The Effect of Visual Complexity on Confidence and Comprehension in Visualization Experiences

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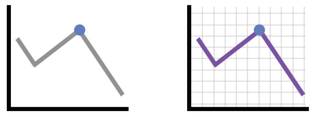
Background

How much detail should I include in my chart's design?

In visualization design...



...researchers have suggested a trade-off between **visual complexity** (VC) and information **comprehension** (COMP).[7]

What should I anticipate readers will do when reading my chart?

1. Human judgment abilities are often influenced by cognitive biases such as **overconfidence.**[8]

estimations > performance

2. **Familiarity** (**fam**) with a topic affects the amount of information that can be recalled.[6]

Questions & Hypotheses

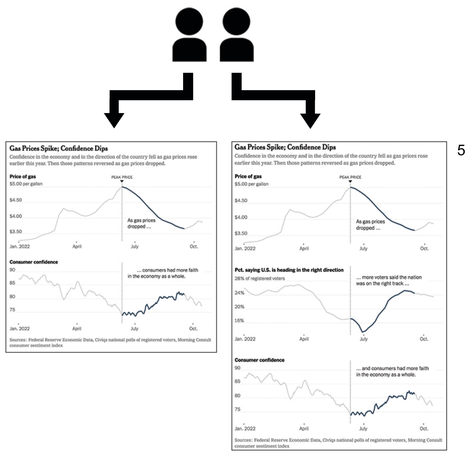
How does...

RQ1	**VC** influence **CONF**?
RQ2	**VC** influence **COMP**?
RQ3	**CONF** align with **COMP**?
RQ4	**FAM** influence **CONF** & **COMP**?

H1	simple = higher **CONF** complex = lower **CONF**
H2	NO effect of **VC** on **COMP**
H3	simple = overconfidence complex = accurate confidence
H4	unfamiliar = overconfidence

RQ1 RQ2 RQ3

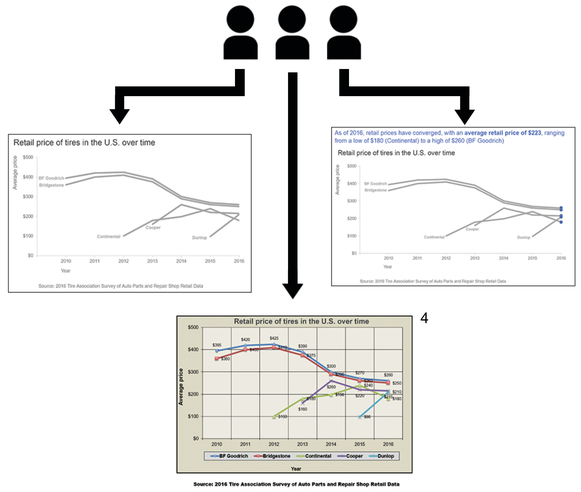
EXP 1 Small Multiples



5

1. Confidence
2. Comprehension
3. VLAT
4. Inferences

EXP 2 Visual Clutter



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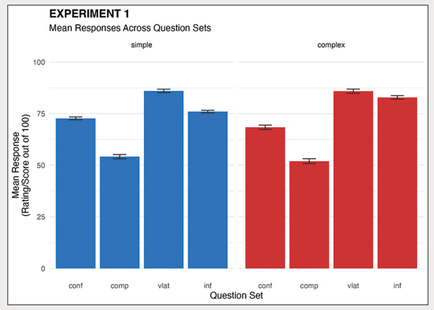
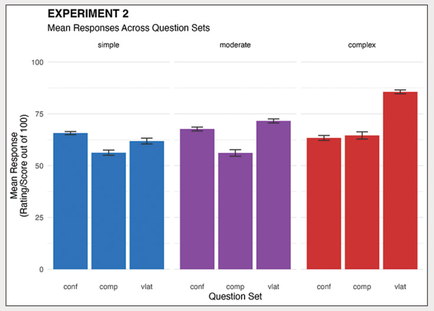
1. Confidence
2. Comprehension
3. VLAT
4. Inferences

Results

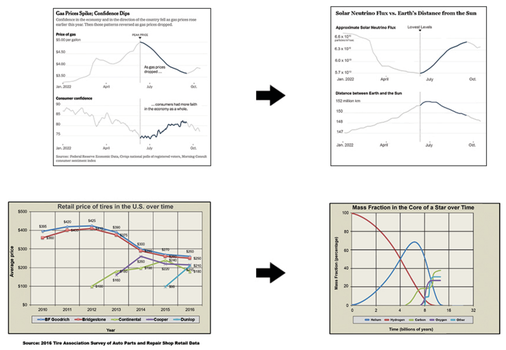


Results



RQ4

EXP 3 Topic Familiarity



Results

Table 5: Comparisons Between Experiment 3 and Experiments 1 and 2

Compared Experiments	*Effect of Topic on…*	*ANOVAs*	
		F	*p*
All Experiments	Familiarity Rating	*21.31*	*< .001**
Experiment 1 vs. Experiment 3	Confidence	*20.64*	*< .001**
	Comprehension	*2.666*	*.108*
	VLAT	*8.62*	*.005**
	Inference	*54.41*	*< .001**
Experiment 2 vs. Experiment 3	Confidence	*10.48*	*.002**
	Comprehension	*3.238*	*0.07*
	VLAT	*0.002*	*0.967*

**significant result.*

Conclusions

H1	H2	H3	H4
✗	✓	✗	✗

As predicted, comprehension scores remained constant regardless of experimental conditions.

However, there were no changes in confidence either!

In addition, people who viewed more unfamiliar topics were less confident in their responses and as such did not induce overconfidence bias.

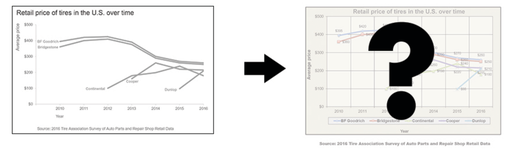
Overall...

...our manipulations of VC did NOT induce overconfidence bias in participants.

Future Work

Across all experiments, no significant effects of visual complexity on confidence ratings were found.

Future goal: find more effective ways to manipulate visual complexity.



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References

[4]Ajani, K., Lee, E., Xiong, C., Knaflic, C. N., Kemper, W., & Franconeri, S. (2021). Declutter and focus: Empirically evaluating design guidelines for effective data communication. IEEE Transactions on Visualization and Computer Graphics, 28(10), 3351-3364.

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