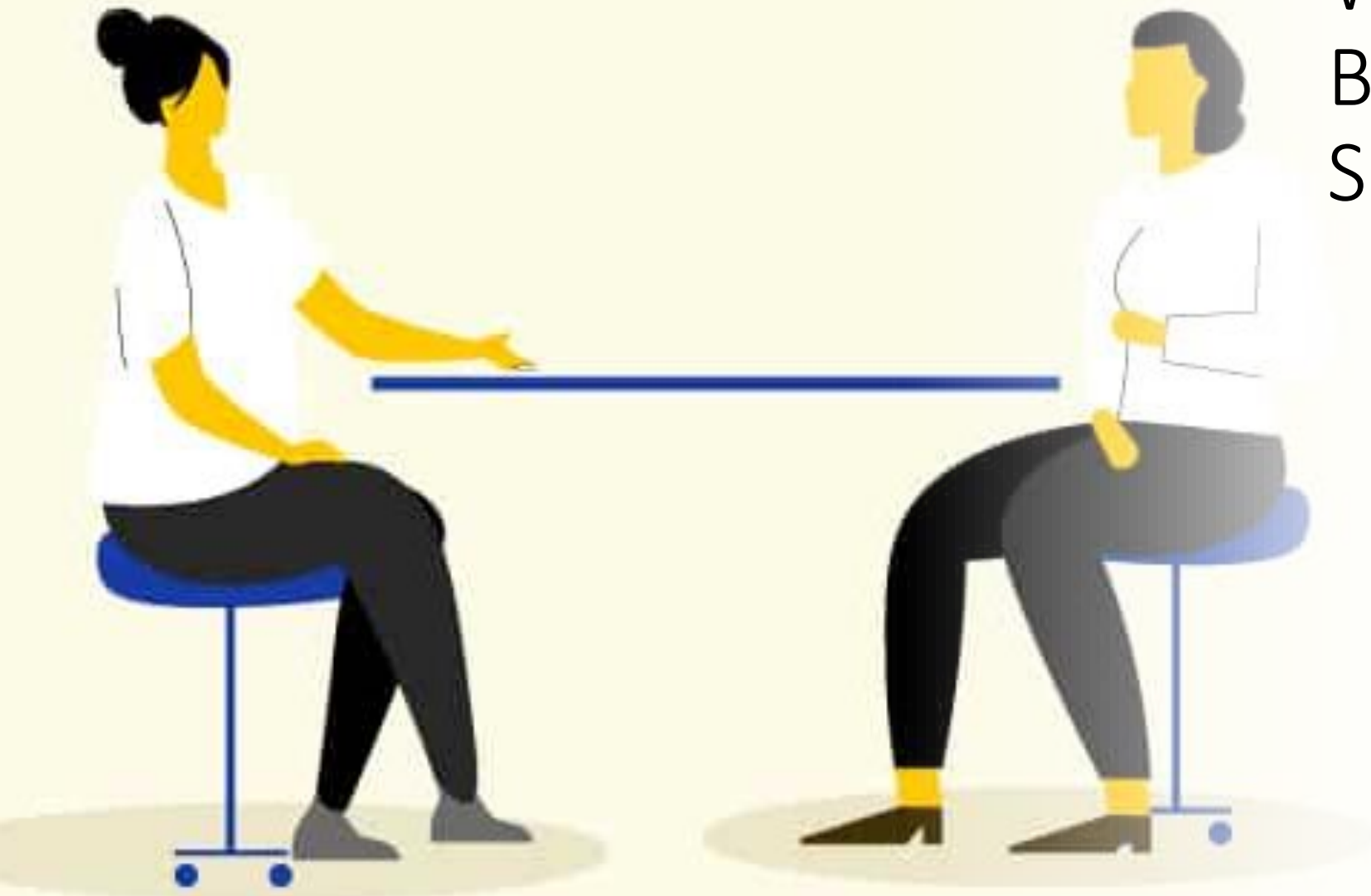




Using Machine Learning to Model the Business Outlook Survey text responses

The views expressed in this presentation are those of the speaker and do not necessarily reflect the official views of the Bank of Canada.



What is the Business Outlook Survey?

“

Through our surveys and conversations with business leaders, we regularly gain insights into business conditions before they show up in official statistics, which is crucial to our monetary policy deliberations.”

- Tiff Macklem, Governor

Our Process

Preprocessing

- Remove stopwords, punctuation and annotator labels
- Lowercase the text

Set up

- Term-Document Matrix
- Date and CPI covariates

Non-negative matrix factorization

- Groups together words that occur together into topics
- Relationships between the prevalence of topics over time or with respect to CPI

Non-negative matrix factorization

NMF Decomposition

Term

Document

Term

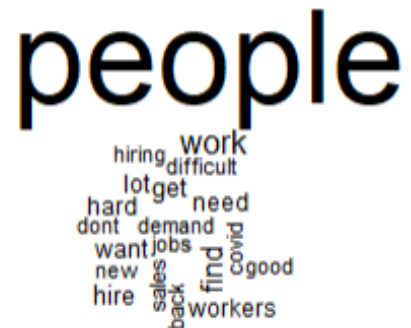
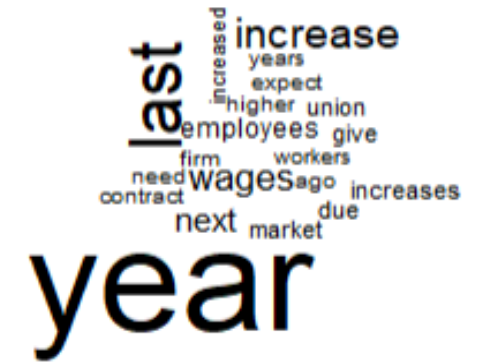
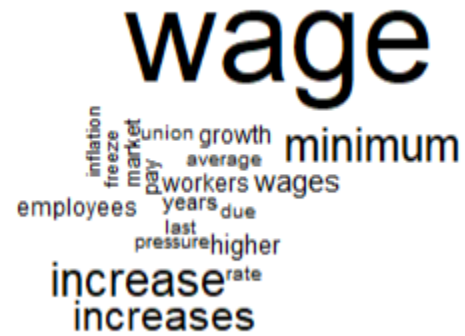
Topic

Topic

Document

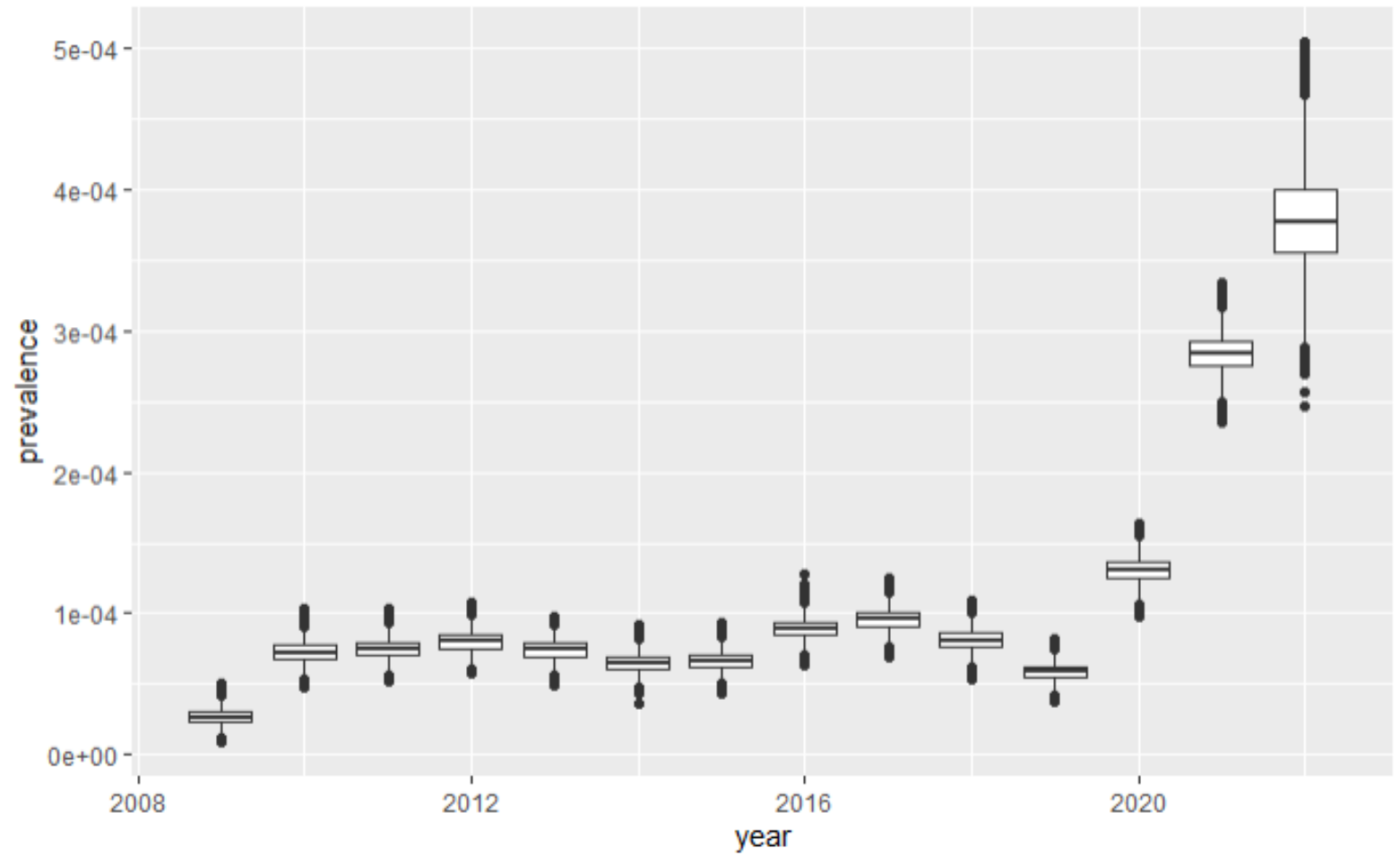
$$X \approx [\hat{W} \times \hat{H}]_+$$

where $[\]_+$ converts every negative element to zero

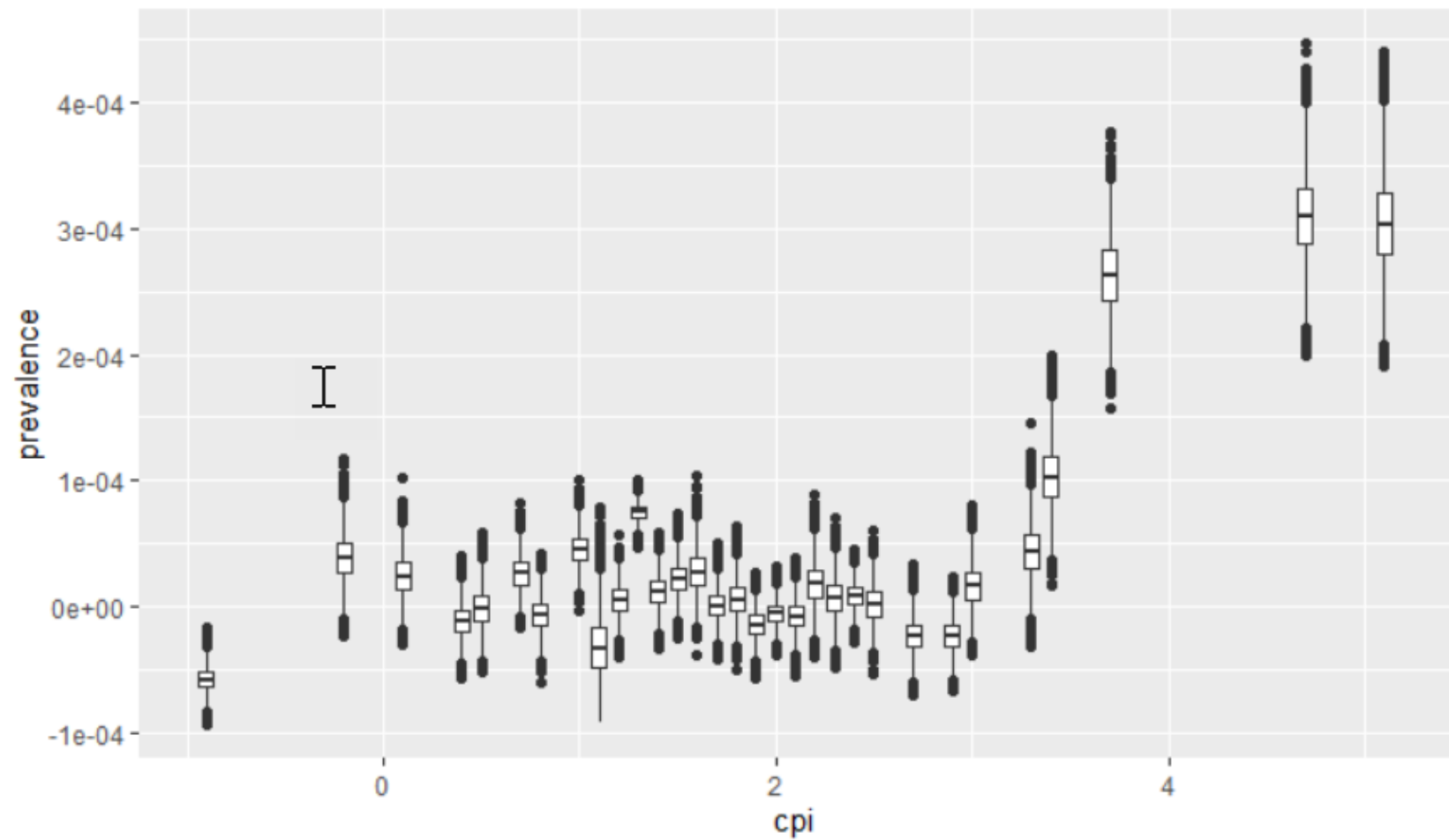


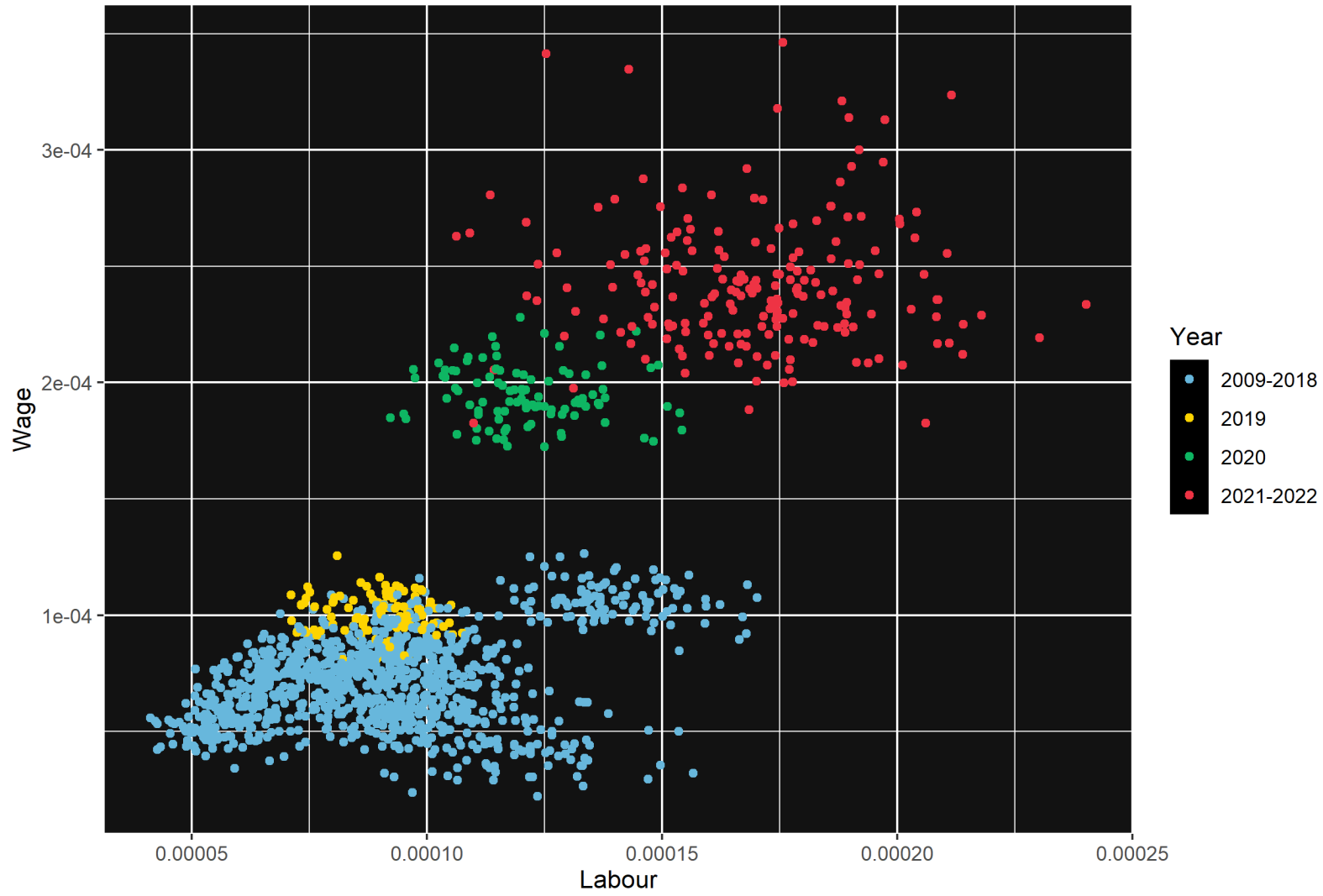
What do the top 20 words tell us about the Labour category?

Prevalence of
the “labour”
topic over
time



Prevalence of
the “Labour”
topic with
respect to
Consumer
Price Index

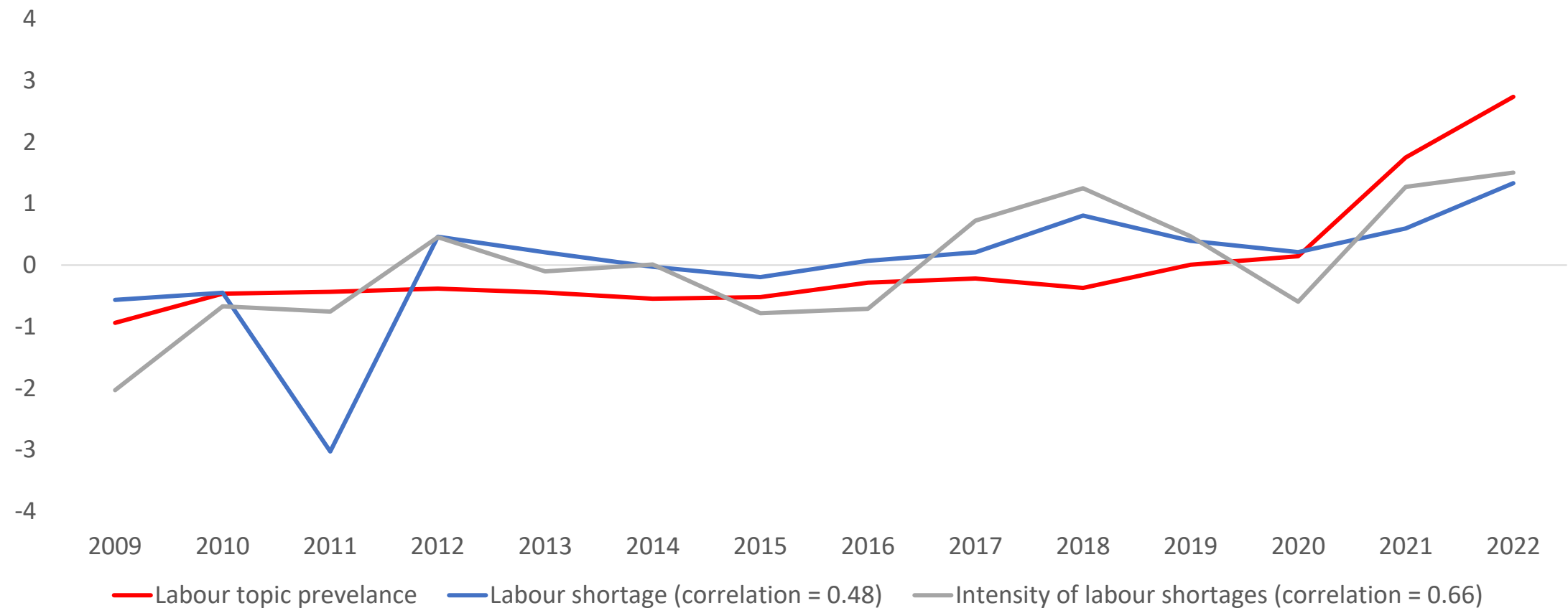




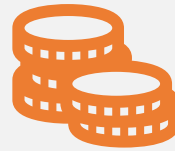
Relationship
between
Wage and
Labour
topics

The labour topic seems to be telling us something different than the BOS results

Prevalence of labour topic and BOS labour shortage indicators over time (standardized units)



Next Steps



Hypothesis testing for other economic variables



Observe within region

A low-angle, upward-looking photograph of several modern skyscrapers with glass facades. The buildings are arranged in a way that they appear to converge towards the top of the frame, creating a strong sense of height and scale. The sky is a clear, bright blue with scattered, light-colored clouds. The glass surfaces of the buildings reflect the sky and each other, creating a complex pattern of light and dark blue tones. A semi-transparent dark grey horizontal band is overlaid across the middle of the image, containing the text "Thank you" in a white, sans-serif font.

Thank you