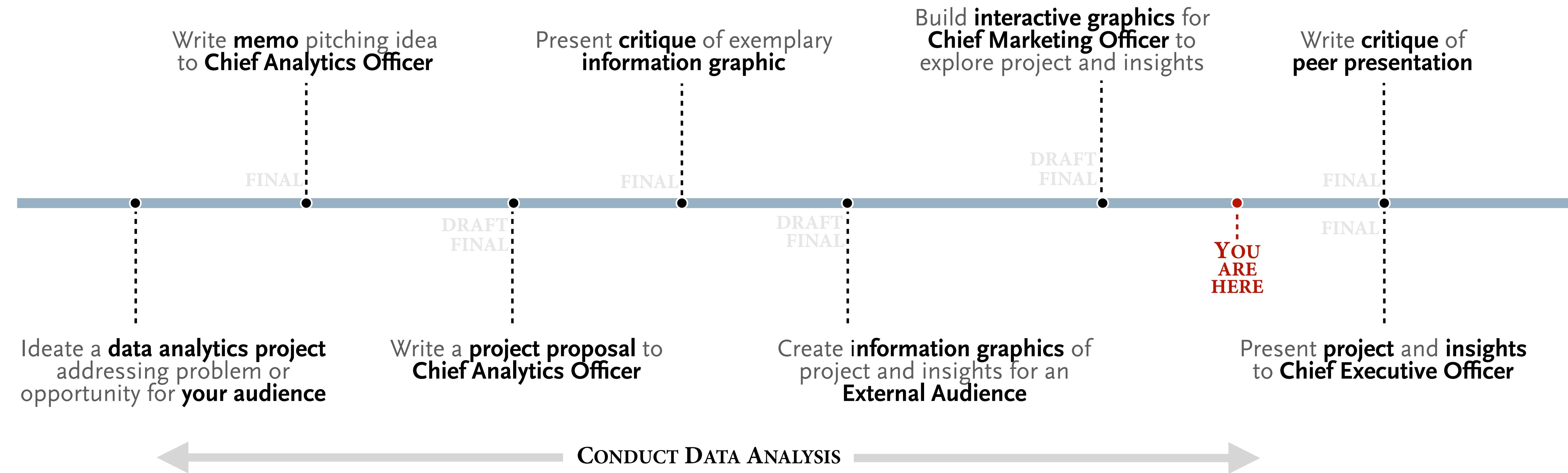


Storytelling with data

12 | Interactive documents and multimodal communication

course overview, main course deliverables



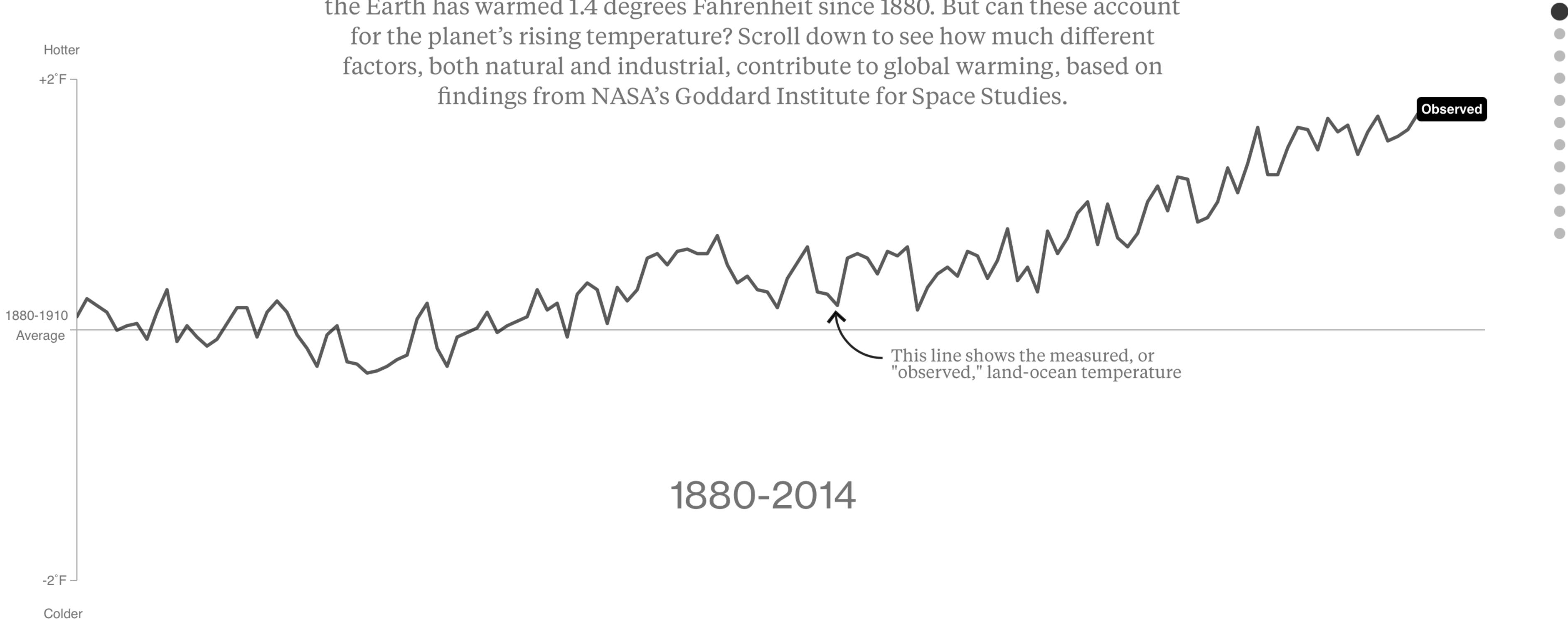
interactive communication, a “scrollytelling” layout

scrollytelling, an example — notice *when* and *how* information is presented to the audience

What's Really Warming the World?

By Eric Roston  and Blacki Migliozzi  | June 24, 2015

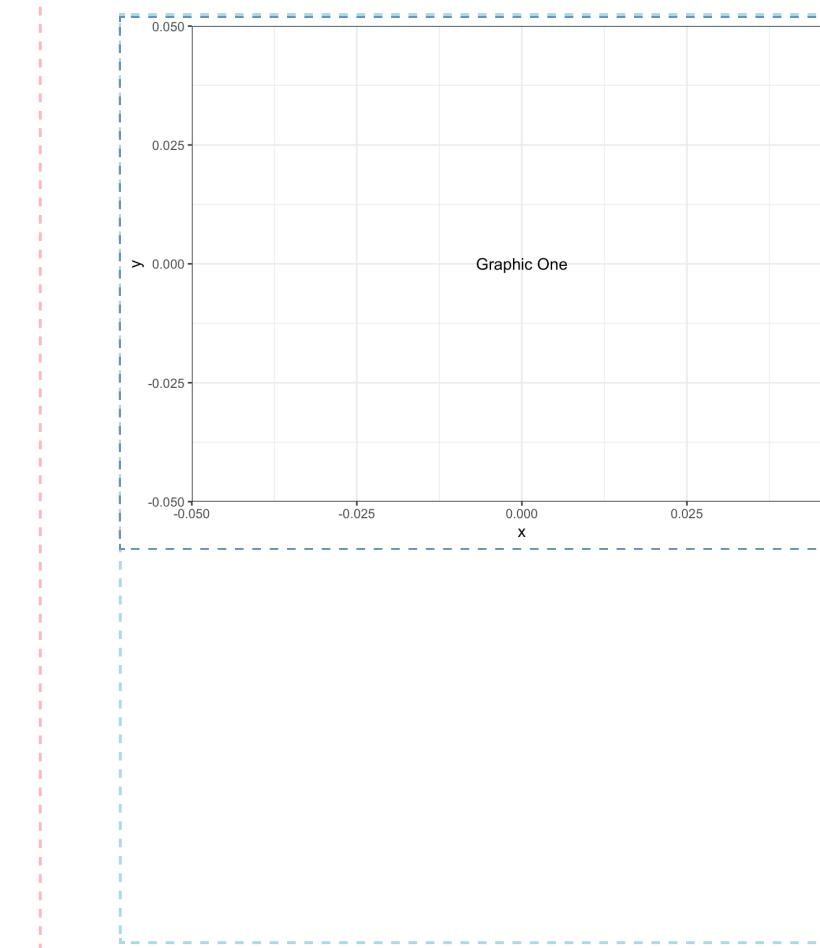
Skeptics of manmade climate change offer various natural causes to explain why the Earth has warmed 1.4 degrees Fahrenheit since 1880. But can these account for the planet's rising temperature? Scroll down to see how much different factors, both natural and industrial, contribute to global warming, based on findings from NASA's Goddard Institute for Space Studies.



scrollytelling, minimal code in an r markdown to scroll **explainers** past *stay-in-place* data graphics

Minimal Scrollytelling Example

This is a paragraph outside the scrollytelling sections. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.



This is a first article paragraph inside the first scrollytelling section. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.

This is a second article paragraph inside the first scrollytelling section. Integer accumsan interdum justo eu pretium. Aliquam maximus mi sit amet dapibus efficitur.

This is a third article paragraph inside the first scrollytelling section. Sed condimentum lacus sit amet turpis aliquam varius nec a lacus. In facilisis convallis ante sit amet consequat. Aenean a lorem mollis, bibendum nibh nec, maximus orci. Nulla facilisi.

scrollytelling, minimal code in an r markdown to scroll explainers past stay-in-place data graphics

```
html

<h1>...</h1>

<p>...</p>

<section>

  <figure>

    ```{r, echo=FALSE}
 # graphics go here
    ```

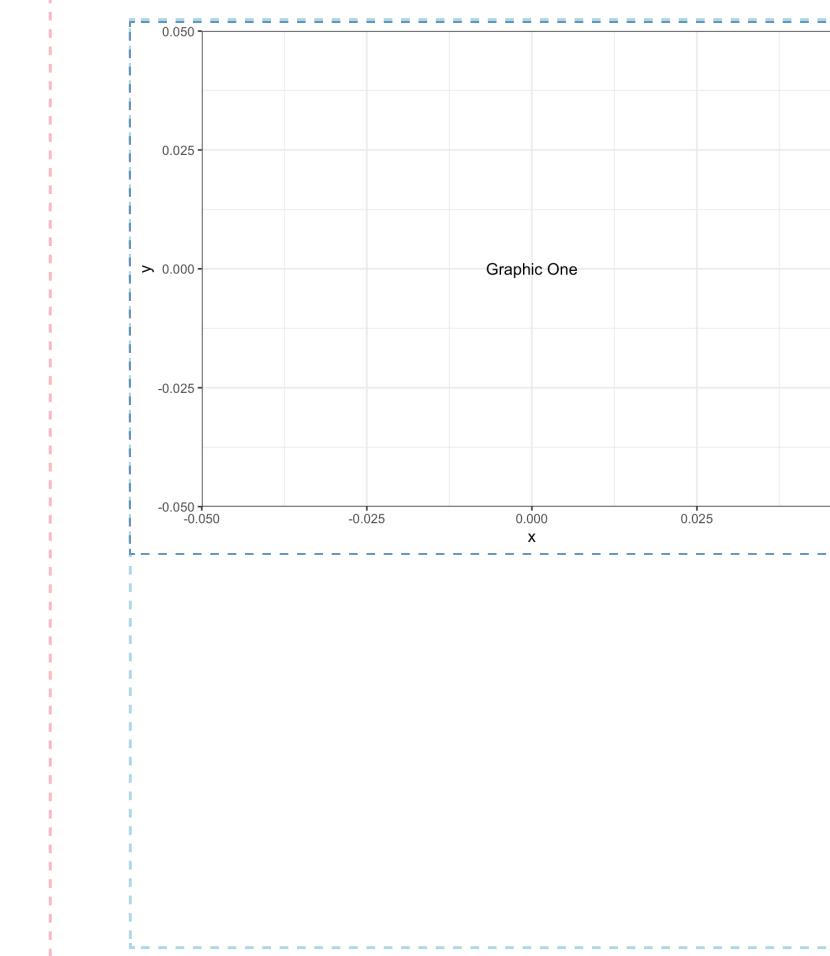
  </figure>

  <article>
    <p>...</p>
  </article>

</section>
```

Minimal Scrollytelling Example

This is a paragraph outside the scrollytelling sections. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.



This is a first article paragraph inside the first scrollytelling section. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.

This is a second article paragraph inside the first scrollytelling section. Integer accumsan interdum justo eu pretium. Aliquam maximus mi sit amet dapibus efficitur.

This is a third article paragraph inside the first scrollytelling section. Sed condimentum lacus sit amet turpis aliquam varius nec a lacus. In facilisis convallis ante sit amet consequat. Aenean a lorem mollis, bibendum nibh nec, maximus orci. Nulla facilisi.

scrollytelling, minimal code in an r markdown to scroll explainers past stay-in-place data graphics

```
css
<style>

section {
  display: flex;
  flex-direction: row;
  margin-top: 1rem;
  margin-bottom: 5rem;
}

section > * {
  flex: 1;
}

article {
  padding: 0 1rem;
}

article p {
  font-size: 0.8rem;
  line-height: 1.4;
}

article p:not(:last-of-type) {
  min-height: 20vh;
}

article p:last-of-type {
  min-height: 50vh;
}

figure {
  display: flex;
  align-items: start;
  justify-content: center;
  height: 30rem;
  top: 5rem;
  position: sticky;
}

figure * {
  max-width: 100%;
  object-fit: contain;
}

</style>
```

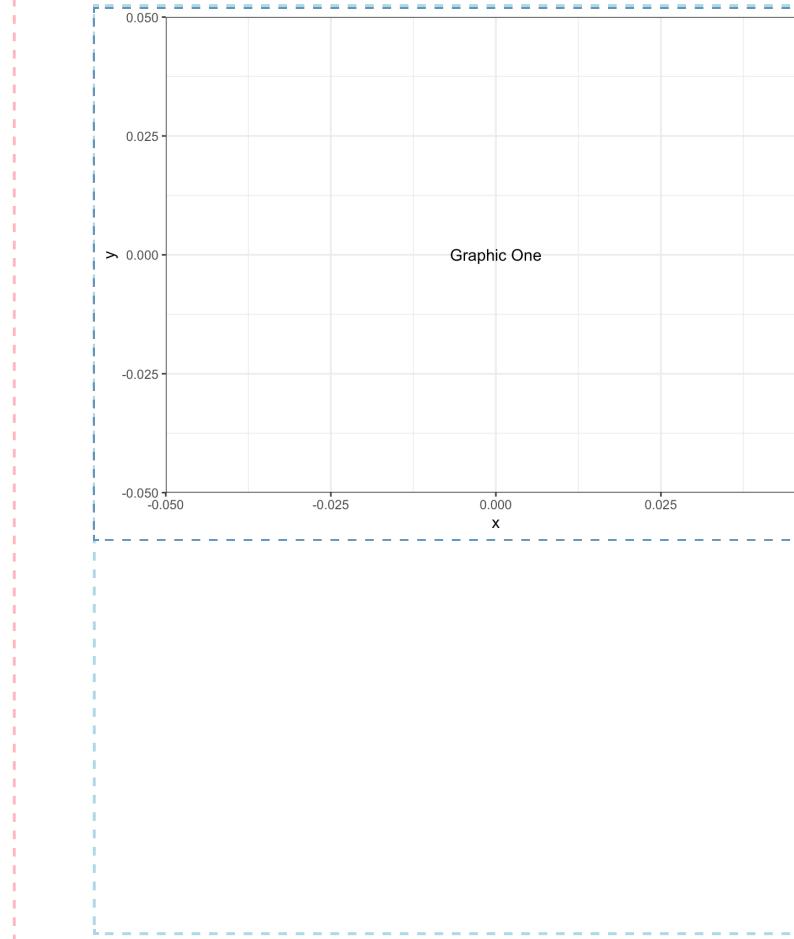
```
html
<h1>...</h1>

<p>...</p>

<section>
  <figure>
    ```{r, echo=FALSE}
graphics go here
 </figure>
 <article>
 <p>...</p>
 </article>
</section>
```

## Minimal Scrollytelling Example

This is a paragraph outside the scrollytelling sections. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.



This is a first article paragraph inside the first scrollytelling section. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.

This is a second article paragraph inside the first scrollytelling section. Integer accumsan interdum justo eu pretium. Aliquam maximus mi sit amet dapibus efficitur.

This is a third article paragraph inside the first scrollytelling section. Sed condimentum lacus sit amet turpis aliquam varius nec a lacus. In facilisis convallis ante sit amet consequat. Aenean a lorem mollis, bibendum nibh nec, maximus orci. Nulla facilisi.

# scrollytelling, minimal code in an r markdown to scroll **explainers** past *stay-in-place* data graphics

```
css
<style>
 section {
 display: flex;
 flex-direction: row;
 margin-top: 1rem;
 margin-bottom: 5rem;
 }

 section > * {
 flex: 1;
 }

 article {
 padding: 0 1rem;
 }

 article p {
 font-size: 0.8rem;
 line-height: 1.4;
 }

 article p:not(:last-of-type) {
 min-height: 20vh;
 }

 article p:last-of-type {
 min-height: 50vh;
 }

 figure {
 display: flex;
 align-items: start;
 justify-content: center;
 height: 30rem;
 top: 5rem;
 position: sticky;
 }

 figure * {
 max-width: 100%;
 object-fit: contain;
 }

</style>
```

Of note: Apply any text formatting you want to `<h1>`, `<p>`, and `<article><p>`

Place code chunks for **interactive graphics** here.

Write your **explainers** that scroll past the **figures** here.

Specify white space for *between article paragraphs*, and for *after the last article paragraph* here. **20vh** means 20 percent of the viewfinder height. Experiment.

When **scrolling**, the `<figure>` element stops — **sticks** — its **top at 5rem** (near the top of the viewfinder, adjust where you like). It will stay there until pushed up or down by its outer scrolling `<section>` element. Unlike the `figure`, the **article paragraphs** keep scrolling.

```
html
<h1>...</h1>

<p>...</p>

<section>
 <figure>
    ```{r, echo=FALSE}
# graphics go here
````
 </figure>
 <article>
 <p>...</p>
 </article>
</section>
```

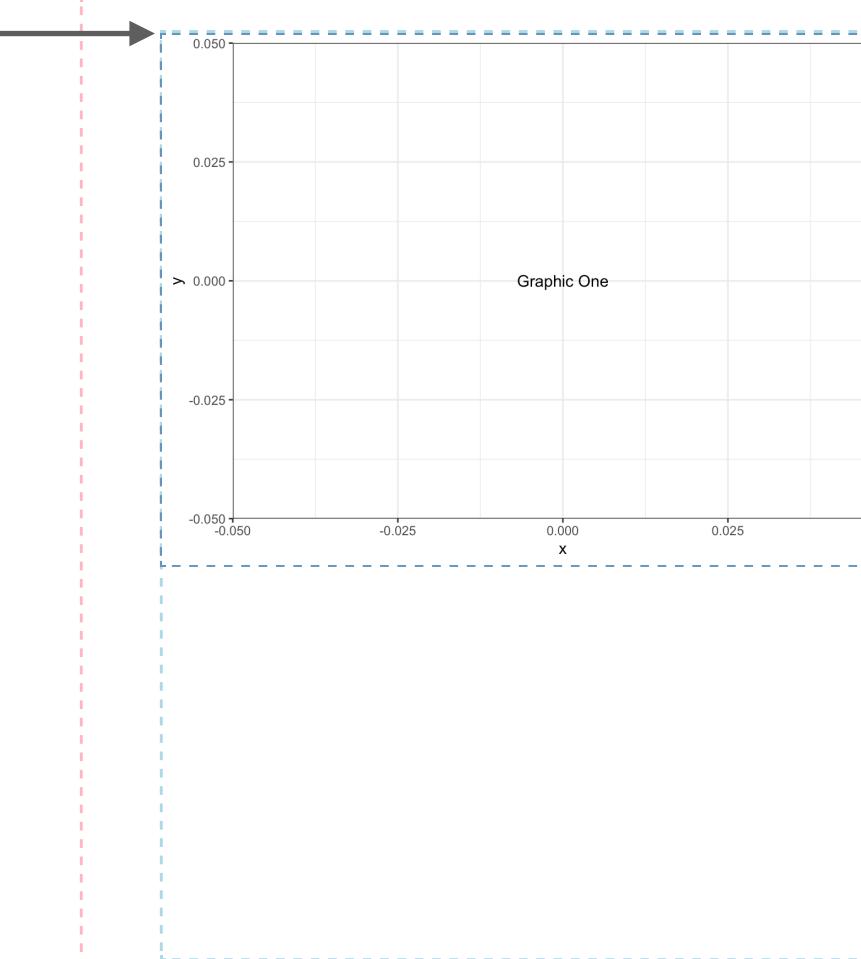
Sticky location of `<figure>`

Empty space inside `<section>` allows `<figure>` to stay put until its bottom contacts scrolling `<section>` bottom.

The `<article>` vertically fills entire `<section>`, so it always scrolls with `<section>`.

## Minimal Scrollytelling Example

This is a paragraph outside the scrollytelling sections. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.



This is a first article paragraph inside the first scrollytelling section. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.

This is a second article paragraph inside the first scrollytelling section. Integer accumsan interdum justo eu pretium. Aliquam maximus mi sit amet dapibus efficitur.

This is a third article paragraph inside the first scrollytelling section. Sed condimentum lacus sit amet turpis aliquam varius nec a lacus. In facilisis convallis ante sit amet consequat. Aenean a lorem mollis, bibendum nibh nec, maximus orci. Nulla facilisi.

**verbal with the visual — *limitations and advantages***

# verbal with the visual, limitations of presentations

PowerPoint, compared to other common presentation tools, **reduces the analytical quality** of serious presentations of evidence.

This is especially the case for the PowerPoint **ready-made templates**, which **corrupt statistical reasoning**, and often **weaken verbal and spatial thinking**.

— Tufte, 2006

# verbal with the visual, limitations of presentations



# verbal with the visual, limitations of presentations

**Powerpoint can have low resolution and it**

# verbal with the visual, limitations of presentations

encourages

# verbal with the visual, limitations of presentations

sequenced  
1 ↗  
2 ↗  
3

# verbal with the visual, limitations of presentations

not

# verbal with the visual, limitations of presentations

spatial  
spatial      spatial  
                  spatial

# verbal with the visual, limitations of presentations

**review.**

## verbal with the visual, limitations of presentations

Information separated. in. time. makes it difficult to understand context and evaluate relationships.

## verbal with the visual, addressing limitations

show comparisons  
adjacent in space



# verbal with the visual, addressing limitations

show comparisons  
adjacent in space

increase data-ink on  
slides too, within reason

# verbal with the visual, addressing limitations

show comparisons  
adjacent in space

one alternate approach,  
document & discussion

increase data-ink on  
slides too, within reason

# **verbal with the visual, advantages of presentations**

show comparisons  
adjacent in space

one alternate approach,  
document & discussion

increase data-ink on  
slides too, within reason

consider advantages of  
sequential presentation

## verbal with the visual, advantages of presentations

show comparisons  
adjacent in space

one alternate approach,  
document & discussion

increase data-ink on  
slides too, within reason

consider advantages of  
sequential presentation

*We control when our audience receives information!*

# verbal with the visual, advantages of presentations



VISION



MEMORY

verbal with the visual, advantages of presentations

GRAPHIC DESIGN  
IS THE USE OF SPACE  
<sup>TO</sup> CONTROL TIME

— Barbara de Wilde

**data**  
**verbal with the  visual**

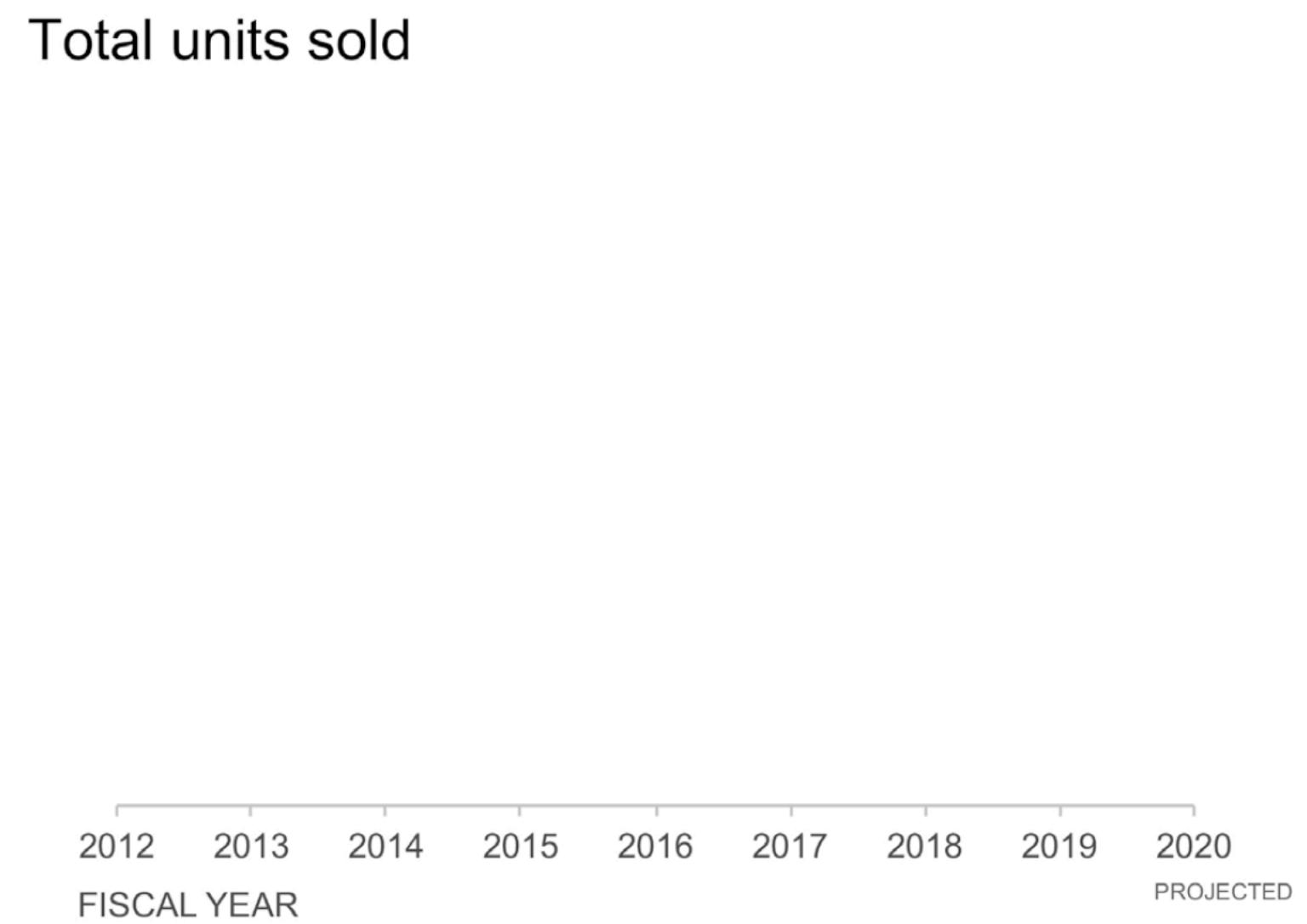
verbal with the (data) visual

# **temporal layering of spatial comparisons**

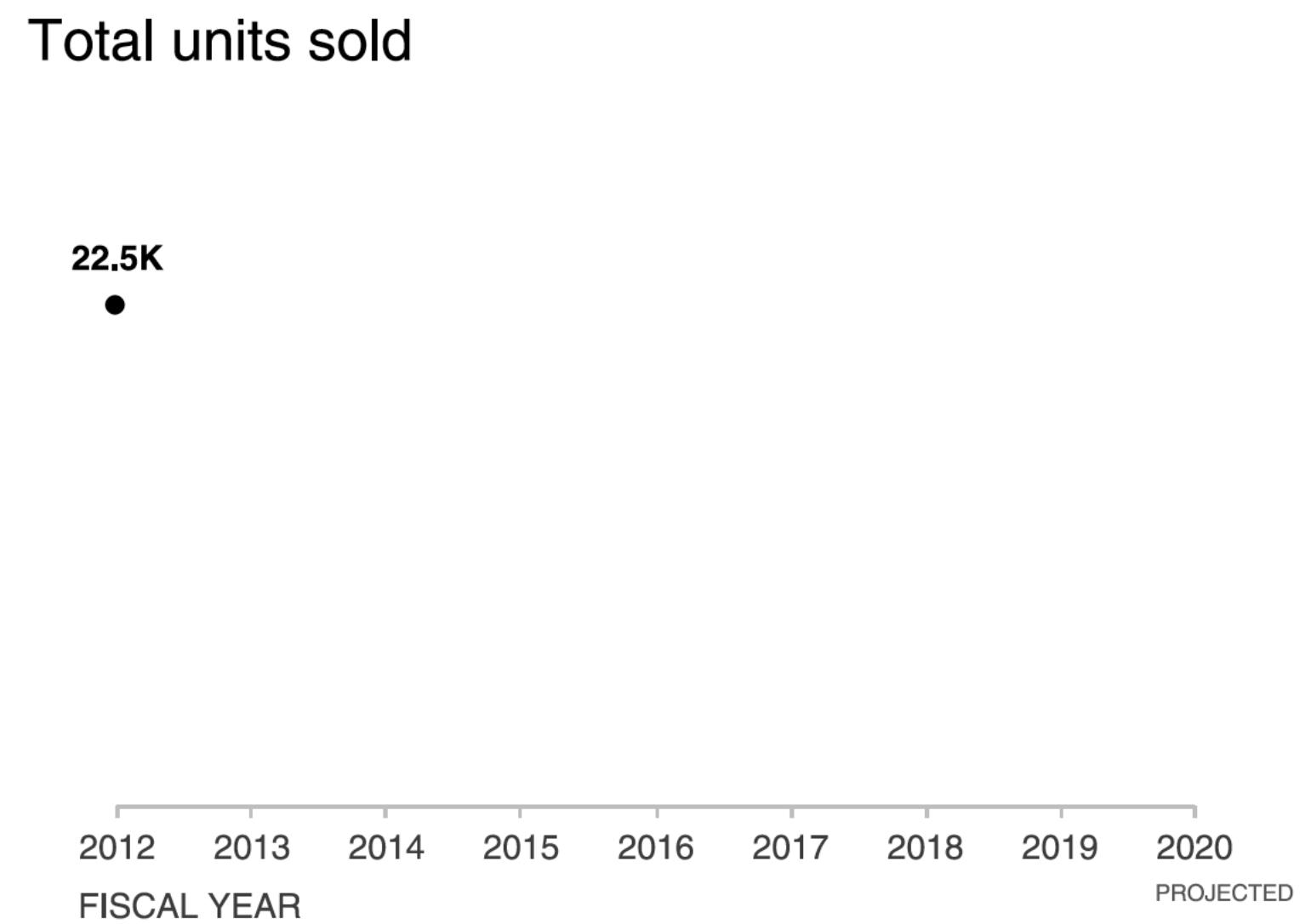
verbal with the (data) visual, temporal layering of spatial comparisons

**example**

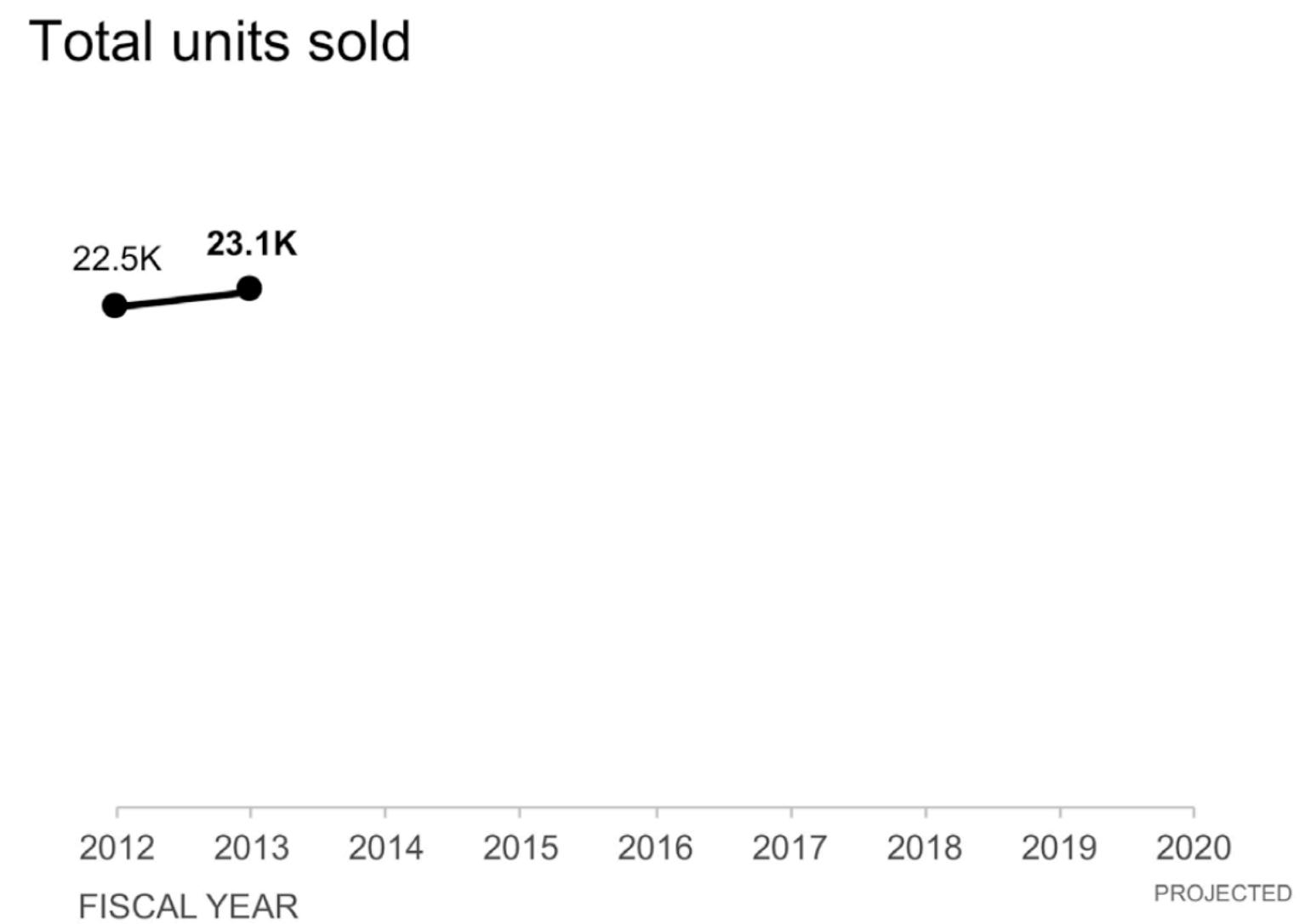
## verbal with the (data) visual, example — temporal layering of spatial comparisons



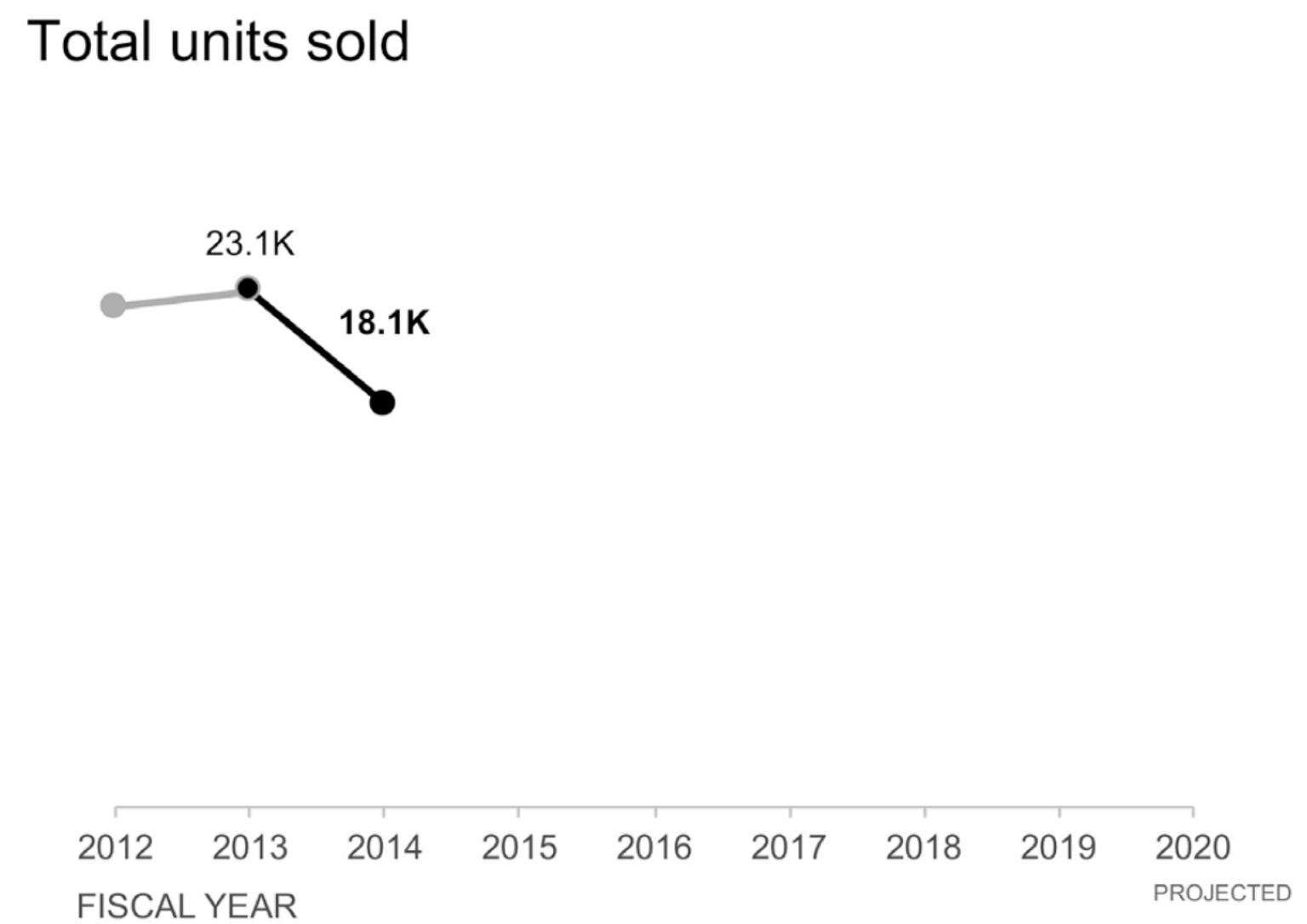
## verbal with the (data) visual, example — temporal layering of spatial comparisons



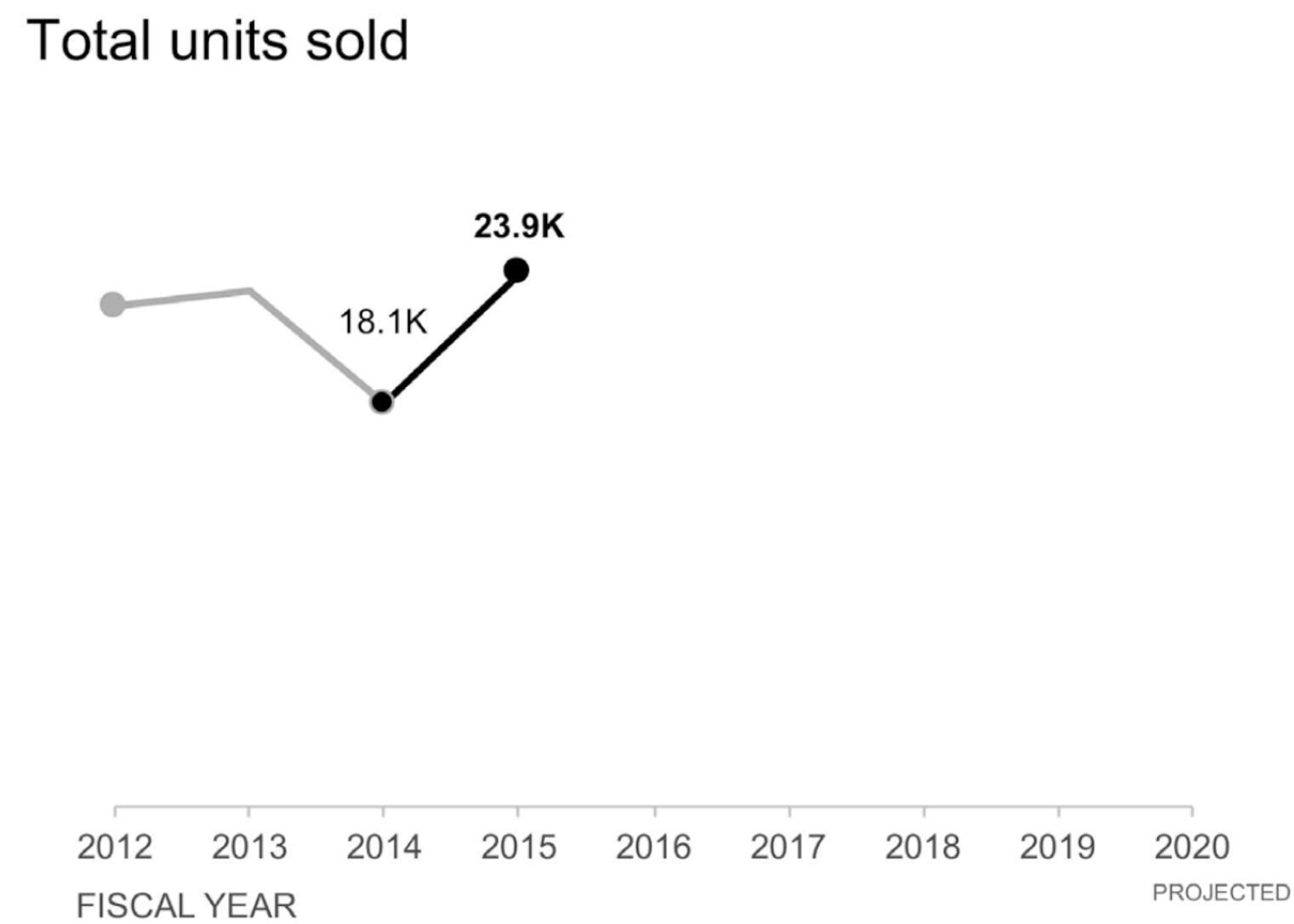
## verbal with the (data) visual, example — temporal layering of spatial comparisons



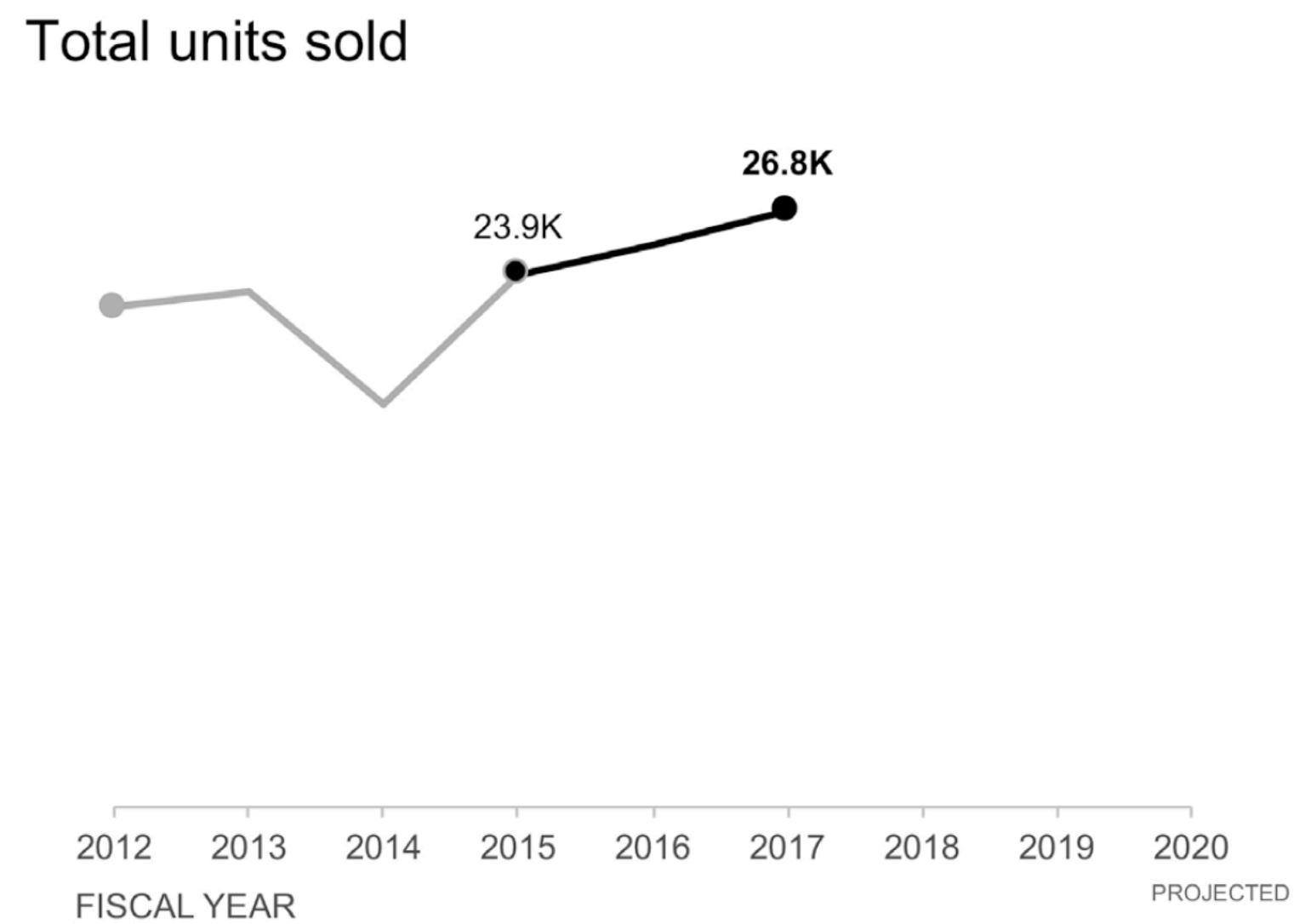
## verbal with the (data) visual, example — temporal layering of spatial comparisons



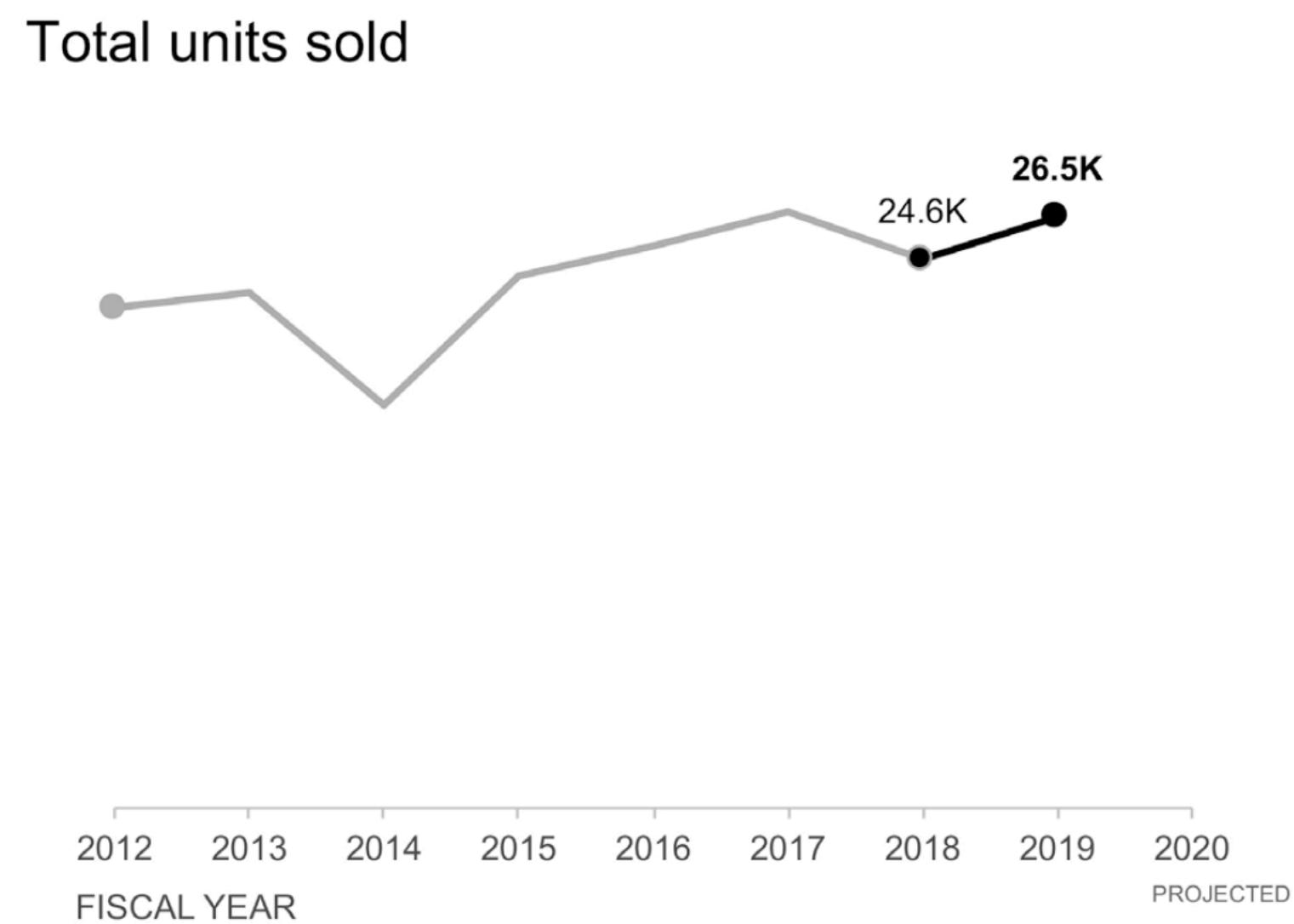
## verbal with the (data) visual, example — temporal layering of spatial comparisons



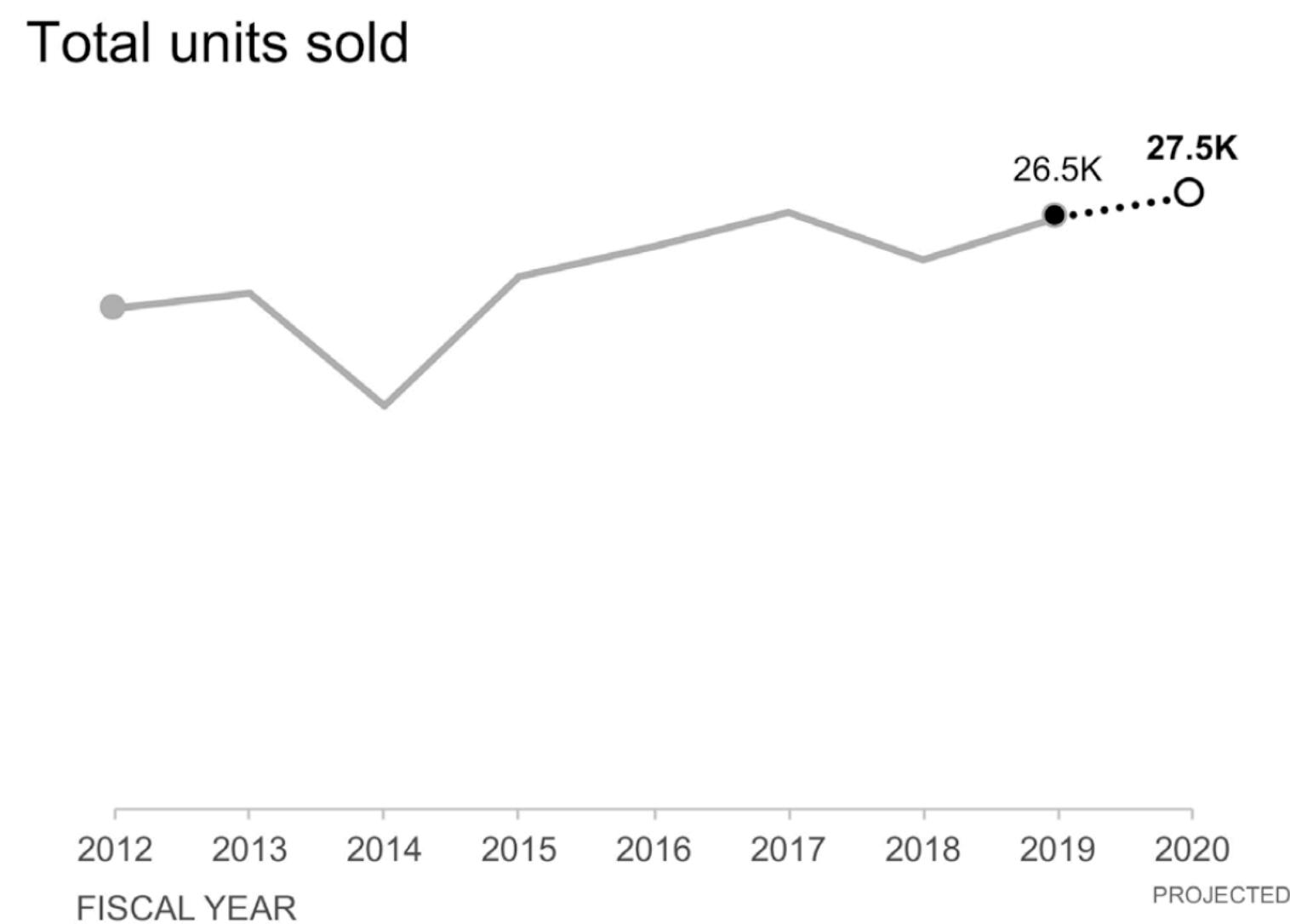
## verbal with the (data) visual, example — temporal layering of spatial comparisons



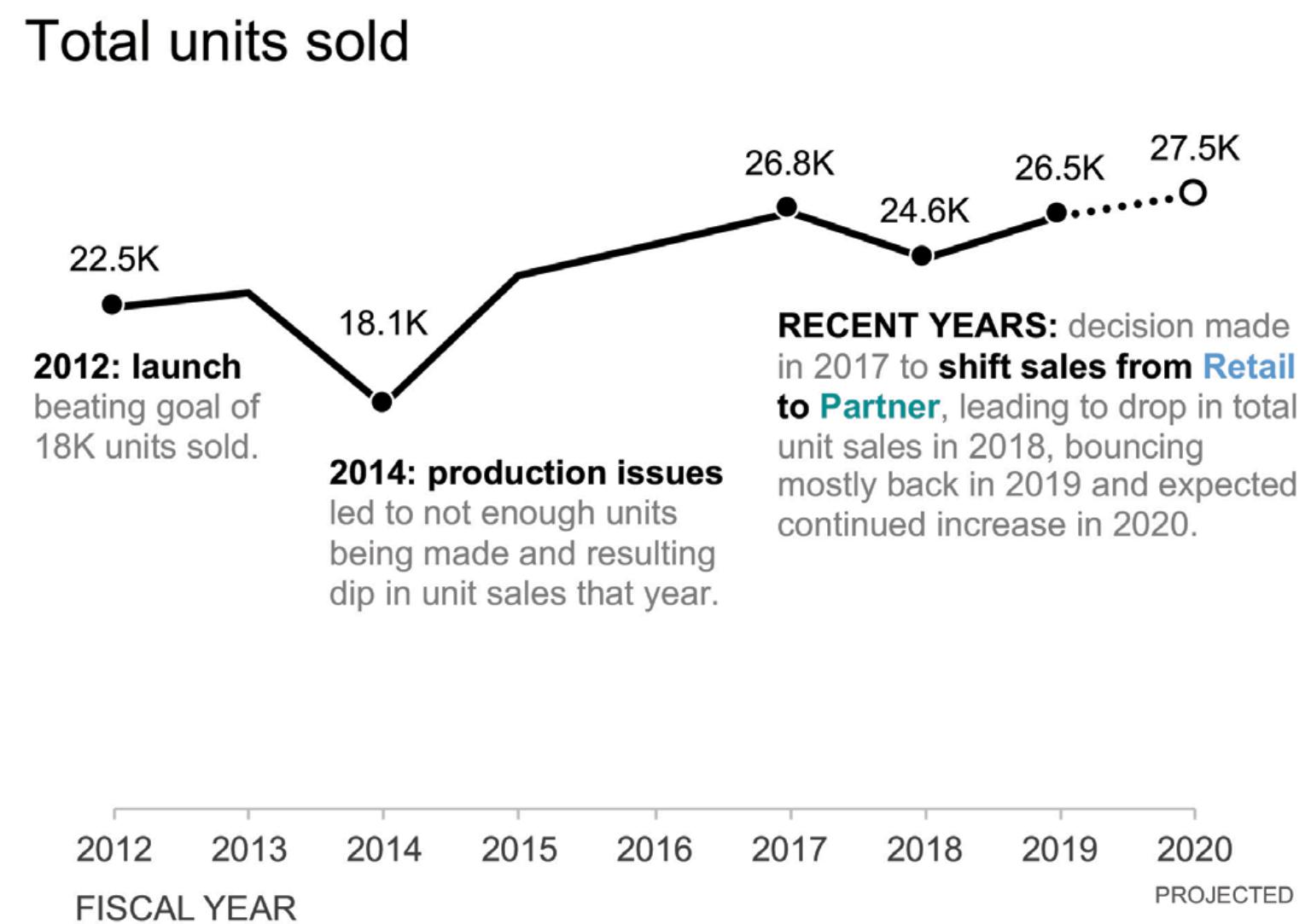
## verbal with the (data) visual, example — temporal layering of spatial comparisons



## verbal with the (data) visual, example — temporal layering of spatial comparisons



## verbal with the (data) visual, example — possible stand-alone version



## verbal with the (data) visual, recall, comparisons convey meaning

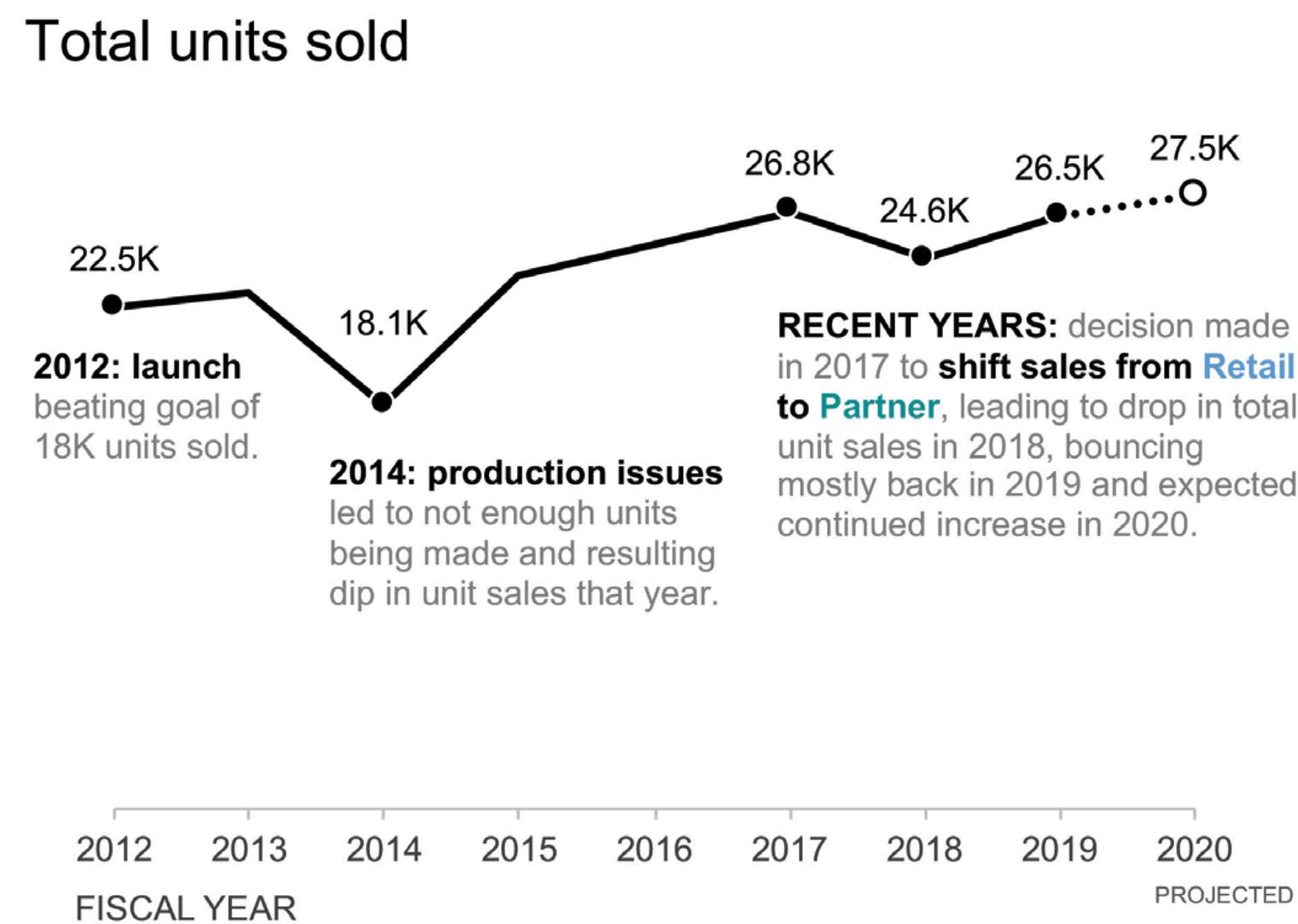
The idea of comparison is crucial. To make a point that is at all meaningful, statistical presentations must refer to differences between observation and expectation, or differences among observations.

— Abelson, Robert, *Statistician, Professor*

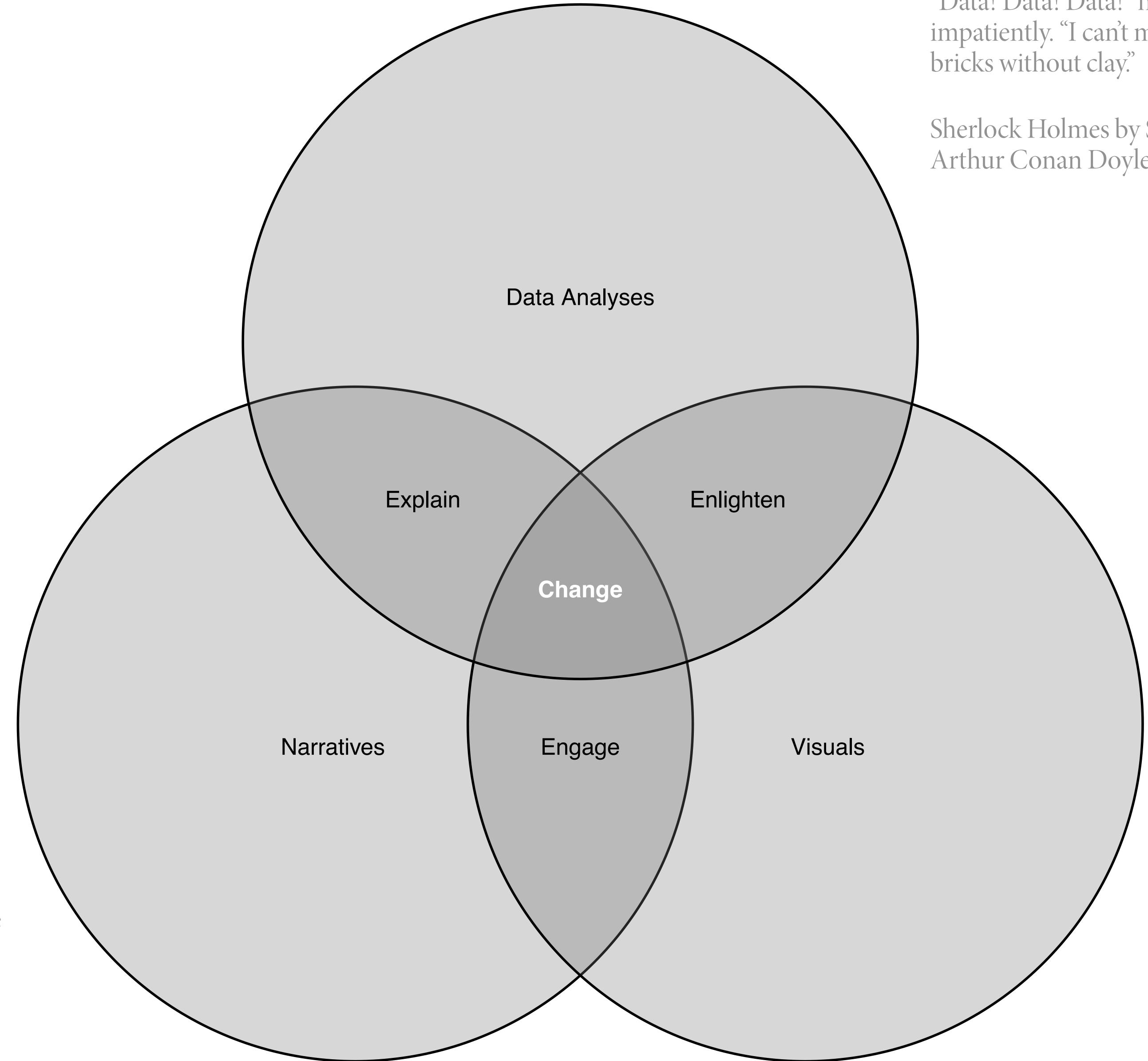
The fundamental analytical act in statistical reasoning is to answer the question ‘Compared with what?’

— Tufte, Edward, *Statistician, Professor, Data Visualization Expert*

verbal with the (data) visual, time is just one example of layering into a data graphic comparisons between things



# storytelling with data, from where we began



No one ever made a decision because of a number. They need a story.

Daniel Kahneman, *psychologist, behavioral economist, and author*

"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay."

Sherlock Holmes by Sir Arthur Conan Doyle, *author*

The greatest value of a picture is when it forces us to notice what we never expected to see.

John W Tukey, *mathematician*

**resources**

# References

- Spencer, Scott.** Sec. 3.3, 4-4.1 In *Data in Wonderland*. 2021. [https://ssp3nc3r.github.io/data\\_in\\_wonderland](https://ssp3nc3r.github.io/data_in_wonderland).
- 
- Corum, Jonathan.** “Design for an Audience.” *13pt Information Design*, April 26, 2018. <http://style.org/ku/>.
- . “See, Think, Design, Produce 3.” *13pt Information Design*, March 28, 2016. <http://style.org/stdp3/>.
- Chu, Tony.** “Animation, Pacing, and Exposition.” *OpenVis Conf 2016*, May 13, 2016. <https://www.youtube.com/watch?v=Z4tB6qyxHJA>.
- Doumont, Jean-Luc.** “Effective Oral Presentations.” In *Trees, Maps, and Theorems*, 85–119. Effective Communication for Rational Minds. Principiae, 2009.
- Hohman, Fred, Matthew Conlen, Jeffrey Heer, and Duen Chau.** “Communicating with Interactive Articles.” *Distill* 5, no. 9 (September 11, 2020): 10.23915/distill.00028. <https://doi.org/10.23915/distill.00028>.
- Knafllic, Cole Nussbaumer.** *Storytelling with Data: Let’s Practice!* Hoboken, New Jersey: John Wiley & Sons, Inc, 2019.

- Natario, Elaina, and Russell Goldenberg.** “Easier Scrollytelling with Position Sticky.” *The Pudding* (blog), June 2018. <https://pudding.cool/process/scrollytelling-sticky/>.
- Rost, Lisa-Charlotte.** Complexity for the Experts, simplicity for everyone else? In *Talks*. <https://lisacharlotterost.de/talks>.
- Roston, Eric, and Blacki Migliozzi.** “What’s Really Warming the World?” *Bloomberg*, June 24, 2015, Businessweek edition. <https://www.bloomberg.com/graphics/2015-whats-warming-the-world/>.
- Schwabish, Jonathan.** *Better Presentations: A Guide for Scholars, Researchers, and Wonks*. Columbia University Press, 2016.
- Tufte, Edward R.** “The Cognitive Style of PowerPoint: Pitching Out Corrupts Within.” In *Beautiful Evidence*. Graphics Press, 2006.
- . “The Future of Data Science.” Presented at the *Microsoft Machine Learning & Data Science Summit*, Seattle, Washington, 2016. <https://youtu.be/rHUDJ8RyseQ>.
- . “Smarter Presentations and Shorter Meetings.” In *Seeing with Fresh Eyes: Meaning, Space, Data, Truth*, 151–61. Cheshire, Conn.: Graphics Press, 2020.

**supplemental**

**verbal with the (data) visual, temporal layering of spatial comparisons**

## **example two**

## Back-to-school shopping survey results

STORE OFFERS...	% FAVORABLE	
	Our store	All stores
The store is well-organized.	40%	38%
Fast and easy checkout.	33%	34%
Friendly and helpful employees.	45%	50%
Good promotions.	45%	65%
I can find what I'm looking for.	46%	55%
I can find the size I need.	39%	49%
A nice atmosphere.	80%	70%
Latest technology for easy shopping.	35%	34%
Lowest sales prices.	40%	60%
A wide selection.	49%	47%
Items I can't find elsewhere.	74%	54%
The latest styles.	65%	55%

Let's **invest** in employee training to  
**improve** the in-store customer experience

Back-to-school shopping accounts for

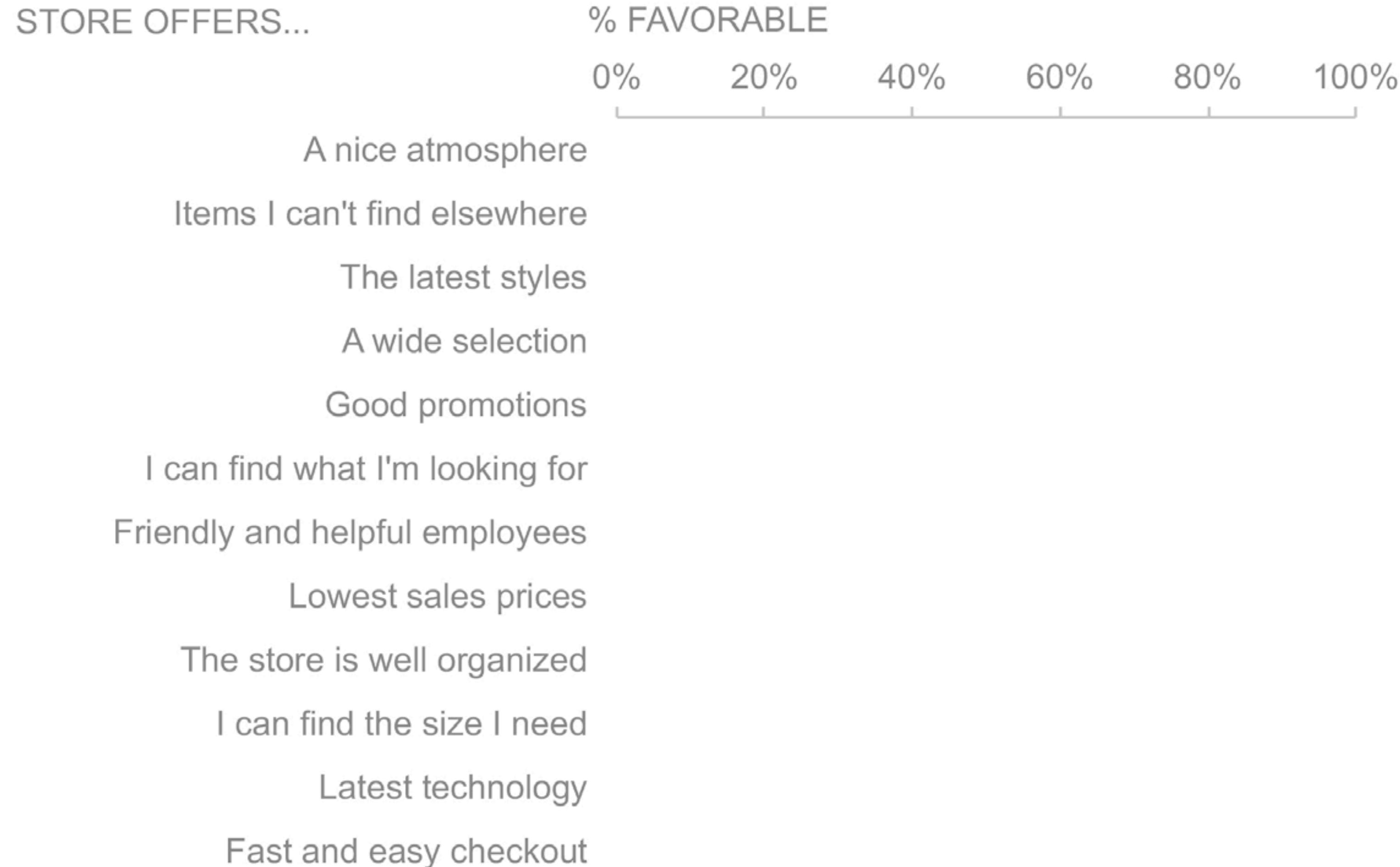
**30%**

of our annual revenue. Because of this, it is a huge driver of our overall annual success.

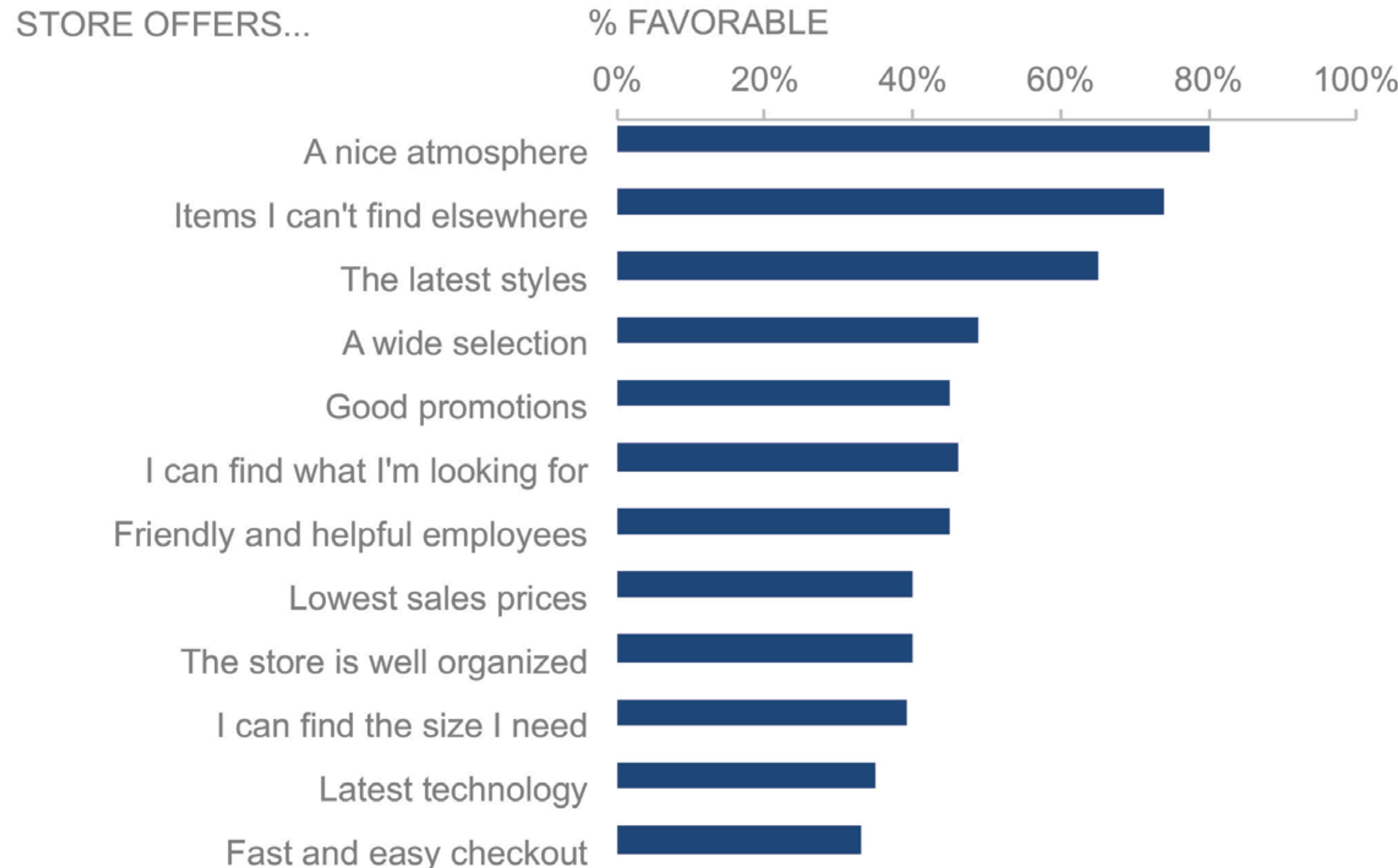
# What we'll cover today

- 1 Discuss what we've learned**  
from our survey analysis<sup>1</sup> and
- 2 Suggest specific recommendations**  
on changes to make for the upcoming back-to-school shopping season to improve customer satisfaction and increase sales.

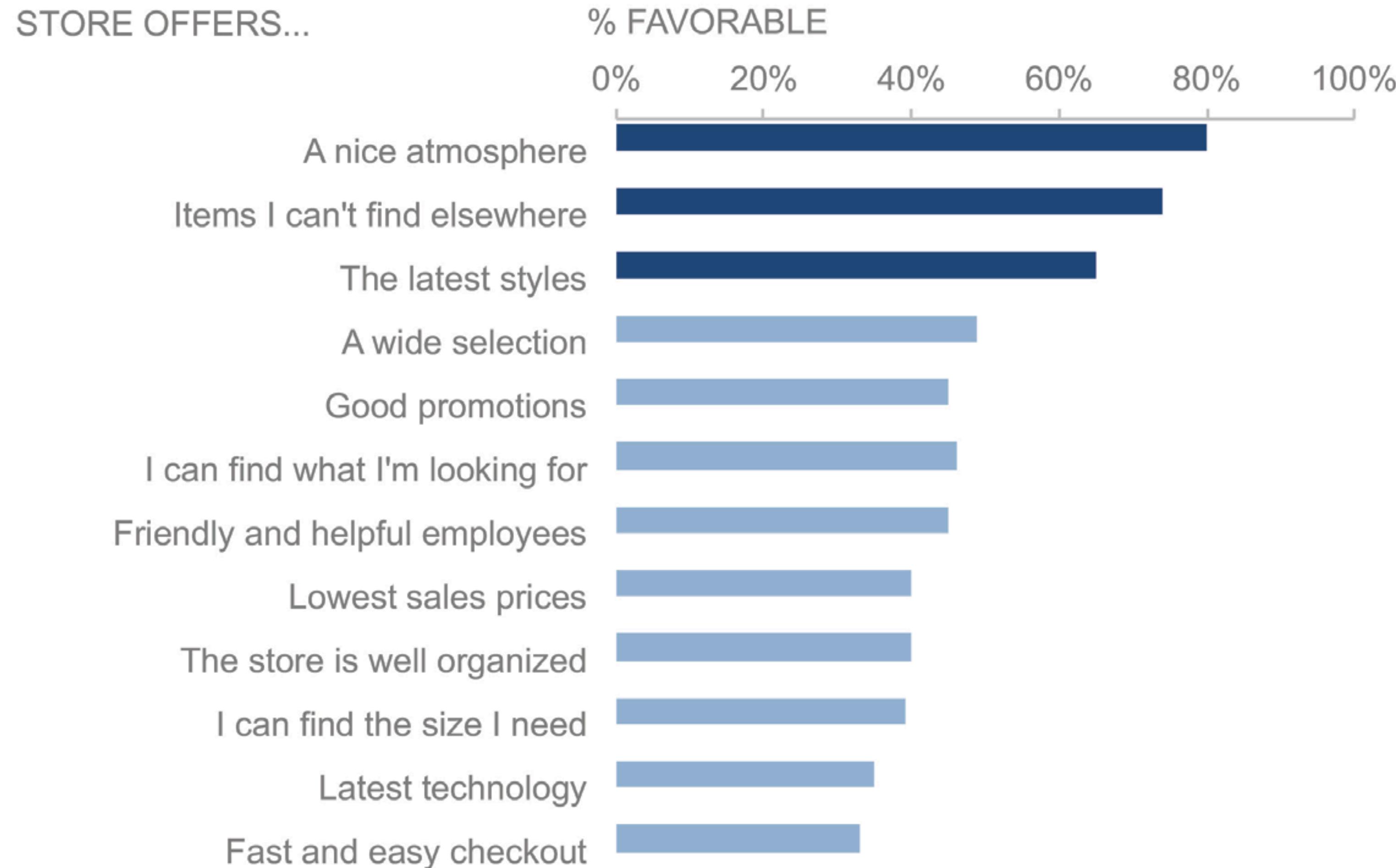
# Back-to-school shopping: consumer sentiment



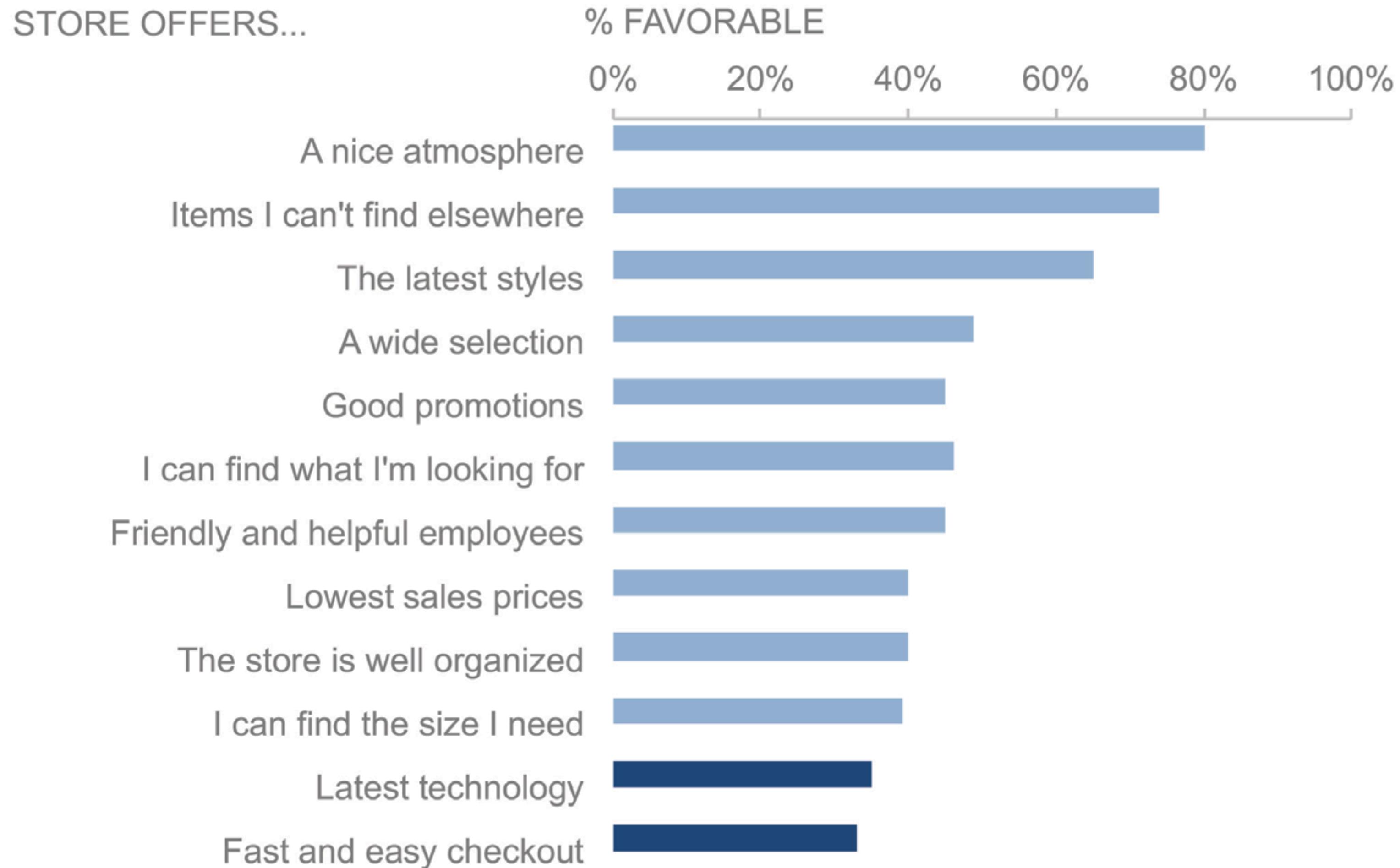
# Back-to-school shopping: consumer sentiment



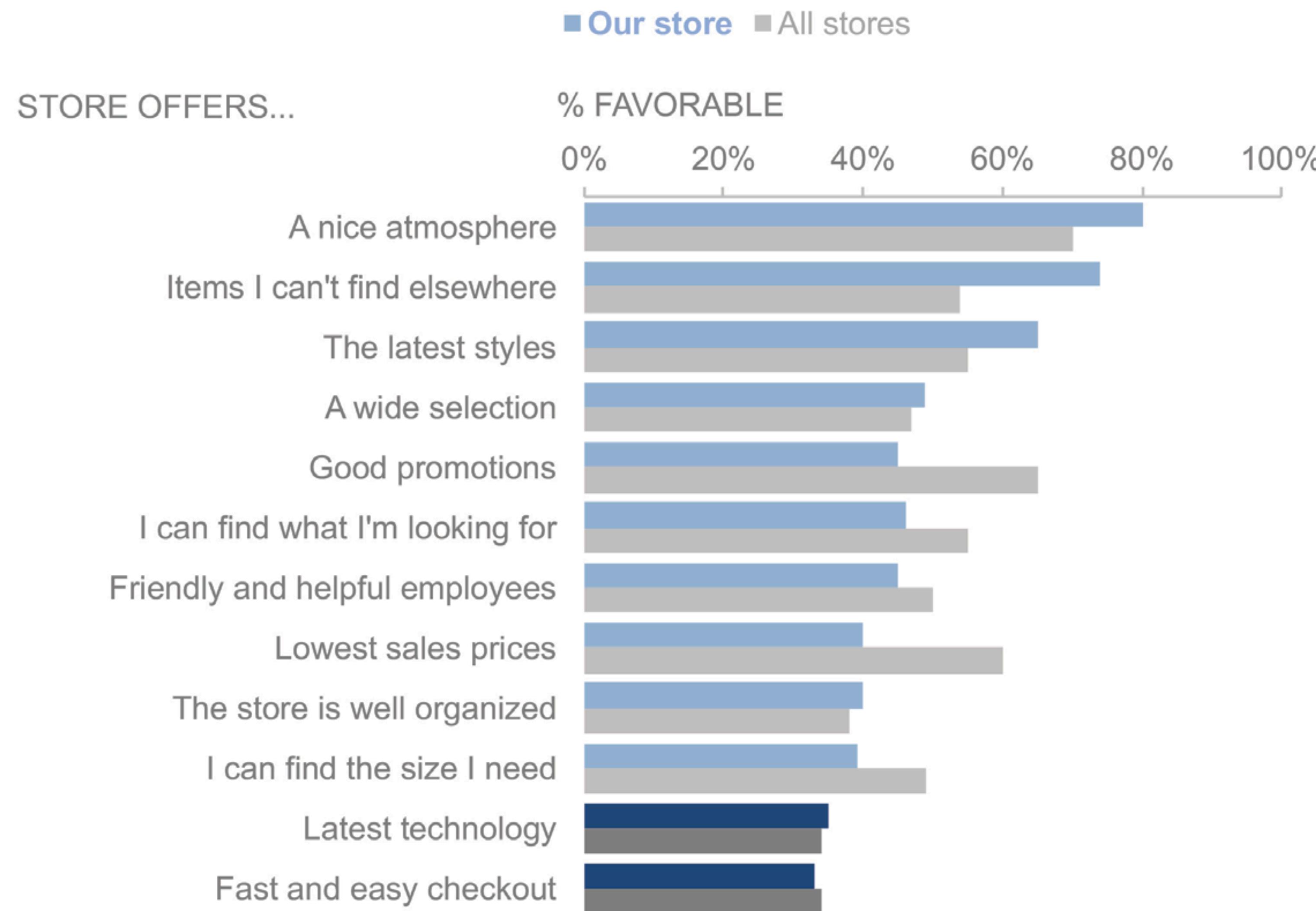
# Back-to-school shopping: consumer sentiment



# Back-to-school shopping: consumer sentiment



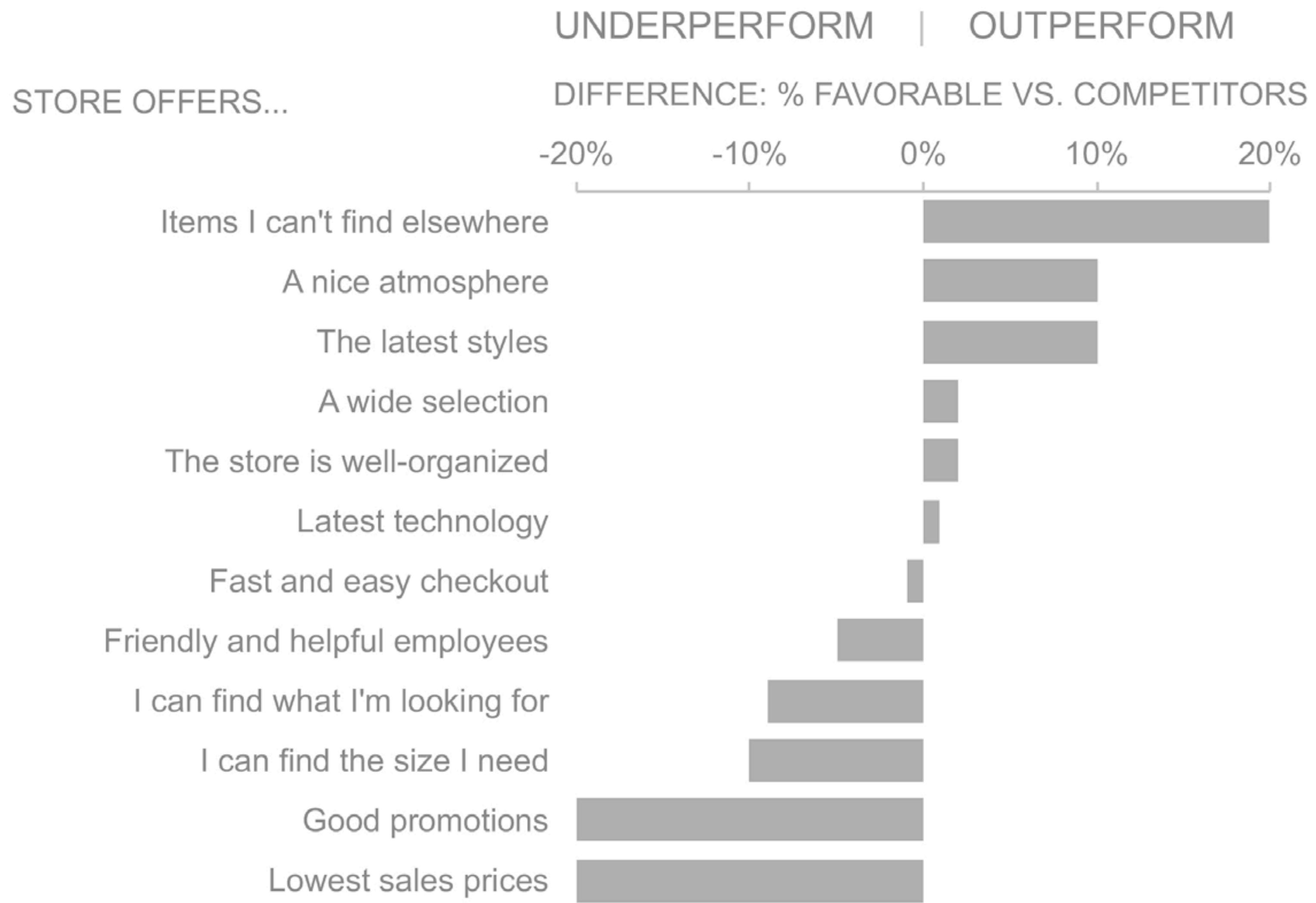
# Back-to-school shopping: consumer sentiment



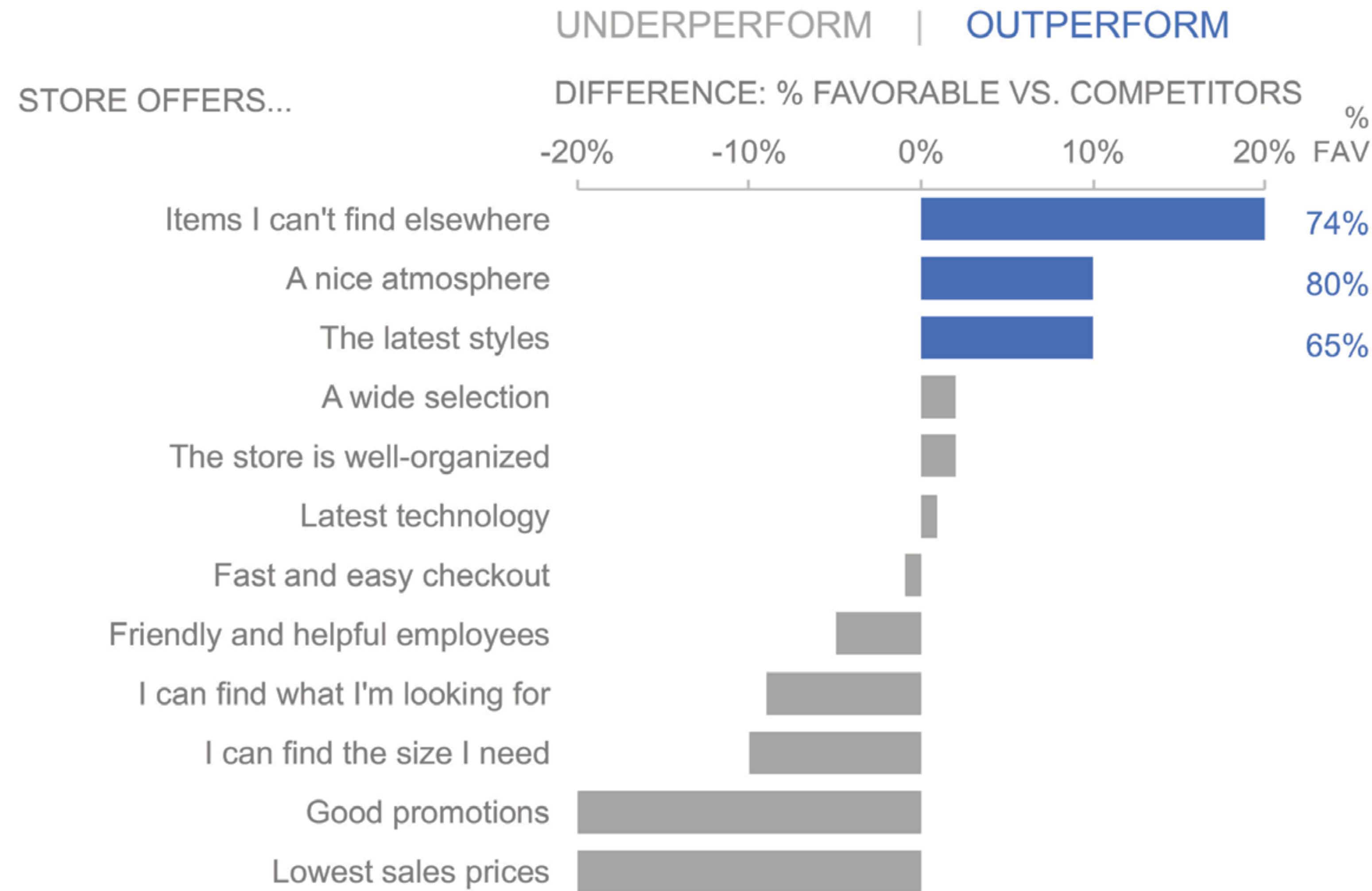
# Back-to-school shopping: consumer sentiment



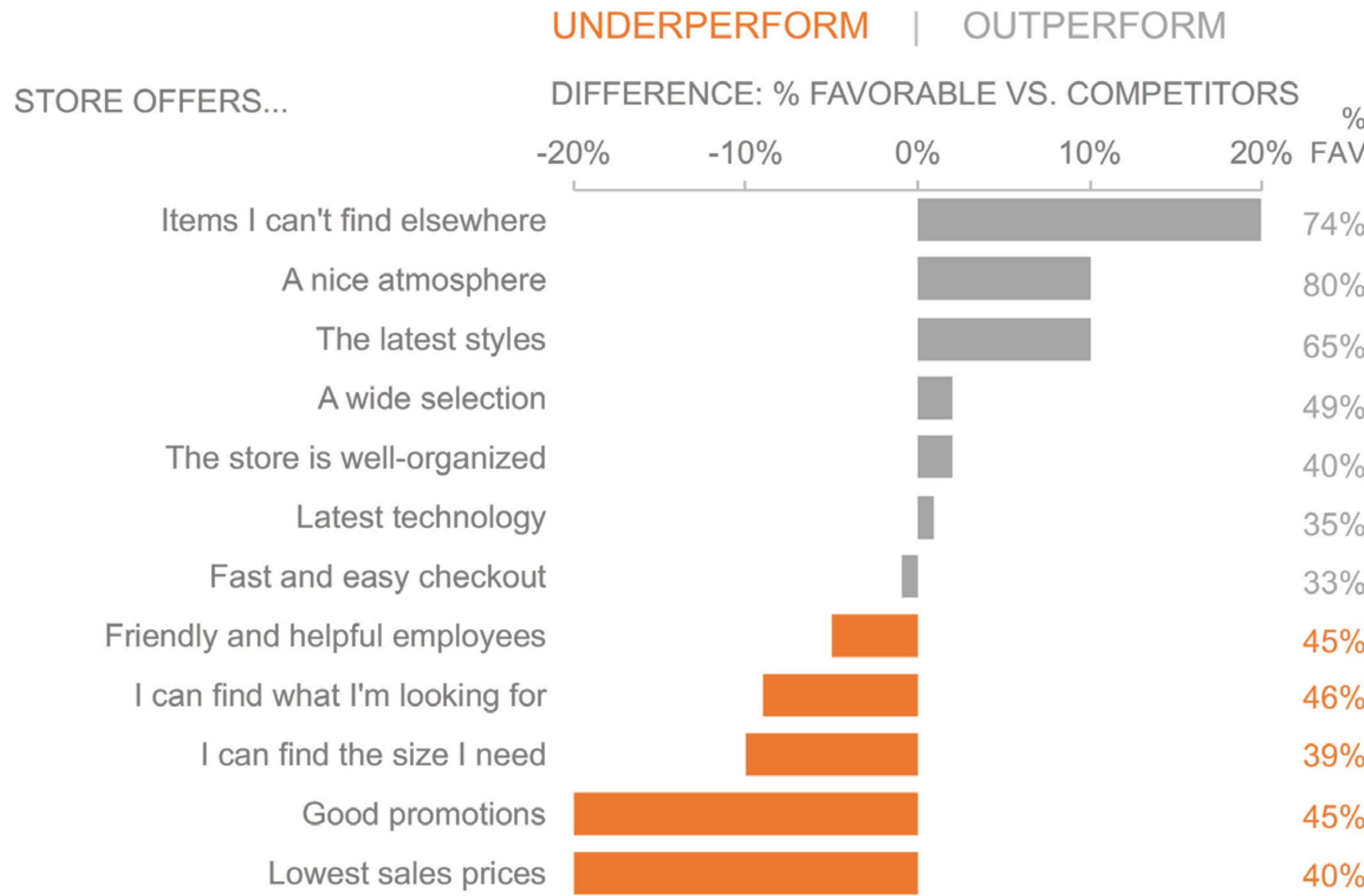
# Back-to-school shopping: consumer sentiment



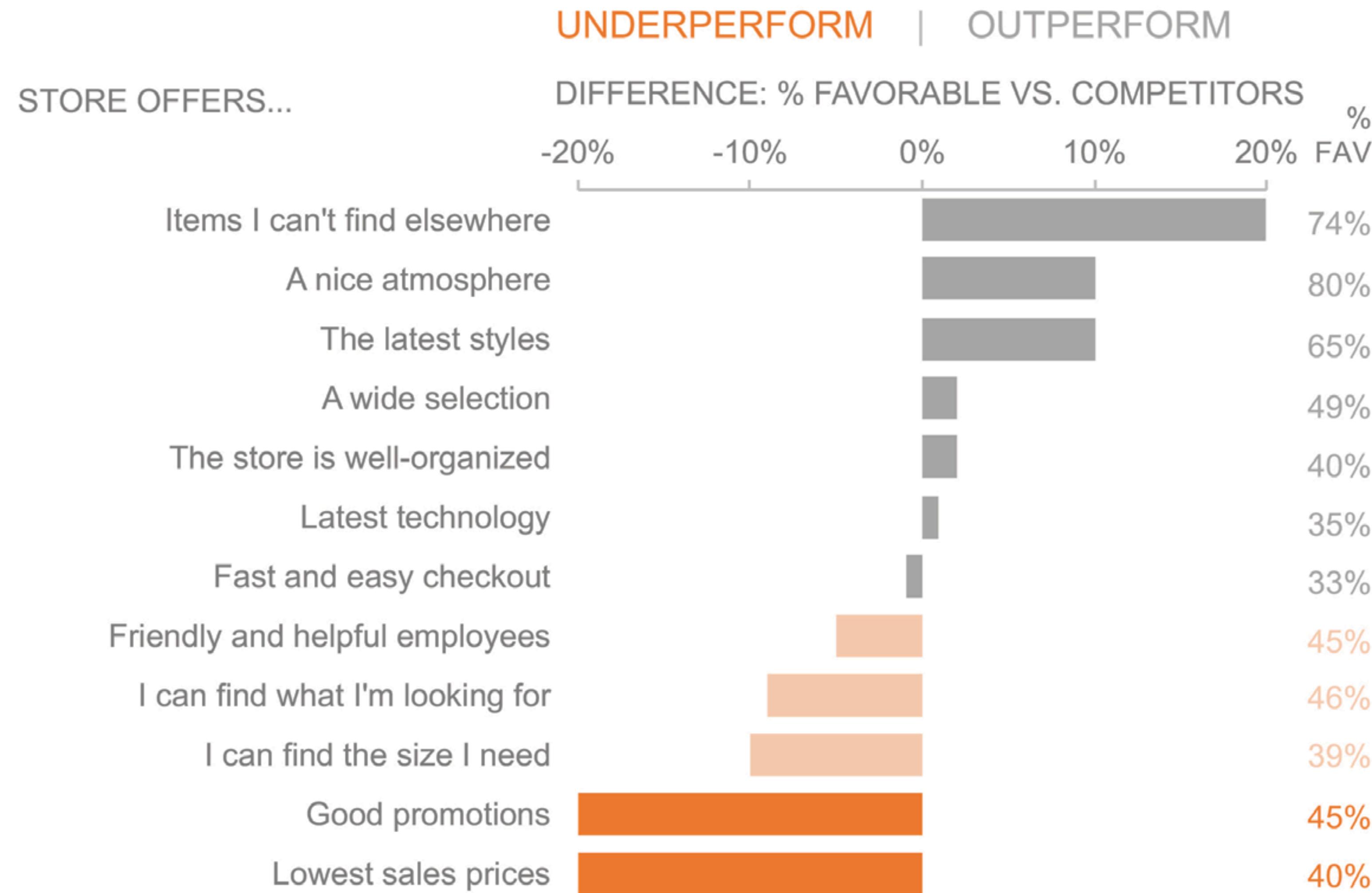
# Back-to-school shopping: consumer sentiment



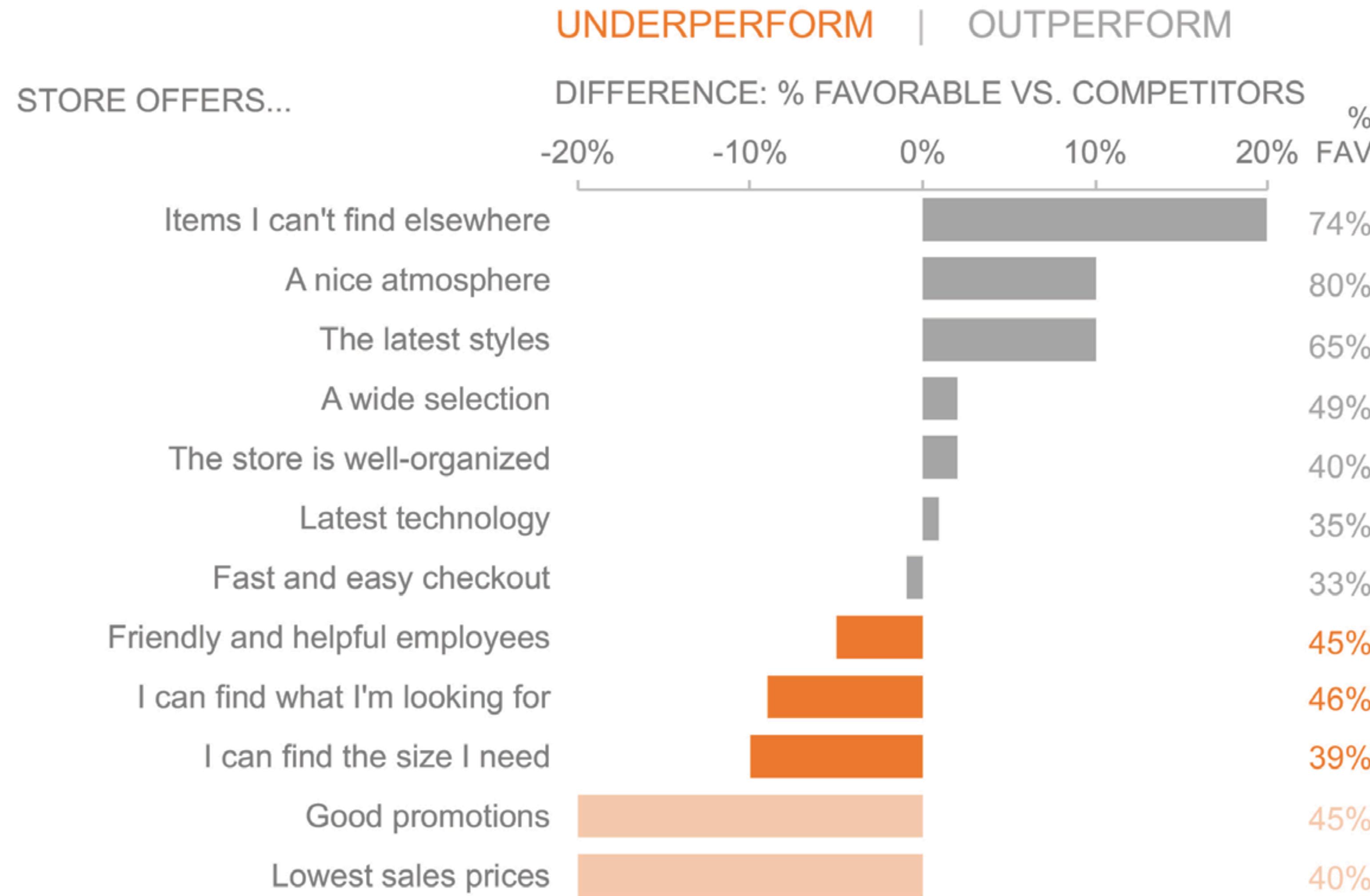
# Back-to-school shopping: consumer sentiment



# Back-to-school shopping: consumer sentiment



# Back-to-school shopping: consumer sentiment



**Let's invest in employee training to  
improve the in-store customer experience**