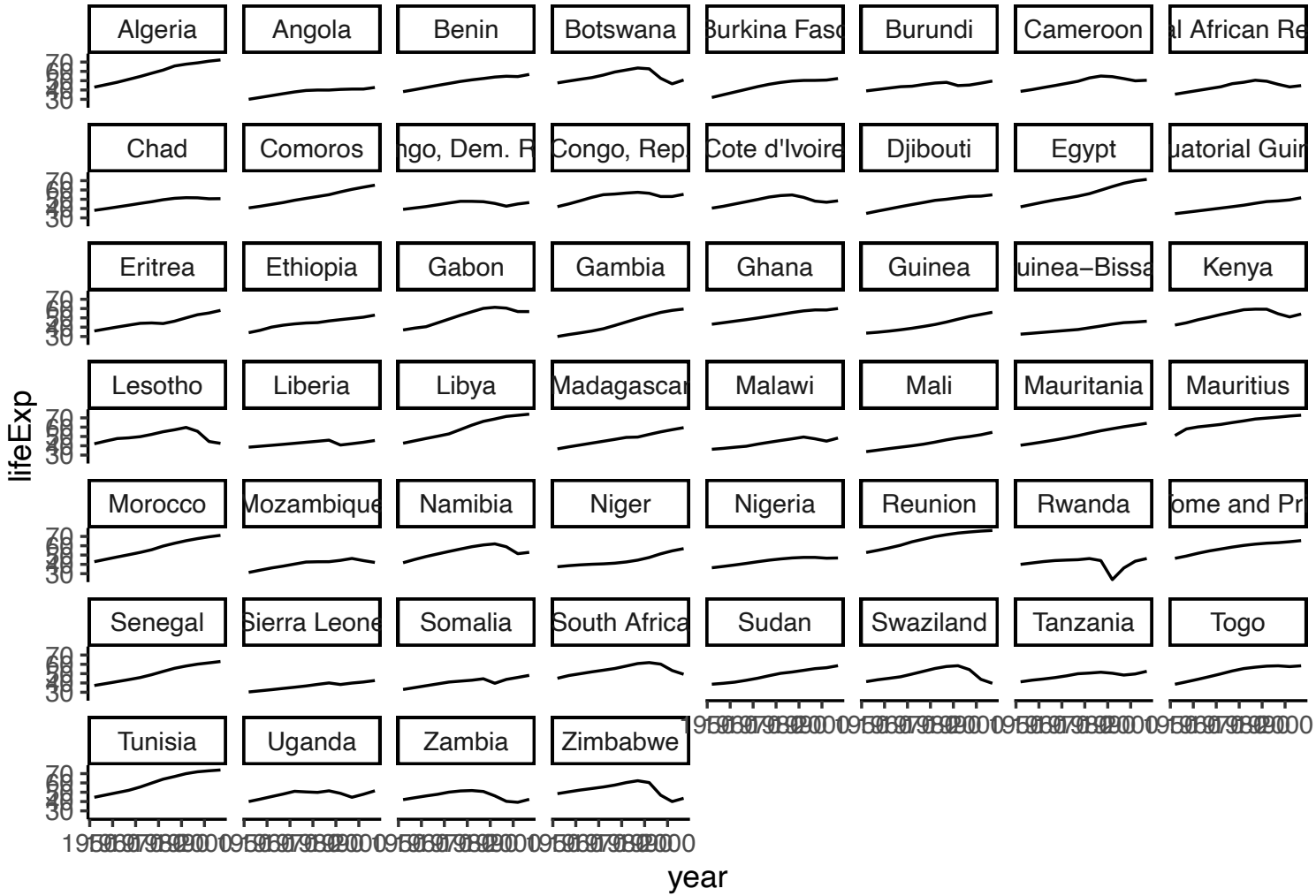



```
+ theme(legend.position = "none")
```

This is really busy! Can we facet by continent?

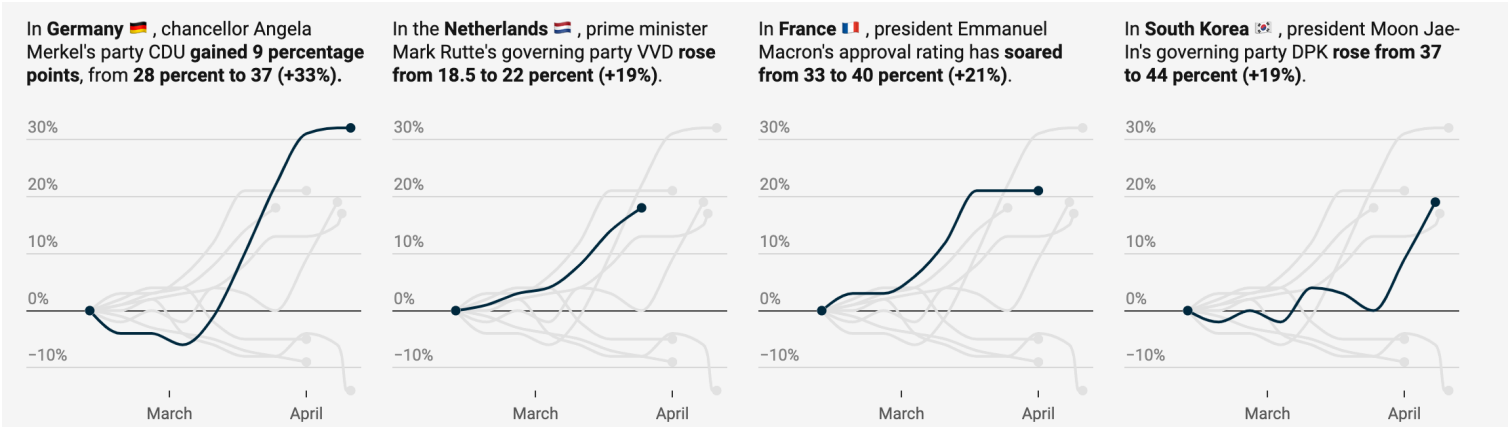


Show facetted line graphs for just Africa



gghighlight

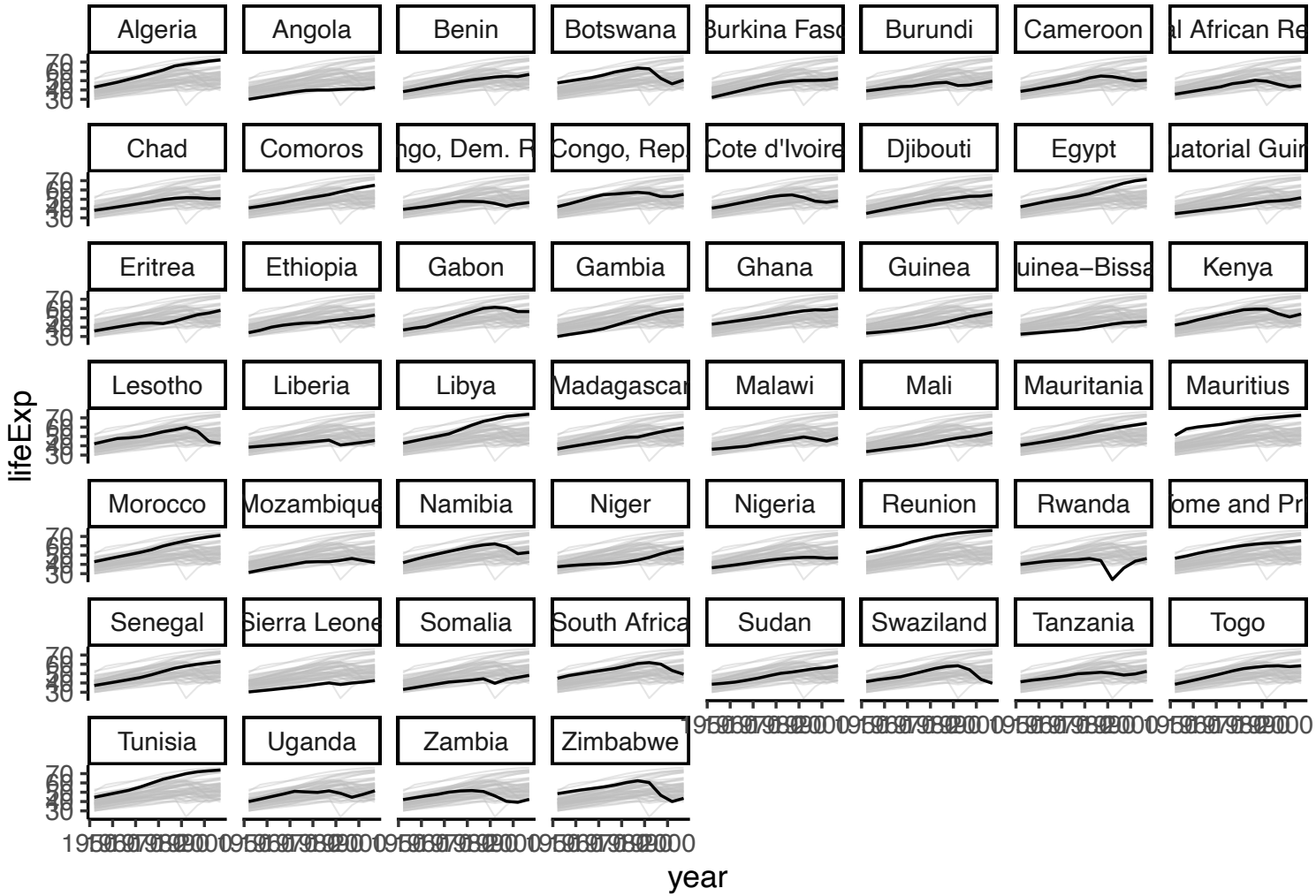
- A powerful technique is to show all the data in each facet, but highlight each line in turn:



Source: Datawrapper

- We can do this with `gghighlight`
- `+ gghighlight() + facet_wrap(...`

With highlighting



We can change the color, too

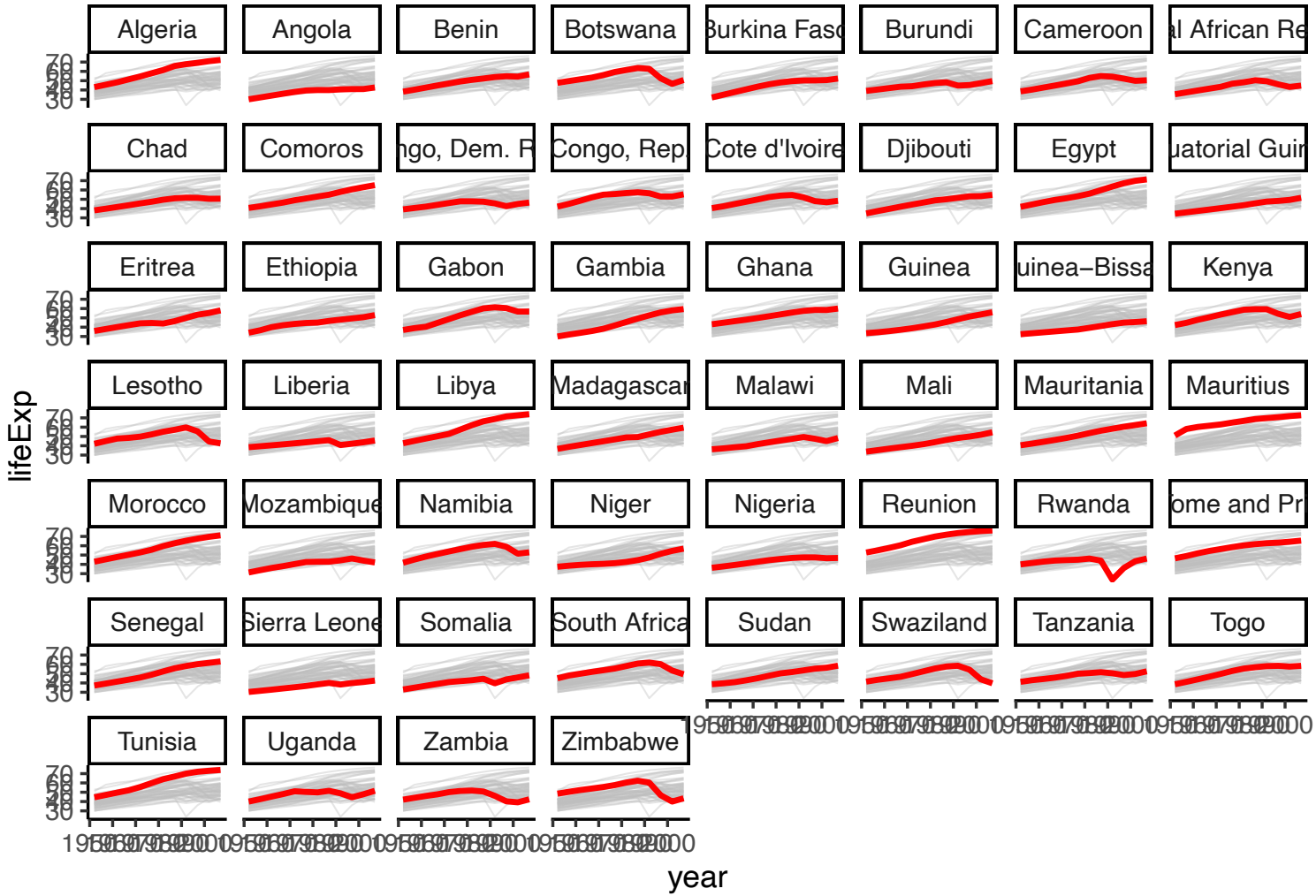


Table of Contents

Polity dataset

- The Polity project codes countries' democracy scores on a -10 to +10 scale, with full autocracies being -10 and full democracies as +10
- Run the code to load the polity dataset and merge it with gapminder.

In-class exercise

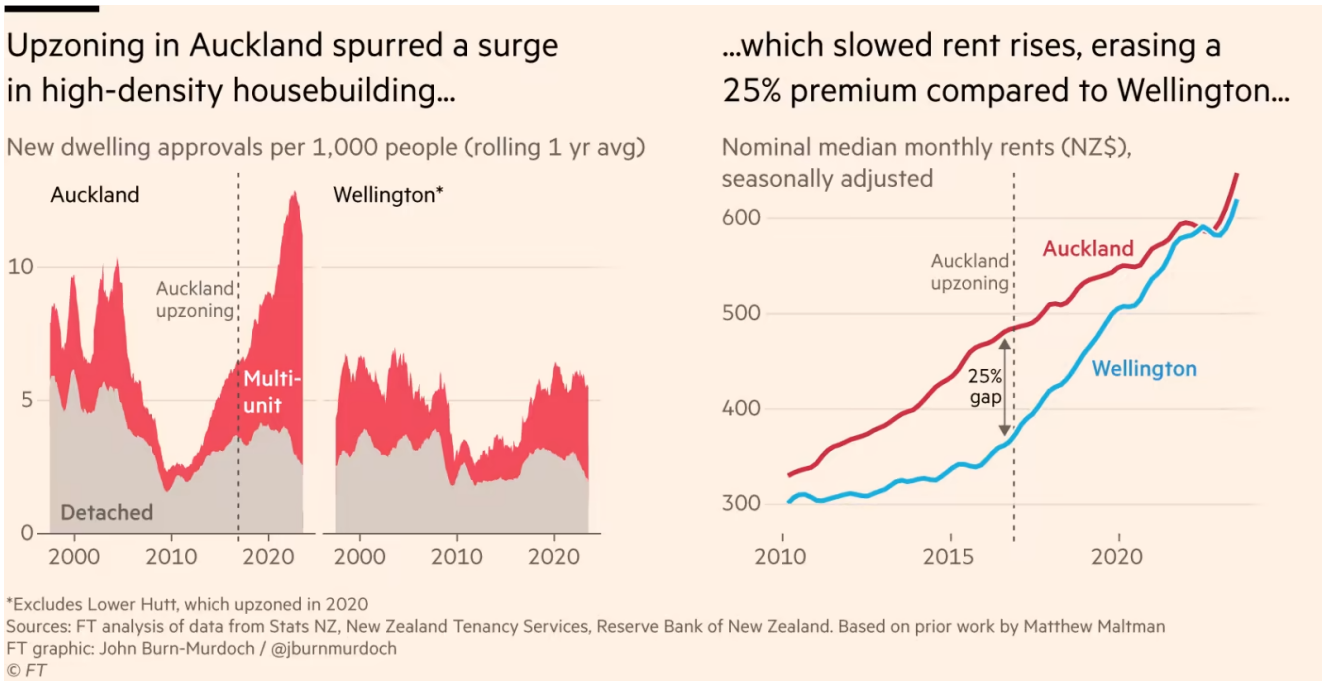
Think of some questions you'd like to answer using the data, then make 2-3 plots to explore it. To get you started:

- What's the relationship between GDP and democracy?
- Do democracies have higher life expectancy?
- How has this changed over time?
- And by continent?
- Make sure to label and scale your plots!

Table of Contents

Combining plots

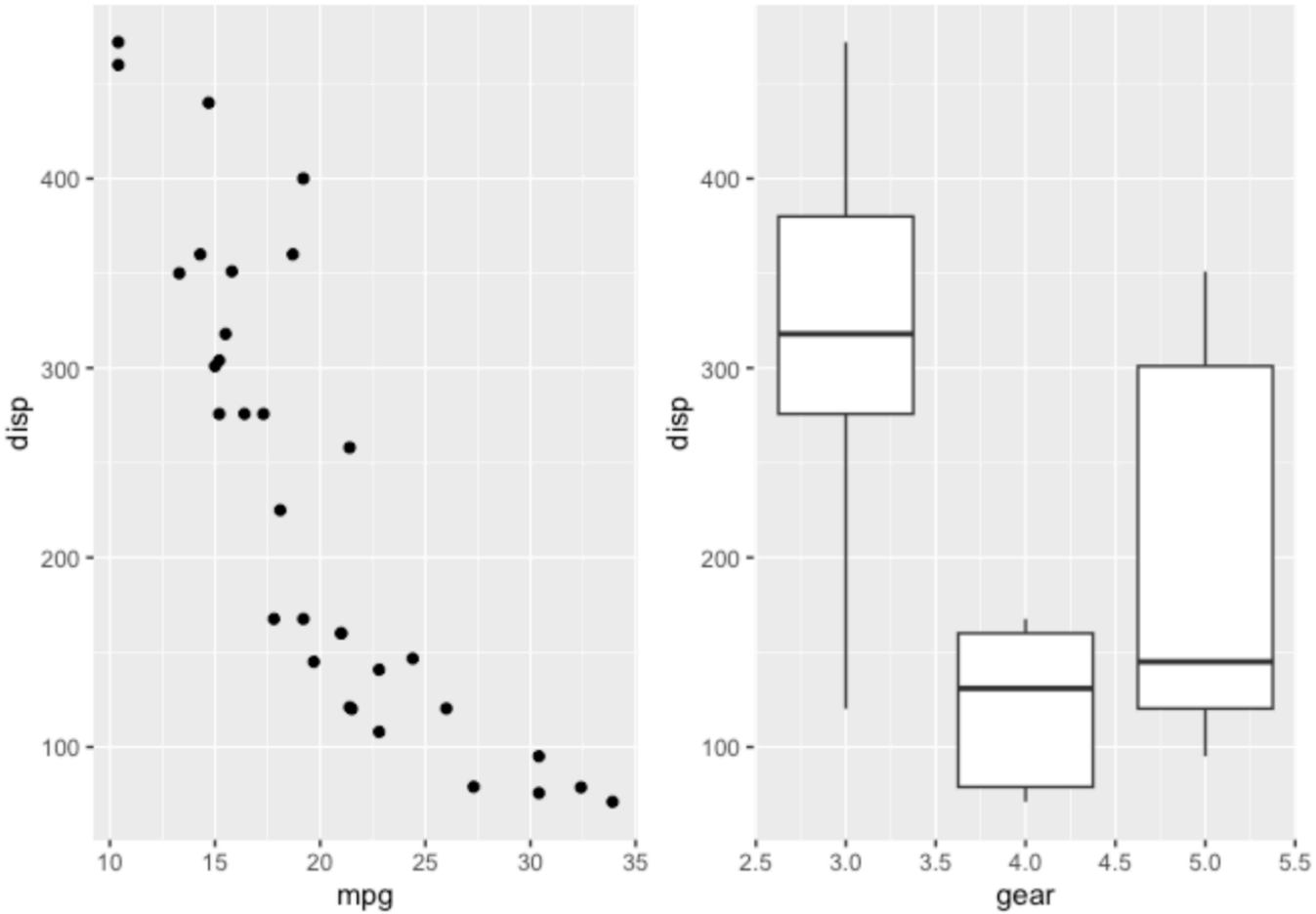
- We've learned how to make small multiples using ggplot's `facets`
- But small multiples are the same plot, repeated by some other categorical variable.
- What if we want to put different plots side by side?



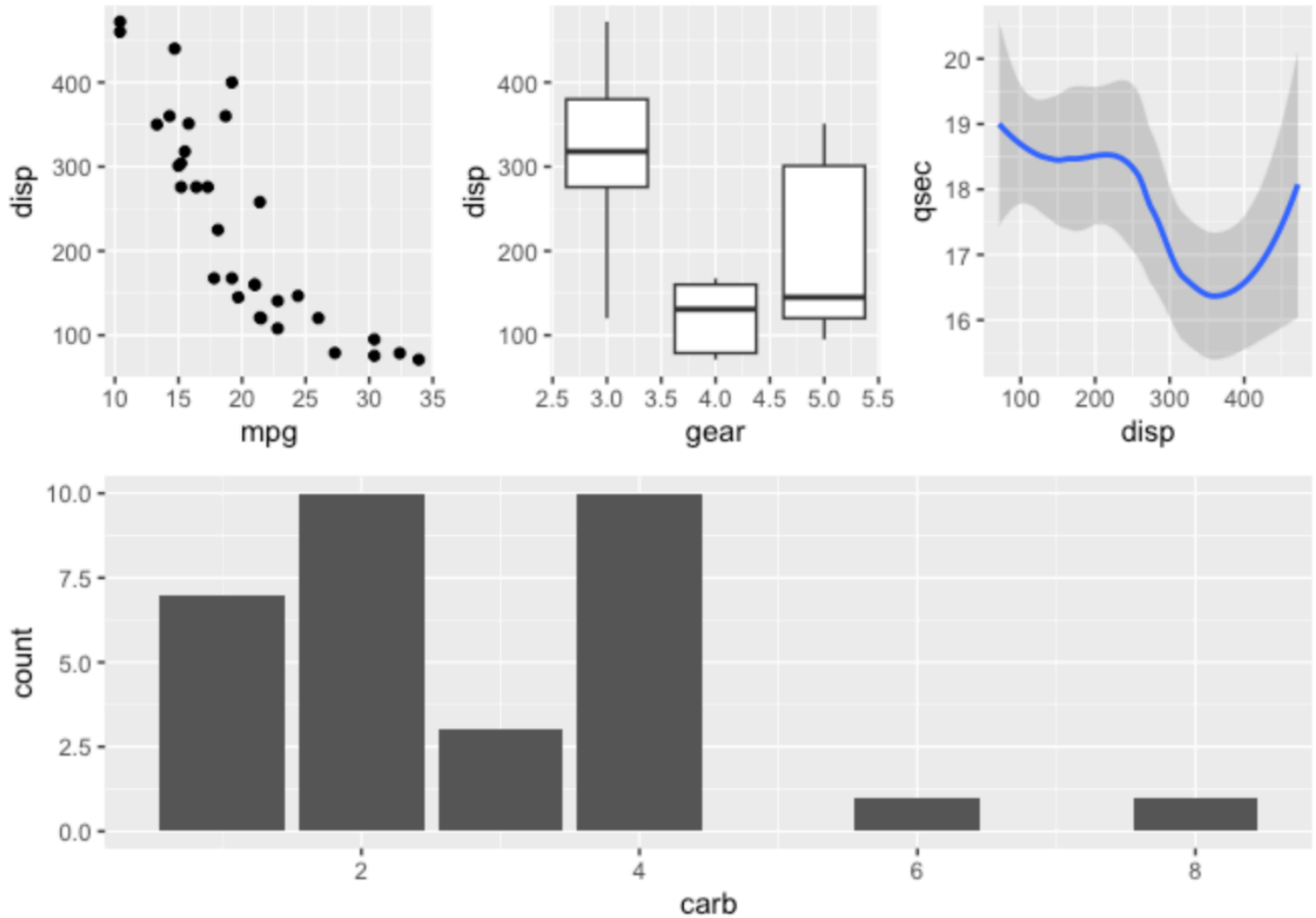
Patchwork

- Patchwork is an easy to use library for combining multiple ggplot figures
- Go ahead and install it: `install.packages('patchwork')`
- To use, we assign our plots to objects: `plot1 <- ggplot(...)`
- ...then we can use the `+` and `/` symbols to put plots next to each other or on top.
- Parentheses allow us to group plots together.

```
library(ggplot2)
library(patchwork)

p1 <- ggplot(mtcars) + geom_point(aes(mpg, disp))
p2 <- ggplot(mtcars) + geom_boxplot(aes(gear, disp, group = gear))

p1 + p2
```



```
p3 <- ggplot(mtcars) + geom_smooth(aes(disp, qsec))
p4 <- ggplot(mtcars) + geom_bar(aes(carb))

(p1 | p2 | p3) /
      p4
```



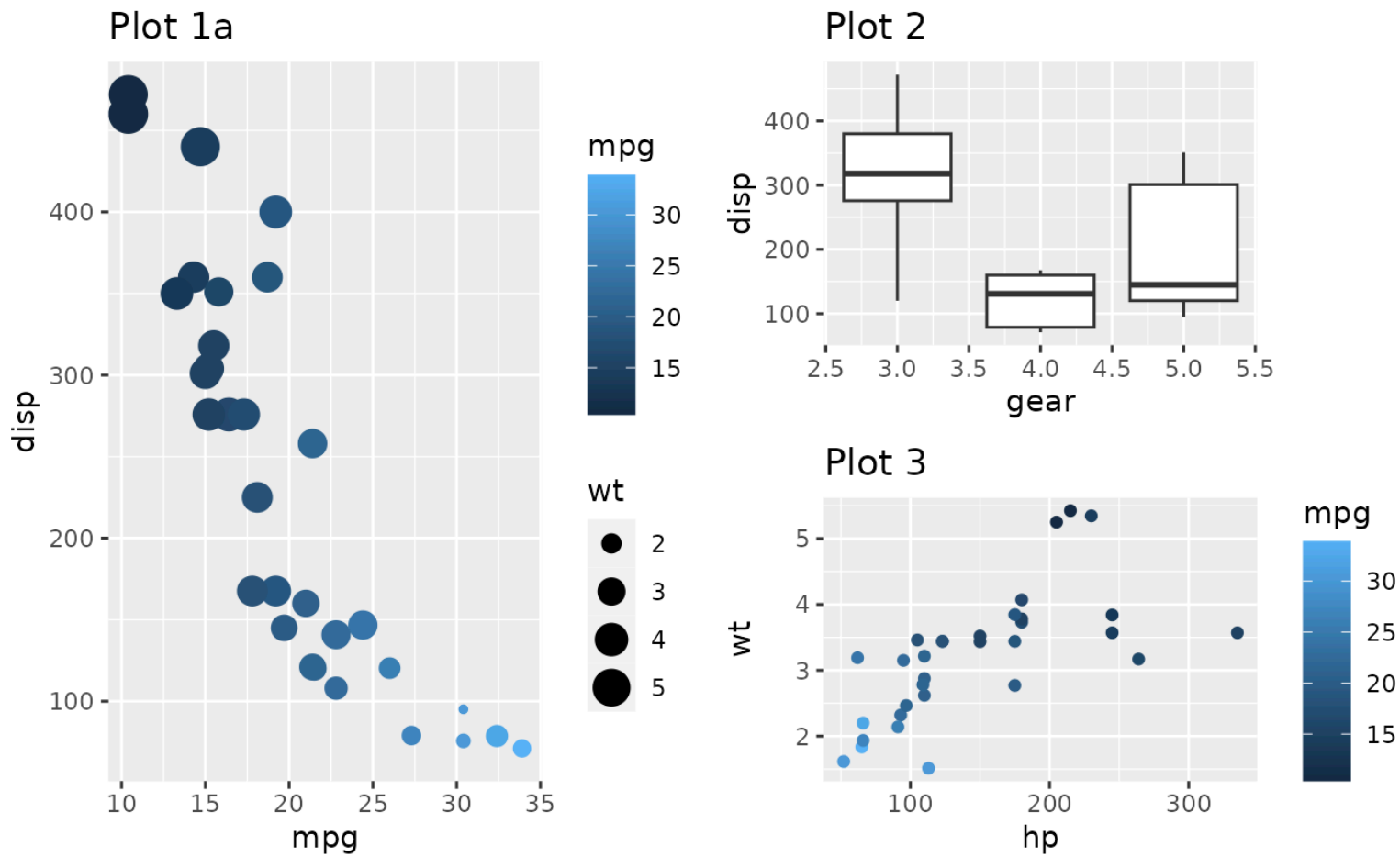
More patchwork options

Patchwork gives you a lot of flexibility to do things like:

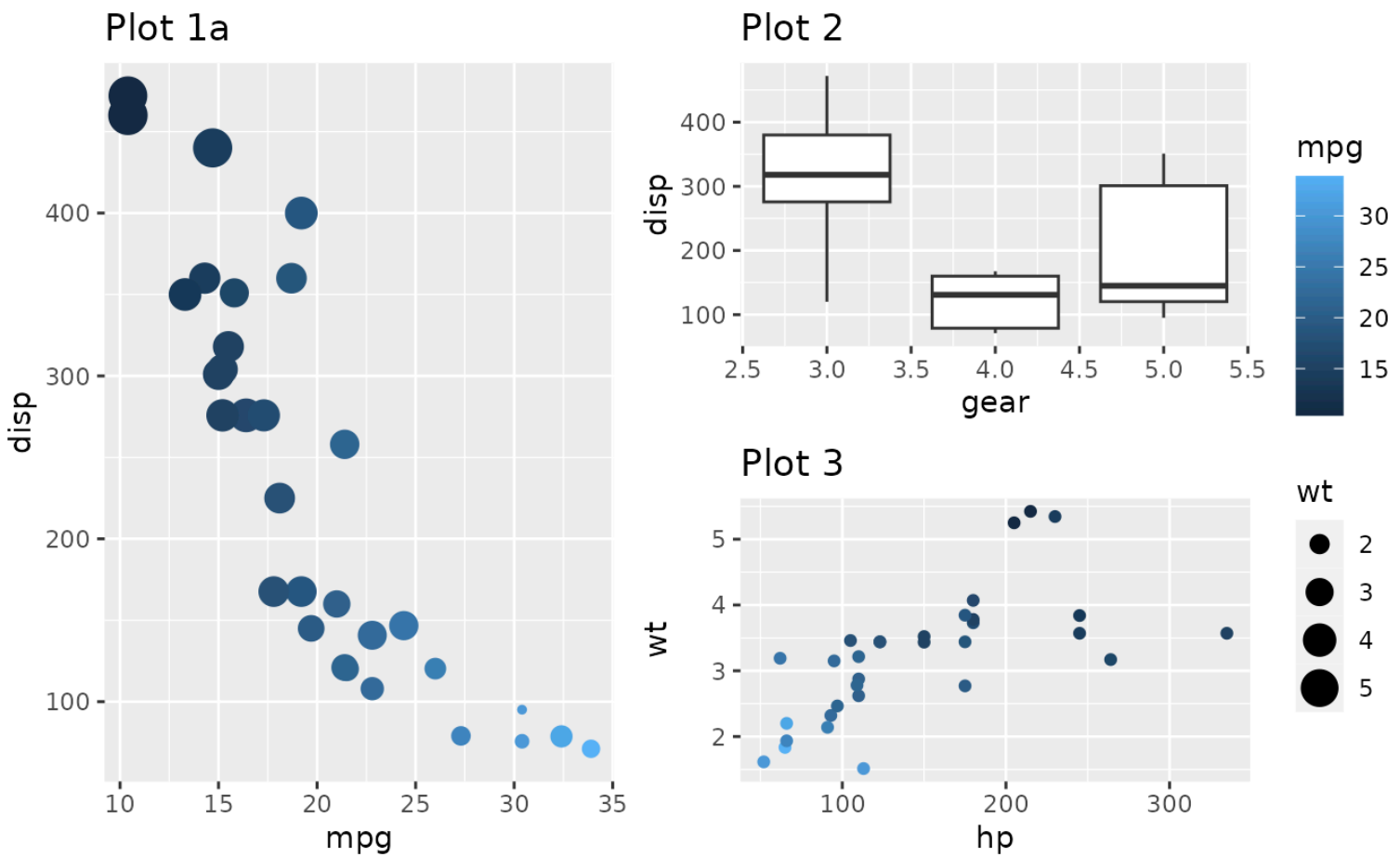
- Add spacing between plots
- Move the legend around
- Adding insets (smaller figures overlayed on top of a larger figure)
- Adding text panels
- Consolidating duplicate legends

These will be very helpful when it comes to the midterm and final projects!

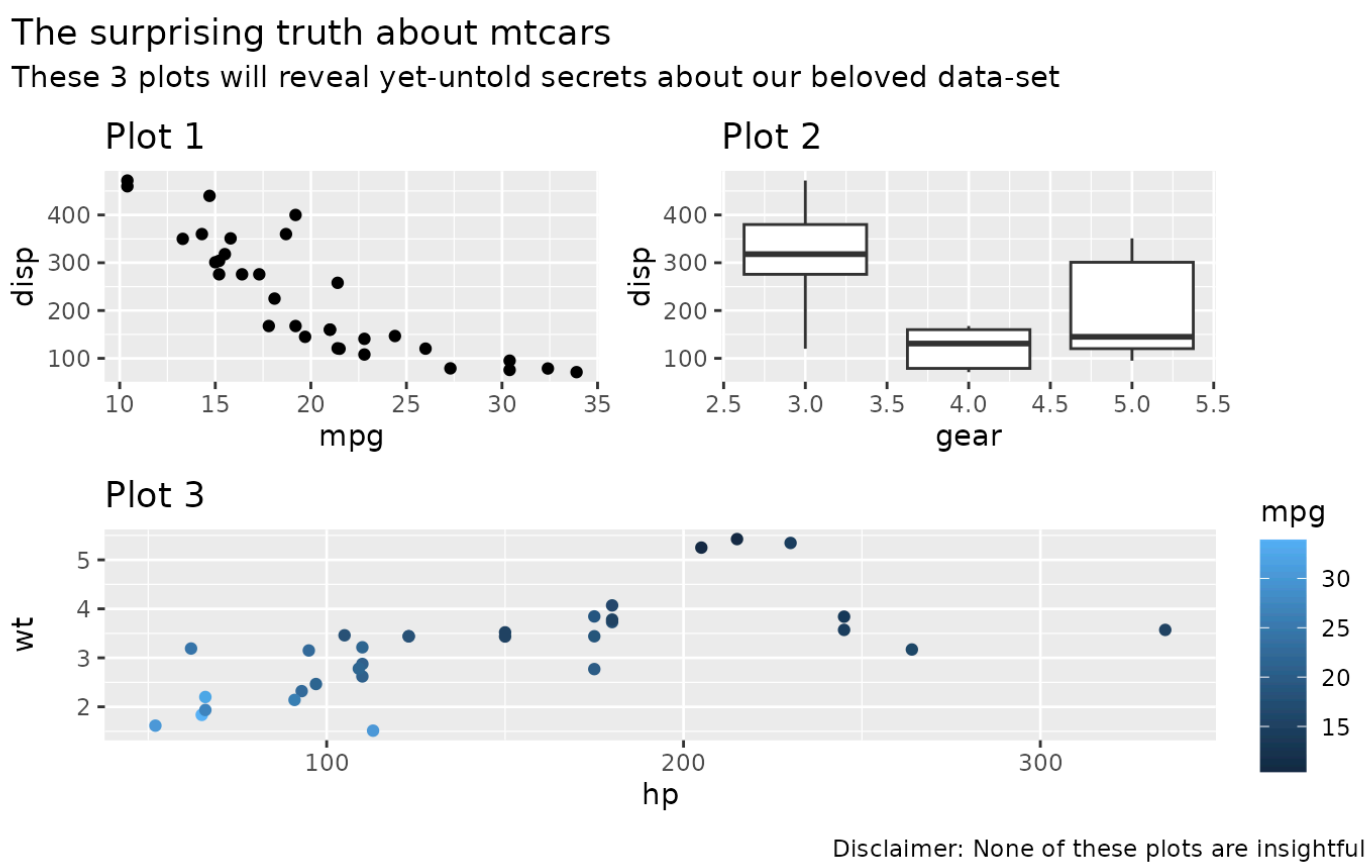
```
p1a <- ggplot(mtcars) +
  geom_point(aes(mpg, disp, colour = mpg, size = wt)) +
  ggtitle('Plot 1a')

p1a | (p2 / p3)
```



```
(p1a | (p2 / p3)) + plot_layout(guides = 'collect')
```



```
patchwork <- (p1 + p2) / p3
patchwork + plot_annotation(
  title = 'The surprising truth about mtcars',
  subtitle = 'These 3 plots will reveal yet-untold secrets about our beloved data-set',
  caption = 'Disclaimer: None of these plots are insightful'
)
```



Now combine your plots into a single patchwork plot and add an overall title.