Do Anecdotes Matter? Exploring the Beige Book through Textual Analysis from 1970-2025

Shengwu Du, Flora Haberkorn, Isabel Kitschelt, Seung Jung Lee, Anderson Monken, Dylan Saez, Kelsey Shipman, and Sandeep Thakur

*Federal Reserve Board of Governors

The views expressed herein are those of the authors' and do not necessarily reflect the opinions of the Board of Governors of the Federal Reserve System or anyone else in the Federal Reserve System.

Abstract

We apply various natural language processing tools to examine if the Beige Book helps understand economic activity. The Beige Book is a gathering of anecdotal compilations of current economic conditions from each Federal Reserve Bank, released publicly prior to FOMC meetings. We find that even controlling for lagged GDP growth and other metrics, Beige Book sentiment provides meaningful explanatory power in nowcasting GDP growth and forecasting recessions—even more so than the yield spread or other news sentiment measures. Results hold in regional panel analysis. Topic modeling reveals different factors driving narratives across particular periods of interest.

Data

The Beige Book is an official Federal Reserve System publication gathering anecdotal compilations of current economic and financial conditions from each Federal Reserve Bank, released publicly prior to FOMC meetings.

History:

- Pre-1970: Anecdotal information presented orally at FOMC meetings
- 1970-1983: "Red Book" created as confidential document for policymakers only
- 1983-present: Became public as "Beige Book," released two weeks prior to FOMC meetings
- We analyze all written Red Book/Beige Books from 1970 onwards, providing over a half-century of text. Numerical regressions run on data from 1980-2019 (excluding COVID period for main analysis)

Figure 1: Beige Book History (1970-2023)

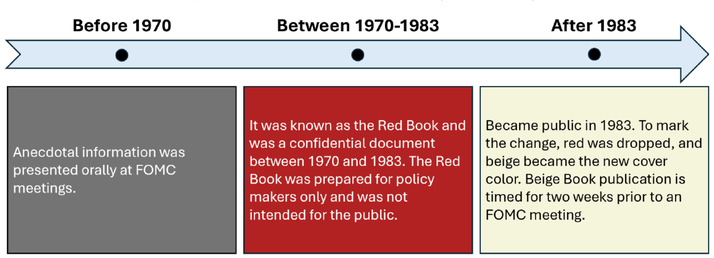


Figure 2: Beige Book Natural Language Processing

FinBERT Analysis

- Sentiment scoring
- Pre-trained NLP model that is trained on financial data

Topical Analysis

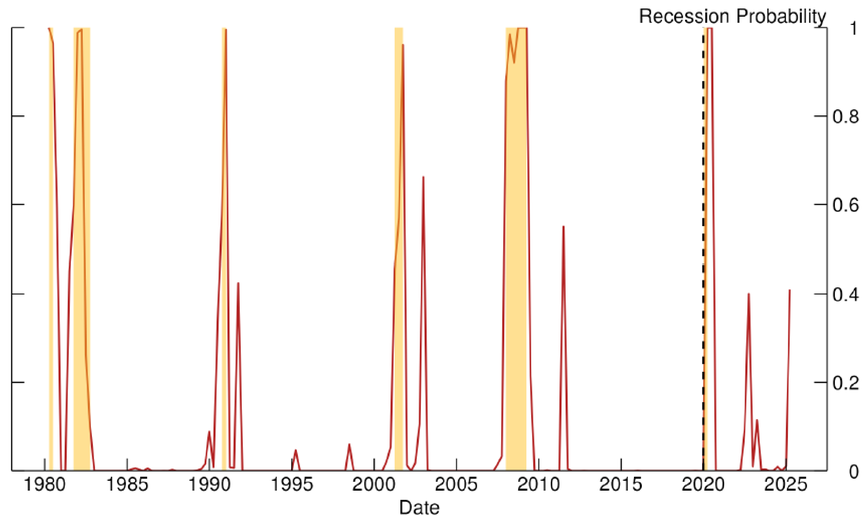
- Lowercase
- Tokenize
- Count number of topic related words
- Count total words
- $\frac{\text{Topic related words}}{\text{Total words}}$

LDA

- Lowercase
- Remove numbers and stop words
- Tokenize
- Topic modeling

Results

Figure 5: Out-of-Sample Recession Nowcast



The figure displays actual versus nowcasted recession probability based on Beige Book FinBERT sentiment, with the out-of-sample period beginning in 2020:Q1. Shaded areas represent NBER recessions. Results demonstrate strong out-of-sample forecasting performance, with the model successfully capturing recession probabilities in real-time. Predicted nowcast recession probability values are derived from the model in Table 4, Column 6. Data sources include NBER-based Recession Indicators for the United States from the Period following the Peak through the Trough (retrieved from FRED via Federal Reserve Bank of St. Louis) and Beige Book FinBERT sentiment from Board of Governors of the Federal Reserve System's Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive).

Table 5: Economic Recession Forecasting Results (COVID excluded)

	Recession					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged2 Real GDP Growth	−0.370***	−0.145	−0.285***	−0.084	0.100	−0.152
	(0.095)	(0.104)	(0.109)	(0.109)	(0.142)	(0.220)
Lagged Yield Spread	−0.407				−1.241**	−2.165***
	(0.286)				(0.551)	(0.783)
Lagged News Sentiment		−11.006***			−10.453***	−15.354***
		(2.753)			(3.975)	(4.827)
Median SPF Real GDP Growth (forecast)			−0.275			0.969**
			(0.187)			(0.451)
Lagged Beige Book FinBERT sentiment				−17.337***	−20.477**	−26.262**
				(4.791)	(8.024)	(10.387)
Observations	159	159	159	159	159	159
Akaike Inf. Crit.	97.358	72.011	97.362	60.850	49.945	45.597

Note: This table presents logistic regression results for nowcasting U.S. economic recessions one quarter ahead. All regressions are based on 159 observations from 1980:Q2 to 2019:Q4, excluding the COVID-19 period. The dependent variable is a binary indicator equal to 1 if the quarter is classified as a recession and 0 otherwise. Each column represents a different model specification, with standard errors in parentheses below coefficient estimates. Lower Akaike Information Criterion (AIC) values indicate better model fit. Standard errors appear in parentheses: *p< 0.1; **p< 0.05; ***p< 0.01.

Methodology

First set of models is nowcasting with unlagged independent variables, except for lagged real GDP growth, and the second set is a forecasting model with lagged independent variables.

$$Pr(Z_t = 1|Y_{t-1}, X_t) = \frac{exp(\alpha + \beta_1 Y_{t-1} + X_t\beta_2)}{1 + exp(\alpha + \beta_1 Y_{t-1} + X_t\beta_2)}$$

$$Pr(Z_t = 1|Y_{t-1}, X_{t-1}) = \frac{exp(\alpha + \beta_1 Y_{t-1} + X_{t-1}\beta_2)}{1 + exp(\alpha + \beta_1 Y_{t-1} + X_{t-1}\beta_2)}$$

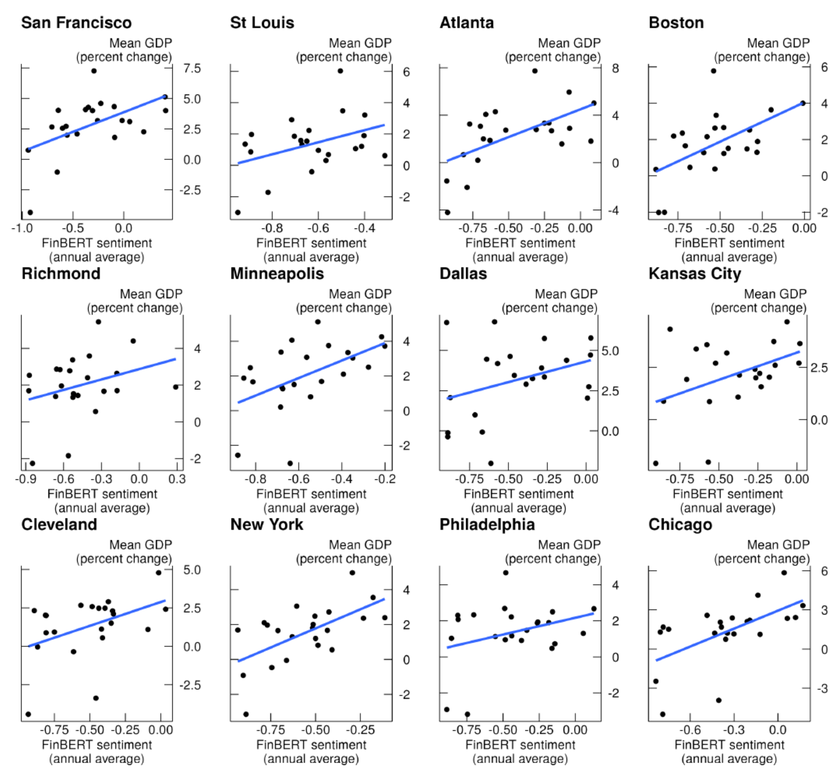
Y_t = Real GDP

X_t = Vector of explanatory variables (Yield Spread, News Sentiment, Beige Book Sentiment, SPF GDP forecast)

Z_t = dummy for recessions

Regional Sentiment

Figure 7: Beige Book FinBERT Sentiment and Regional GDP Growth by Federal Reserve District



Do Anecdotes Matter? Exploring the Beige Book through Textual Analysis from 1970 to 2025*

Shengwu Du[a], Flora Haberkorn[a], Isabel Kitschelt[a], Seung Jung Lee[a], Anderson Monken[a], Dylan Saez[b], Kelsey Shipman[c], and Sandeep Thakur[d]

[a] *Board of Governors of the Federal Reserve System*
[b] *The University of Chicago Booth School of Business*
[c] *University of Wisconsin, Madison*
[d] *Federal Reserve Bank of New York*

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Abstract

We apply various natural language processing tools to see if the Beige Book is helpful in understanding economic activity. The Beige Book is a gathering of anecdotal compilations of current economic conditions from each Federal Reserve Bank, which is released to the public prior to FOMC meetings. We find that even controlling for lagged GDP growth and other metrics, the Beige Book sentiment provides meaningful explanatory power in nowcasting GDP growth and forecasting recessions, even more so than the yield spread or other news sentiment measures. The results on economic activity even hold in regional panel analysis. The Beige Book offers many more insights on the economy that can be gathered from even simple keyword tabulations. Topic modeling can also inform us about the different factors driving the narrative across particular periods of interest.

JEL classification: E32, E37

Keywords: Beige Book, real economic activity, recessions, nowcasting and forecasting, FinBERT, machine learning, sentiment analysis, natural language processing

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Disclaimer: The views expressed herein are those of the authors, and do not necessarily represent the views of the Board of Governors of the Federal Reserve System, the Federal Reserve Bank of New York, or its staff.

1 Introduction

In this paper, we use various natural language processing tools to shed light on different factors that help nowcast and forecast real economic activity and recessions through the lens of anecdotes. We extract textual information from the Beige Book, which is an official publication by the Federal Reserve System that gathers anecdotal compilations of current economic and financial conditions from each Federal Reserve Bank in the Federal Reserve System. This publication is released to the public prior to FOMC meetings. The anecdotes therein are helpful in seeing what contacts had to say about regional economic activity and financial conditions since 1970.

We first investigate how the sentiment in the Beige Book over the years has correlated with real economic activity and recessions. To do so, we run regressions of real economic activity and recessions on sentiment extracted from the Beige Books based on the FinBERT model, which is widely used in the literature for extracting sentiment from economic and financial text. Even controlling for lagged GDP growth, the Beige Book sentiment provides meaningful explanatory power in nowcasting GDP growth and recessions and forecasting recessions, even beyond the yield spread, media sentiment, and a highly regarded GDP survey indicator.

The structure of the Beige Book allows us to differentiate among different Federal Reserve Banks. We find that even regional sentiment conveyed in the Beige Books also helps nowcast regional real economic activity controlling for region- and time-fixed effects. Separately, we also find that each district's economic activity is also correlated with sentiment conveyed about all other districts separate from it's own.

Finally, keyword searches and topic modeling provide insight into what the topics of the day were and contextualize different historical periods in the US economy; for example, supply chain issues after the COVID pandemic were an unusual issue recently compared to recent Beige Book history. In fact, natural language processing enables us to understand which topics are mentioned in different periods, which offers an understanding of the background to the various drivers of economic activity, especially in downturns.

The remainder of the paper is structured as follows. Section 2 goes over the history of the Biege Book in more detail, followed by Section 3, which provides a literature review on relevant studies that featured the Beige Book. Section 4 describes how the sentiment in the Beige Book is calculated and briefly describes how the sentiment and topic modeling in the Beige Book are calculated. Section 5 provides econometric analysis in both aggregate for the

entire US economy and on a regional basis for a panel of the Federal Reserve Banks. Section 6 goes through basic topical analysis before the Conclusion in Section 7.

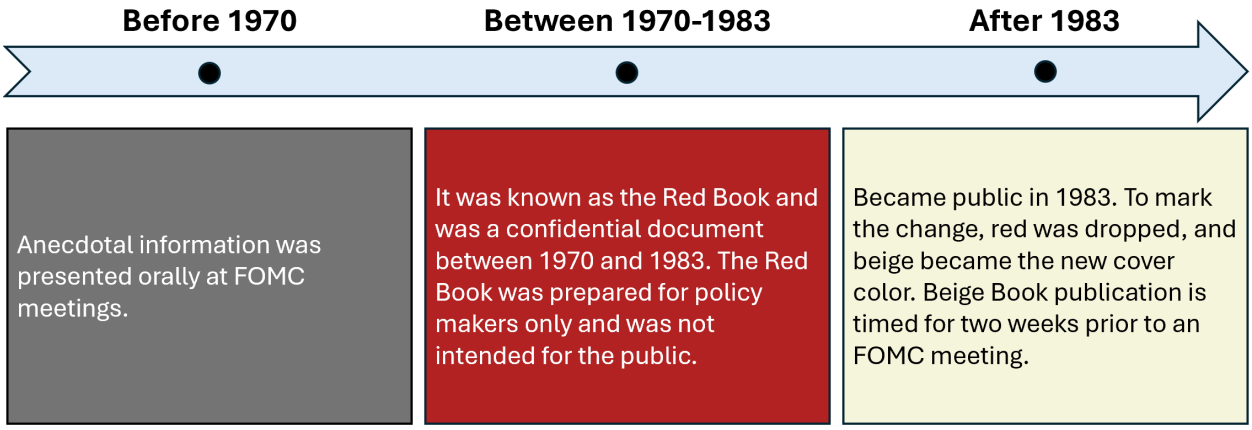
2 Beige Book History

Before we describe the literature on how the informational content of the Beige Book has been useful for understanding economic activity, we briefly go over the history of the Beige Book.

As depicted in Figure 1, prior to 1970 anecdotal information from business contacts at the different Federal Reserve Banks was presented orally at the FOMC meetings. From 1970 to 1983, the Red Book was created as a confidential document, which was prepared for policy makers only. The public did not have access to this series of documents. After 1983, however, this document became public; to mark the change in accessibility, the name changed to the Beige Book (along with a new color on the cover) and was timed to be released to the public two weeks prior to the FOMC Meeting. Ever since this document became public, the media, as well as policy makers, have relied on it to gauge what is happening in the U.S. economy.

We can analyze all the written Red Book/Beige Books from 1970 onwards, which provides us with over a half-century of text to analyze. Due to data availability, we run our numerical regressions, however, on data starting from 1980.

Figure 1: **Beige Book History (1970-2025)**



3 Literature Review

In the literature, the Beige Book has been used as a source of text that can be measured quantitatively for economic interpretation. For example, most recently, Burke and Nelson (2025) provide evidence that Beige Book information at the individual Reserve Bank level helps forecast recessions at the national level. Gascon and Martorana (2025) provide some qualitative evidence that Beige Book sentiment and GDP growth move in tandem, indicates business cycle turning points, and references various shocks, internal and external, to the economy. Balke and Petersen (2002) converted text from the Beige Book that dealt with economic activity to numerical scores from -2 to 2 to analyze GDP growth. The method of manually assigning scores, however, was seen as time consuming and costly in Balke, Fulmer and Zhang (2017), where they instead focused on using algorithms to conduct textual analysis. Although both refer to different ways of extracting quantitative data, they both agree that the text in the Beige Book has predicative capabilities for economic activity, especially in relatively short time horizons.

Furthermore, analysis of the Beige Book text can be expanded by gathering topics and sentiment. Gascon and Werner (2022) created two lists of words that pertained to the topic of inflation and the labor market and found the counts of each topic followed inflation and labor market trends fairly closely. Exploring more economic topics within the Beige Book would further exemplify what the Beige Book text has to offer in terms of being able to extract quantitative data. In addition, incorporating sentiment analysis helped to provide further insights on the economy. For example, Sadique et al. (2013) found that turning points in industrial production and unemployment was able to be predicted by the tone of the national summary.

However, most of the literature is based on the entire body of text and uses a dictionary approach for extracting information from the Beige Books. In this paper, we provide a general overview of how sentiment measured by new machine learning models can help nowcast and predict economic activity and recessions, controlling for other relevant variables such as news sentiment from official media and the term premium, in addition to GDP forecasts by professionals. We also show that the Beige Book can shed light on regional economic activity as well, which the literature has not touched upon. Finally, we provide the capability to understand richer context in terms of how different topics evolved throughout the past half century, including how international developments were mentioned in the context of U.S. economic and financial activity, and how different periods of recessions differed in their

substance. Text allows us to extract these types of nuances throughout the period in which the Beige Book existed.

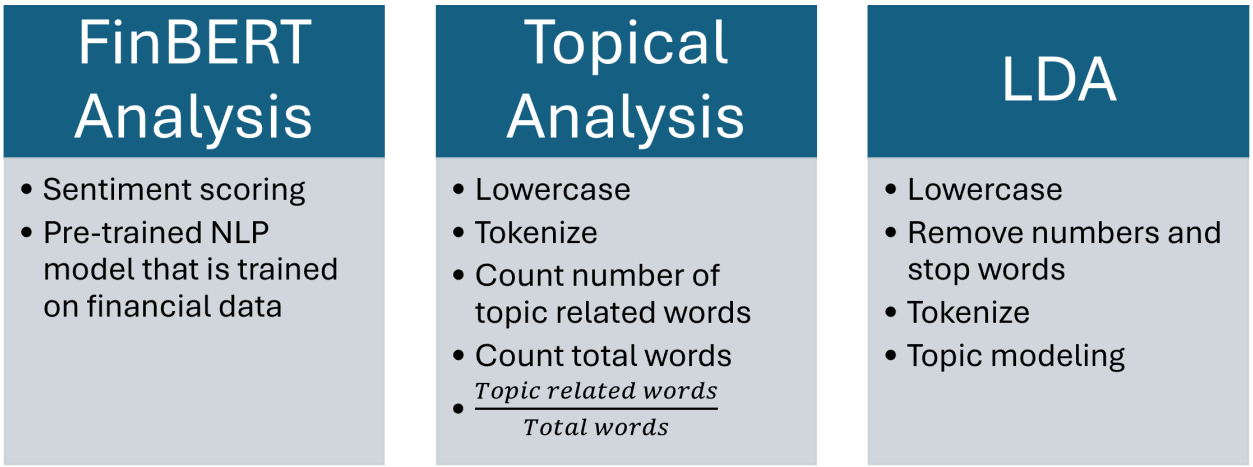
4 Sentiment in Beige Books

The method we use for analyzing text in the Beige Books is straightforward. In this section, we describe how we clean and model the Beige Book corpus of text.

First, we do some basic text cleaning that follows the literature. We convert the text to lowercase and remove numbers and stop words. Stop words are basically a set of commonly used words that provide little meaning to the text, such as "the," "and," "his," etc. We then tokenize each word, such that words such as "increase," "increasing," and "increasingly" are all considered as providing the same sentiment.

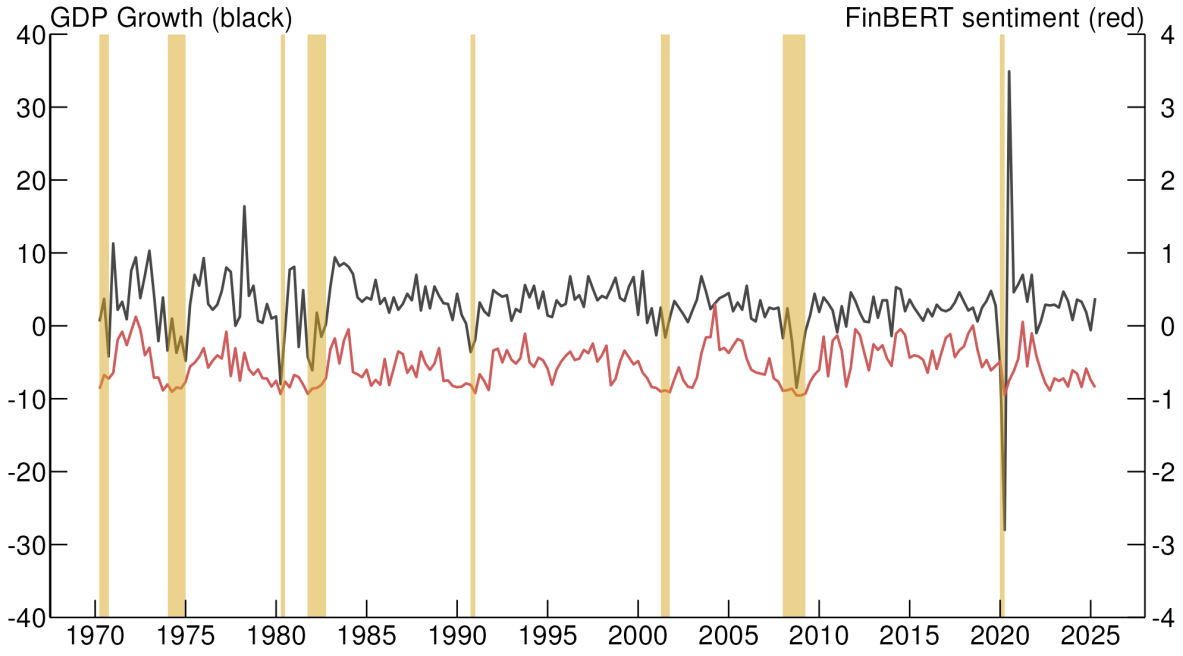
The second step we follow is to apply a model for sentiment scoring. Here we use the FinBERT model to calculate sentiment in the Beige Books. The FinBERT large language model is based on the BERT model and is fine-tuned on financial text. BERT stands for "Bidirectional Encoder Representations from Transformers" which allows for the natural language processing to be achieved by looking both before and after the word or token to enhance consideration of the context that the word or token is used in. This BERT model still powers the Google search engine, as it was created by Google researchers in 2018. As for FinBERT, many studies have used this model because it has been shown to be good at differentiating sentiment of economic and financial text (Araci (2019)).

Figure 2: **Beige Book Natural Language Processing**



We convert the Beige Book FinBERT sentiment (scores) to quarterly data by taking the last observation in the quarter. Figure 3 shows the time series of the Beige Book sentiment through time as well as real U.S. GDP growth since 1970. Due to the conservative writing style in the Beige Book, the Beige Book sentiment score tends to be negative in general. The correlation between the two series is 0.32. If we remove data from 2020:Q1 and thereafter due to the unusual circumstances of the COVID pandemic, the correlation increases to 0.43. Because one of our main control variables begins in 1980 and the COVID pandemic was such a unique event, we conduct our empirical analysis from 1980:Q2 to 2019:Q4. Still, the graph shows that these two series are positively correlated for the longer time series, and we ultimately use more recent data for out-of-sample testing of our model.

Figure 3: **Beige Book Sentiment and U.S. Real GDP Growth**



Note: Beige Book sentiment (red line) and U.S. Real GDP growth (black line) from 1970 to the present. Shaded areas represent NBER recessions. Beige Book sentiment tends to be negative in general, reflecting the report's conservative writing style. The correlation between the two series is positive, 0.323.
Sources: U.S. Bureau of Economic Analysis, Real Gross Domestic Product, retrieved from FRED; Beige Book FinBERT from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

5 Econometric Analysis

In this section, we test to see if Beige Book sentiment provides significant explanatory power for nowcasts and forecasts of economic growth and recessions using some basic econometric specifications. We conduct the test at both the national and regional level. For the national level analysis, we control for other major indicators that help nowcast and forecast economic growth and recessions: the Survey of Professional Forecasters (SPF GDP forecast), the yield spread between 2-year and 10-year US Treasury, the Daily News Sentiment Index from the Federal Reserve Bank of San Francisco, in addition to our Beige Book Sentiment Index.

The Survey of Professional Forecasters is the oldest quarterly survey of macroeconomic forecasts in the United States. The survey began in 1968 and was conducted by the American Statistical Association and the National Bureau of Economic Research. The Federal Reserve Bank of Philadelphia took over the survey in 1990. It has been one of the most commonly used methods for forecasting/nowcasting GDP. The Daily News Sentiment Index is a high frequency measure of economic sentiment based on lexical analysis of economics-related news articles. The index and methodology are described in Shapiro, Sudhof and Wilson (2022). The yield curve—which measures the spread between the yields on short-term and long-term maturity bonds—is often used to predict economic growth and recessions (Haubrich (2006)). Barbaglia, Consoli and Manzan (2023) argues that the economy forecast accuracy increases significantly when economic sentiment is used in a time series model as these measures tend to proxy for the overall state of the economy. Normalized and seasonally adjusted real US GDP growth rate is the response or dependent variable in our regression models and lagged GDP growth is introduced to control for the auto-correlation effect in the time series.

5.1 Beige Book Sentiment and Economic Growth

To gauge how the sentiment in Beige Books reflects and predicts economic growth, we estimate the following two sets of linear regression models from 1980 to 2019. The first set of models is a nowcasting model with unlagged independent variables (except for the lagged dependent variable, real GDP growth) and second set is a forecast model with lagged independent variables.

The nowcasting linear regression model is specified as follows:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 X_t + \epsilon_t, \tag{1}$$

where Y_t is real GDP growth at time t, α is the constant term, β_1 is the coefficient of lagged GDP growth, X_t is a vector of concurrent explanatory variables such as the yield spread, news sentiment, Beige Book sentiment, and the SPF survey at time t that varies based on the specification, and β_2 is the corresponding coefficients. ϵ is the error term.

Then the forecasting model is simply the following:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 X_{t-1} + \epsilon_t, \tag{2}$$

with all the explanatory lagged one period.

Tables 1 and 2 illustrate how the sentiment embodied in the Beige Books help nowcast and forecast real GDP growth, respectively. Because real GDP growth is reported with a lag relative to the Beige Book publication, the ability to nowcast GDP growth is also useful. Controlling for lagged real GDP growth, we see that the Beige Book sentiment is statistically significant and economically meaningful in nowcasting real economic activity. For example, an increase in the Beige Book sentiment from -0.5 to 0.5 is reflective of an increase in real GDP growth of about 2.5 to 3.5 percentage points depending on the specification. In general, the regression models with the Beige Book sentiment index as a predictor perform better than the models with yield curve and the general news index. Specification (6) shows that the Beige Book sentiment can still explain real economic growth even when controlling for News sentiment and the SPF GDP survey, though the significance level is reduced. For the forecasting regression model, the coefficient of the Beige Book sentiment is statistically significant and meaningful on a stand-alone basis, but when controlling for News sentiment and the SPF GDP survey, the coefficient is not statistically significant. This may be because official media and the Survey of Professional Forecast may have more forward-looking components or already incorporate the informational content from the Beige Books. Studies such as Chen et al. (2023) have found that official media tends to be better at forecasting financial crises, for example, than official publications. Also, many papers have shown that the Survey of Professional Forecast can predict the GDP growth with a high degree of confidence (Eo and Morley (2023); Engelberg, Manski and Williams (2009)).

Table 1: Real GDP Growth Nowcasting Results (COVID excluded)

	Real GDP Growth (seasonally adjusted annual rate)					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Real GDP Growth	0.381***	0.261***	0.220**	0.280***	0.215***	0.153
	(0.074)	(0.076)	(0.100)	(0.075)	(0.076)	(0.097)
Yield Spread	−0.205				−0.243	−0.265
	(0.237)				(0.237)	(0.237)
News Sentiment		5.225***			3.329**	3.089**
		(1.245)			(1.402)	(1.420)
Median SPF Real GDP Growth (nowcast)			0.392**			0.171
			(0.162)			(0.164)
Beige Book FinBERT sentiment				3.436***	2.706***	2.510**
				(0.837)	(0.944)	(0.962)
Observations	159	159	159	159	159	159
R^2	0.154	0.237	0.181	0.233	0.275	0.280
Adjusted R^2	0.144	0.227	0.171	0.223	0.257	0.257

Note: This table presents regression results for nowcasting real GDP growth using different combinations of predictors. All regressions are based on 159 observations from 1980:Q2 to 2019:Q4, excluding the COVID-19 period. The dependent variable in all specifications is the seasonally adjusted annual rate of real GDP growth. Each column represents a different model specification. Standard errors appear in parentheses: *p< 0.1; **p< 0.05; ***p< 0.01.

Table 2: Real GDP Growth Forecasting Results (COVID excluded)

	Real GDP Growth (seasonally adjusted annual rate)					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged2 Real GDP Growth	0.270***	0.162**	0.186**	0.181**	0.137*	0.125
	(0.077)	(0.081)	(0.090)	(0.080)	(0.083)	(0.093)
Lagged Yield Spread	0.200				0.194	0.171
	(0.239)				(0.243)	(0.255)
Lagged News Sentiment		4.214***			3.409**	3.280**
		(1.314)			(1.478)	(1.542)
Median SPF Real GDP Growth (forecast)			0.314			0.062
			(0.191)			(0.206)
Lagged Beige Book FinBERT sentiment				2.669***	1.558	1.536
				(0.895)	(1.017)	(1.022)
Observations	159	159	159	159	159	159
R^2	0.075	0.128	0.086	0.121	0.150	0.151
Adjusted R^2	0.063	0.117	0.075	0.109	0.128	0.123

Note: This table presents regression results for forecasting real GDP growth using different combinations of lagged predictors. All regressions are based on 159 observations from 1980:Q2 to 2019:Q4, excluding the COVID-19 period. The dependent variable in all specifications is the seasonally adjusted annual rate of real GDP growth. Each column represents a different model specification. Standard errors appear in parentheses: *p< 0.1; **p< 0.05; ***p< 0.01.

When using the regression model to forecast economic activity, our Beige Book sentiment showed minimal evidence of contributing to out-of-sample forecasting performance compared to the other two variables: yield spread and News Sentiment. Table 3 shows that the ratio of root mean squared errors (RMSEs) of models with Beige Book sentiment over those without Beige Book sentiment is less than one. In most cases, however, these ratios are not statistically significantly different from one, but this is partly due to the lack of observations. Still, they are only marginally insignificant. Adding the Beige Book sentiment does improve the out-of-sample nowcasting performance for real GDP growth, especially during the COVID period, compared to just having the lagged GDP growth rate. This highlights the fact that the aggregate news sentiment and the Survey of Professional Forecast can nowcast real GDP growth with a high degree of confidence out of sample, which may have been a special circumstance after COVID (Eo and Morley (2023); Engelberg, Manski and Williams (2009)).

Table 3: Comparisons of Out-of-Sample Nowcasts, Ratios of RMSEs

	Time period			
	2020:Q1 onward	2020:Q2 onward	2020:Q3 onward	2020:Q4 onward
Spec. 4 vs Spec. 4 (without Beige Book FinBERT sentiment)	**0.994**	**0.943**	0.929	0.795
	(0.083)	(0.082)	(0.104)	(0.139)
Spec. 5 vs Spec. 5 (without Beige Book FinBERT sentiment)	0.979	0.976	0.961	0.898
	(0.205)	(0.177)	(0.126)	(0.120)
Spec. 6 vs Spec. 6 (without Beige Book FinBERT sentiment)	0.951	0.948	0.931	0.891
	(0.158)	(0.149)	(0.145)	(0.135)
Observations	22	21	20	19

Note: This table presents the relative nowcasting performance of specifications 4-6 in Table 1 with and without Beige Book FinBERT sentiment. Each entry represents the ratio of root mean square error (RMSE) of specifications with Beige Book sentiment to identical specifications without it, across different starting nowcasting periods. Diebold-Mariano test p-values in parentheses. Ratios statistically significantly less than one at the 10% level are indicated in bold.

5.2 Beige Book Sentiment and Recessions

To determine if the Beige Book sentiment nowcasts or predicts recessions, we use the logistic regression model to the same specifications in equations 1 - 6. Following the same framework of linear regression model in previous section, we run our regressions from 1980 to 2019, excluding COVID. Again, the first set of models is nowcasting with unlagged independent variables, except for lagged real GDP growth, and the second set is a forecasting model with lagged independent variables.

More specifically, the specifications are as follows:

$$Pr(Z_t = 1|Y_{t-1}, X_t) = \frac{exp(\alpha + \beta_1 Y_{t-1} + X_t\beta_2)}{1 + exp(\alpha + \beta_1 Y_{t-1} + X_t\beta_2)} \tag{3}$$

and

$$Pr(Z_t = 1|Y_{t-1}, X_{t-1}) = \frac{exp(\alpha + \beta_1 Y_{t-1} + X_{t-1}\beta_2)}{1 + exp(\alpha + \beta_1 Y_{t-1} + X_{t-1}\beta_2)} \tag{4}$$

where Z_t is now an indicator dummy for recessions with the other variables as before.

As described in Tables 4 and 5, the logistic regression results show that the coefficient for the Beige Book sentiment is statistically significant, and the sentiment has meaningful power in nowcasting and forecasting economic recessions, even with SPF GDP survey as a control

variable in the regression. Again, the nowcast model has larger coefficient values, reflecting the fact that it uses the most updated information to predict economic recession. Like the linear regression model for economic growth, the logistic regression model with the Beige Book sentiment as a predictor performs better than the models with the yield curve and the general news sentiment index as a predictor. The multivariate logistic regression models with all the indicators also show that the coefficient for the Beige Book sentiment is statistically significant for nowcasting and forecasting economic recessions. The coefficients for the other indicators are less statistically significant compared to the coefficient for the Beige Book sentiment index. Indeed, the Akaike information criterion (AIC) metrics plummets as we include the Beige Book sentiment in any of our specifications for nowcasting or forecasting recessions. These are more striking results than for real GDP growth; even if the Beige Book sentiment may be less effective in determining a slowing down economy, it appears to have more power in predicting an economic recession. Moreover, unlike the linear regression to predict real GDP growth, the logistic regression estimation results are even statistically significant including the COVID time period (not shown), although results without the COVID period are better in general. It is noteworthy that model performance for recessions is superior to that of real GDP growth as the COVID period was very unique in our macrofinancial history in its abrupt nature of disruptions to economic activity.

Table 4: Economic Recession Nowcasting Results (COVID excluded)

	Recession					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Real GDP Growth	-0.686^{***}	-0.510^{***}	-0.449^{**}	-0.487^{***}	-0.578^{**}	-0.529^{*}
	(0.145)	(0.173)	(0.176)	(0.186)	(0.280)	(0.314)
Yield Spread	0.202				-0.092	0.015
	(0.344)				(0.550)	(0.596)
News Sentiment		-12.628^{***}			-12.474^{**}	-12.132^{**}
		(3.515)			(5.443)	(5.562)
Median SPF Real GDP Growth (nowcast)			-0.534^{**}			-0.140
			(0.242)			(0.354)
Beige Book FinBERT sentiment				-28.739^{***}	-29.139^{**}	-28.100^{**}
				(9.503)	(11.822)	(11.772)
Observations	159	159	159	159	159	159
Akaike Inf. Crit.	75.185	50.863	69.997	37.828	33.221	35.066

Note: This table presents logistic regression results for nowcasting U.S. economic recessions. All regressions are based on 159 observations from 1980:Q2 to 2019:Q4, excluding the COVID-19 period. The dependent variable is a binary indicator equal to 1 if the quarter is classified as a recession and 0 otherwise. Each column represents a different model specification, with standard errors in parentheses below coefficient estimates. Lower Akaike Information Criterion (AIC) values indicate better model fit. Standard errors appear in parentheses: $^{*}p< 0.1$; $^{**}p< 0.05$; $^{***}p< 0.01$.

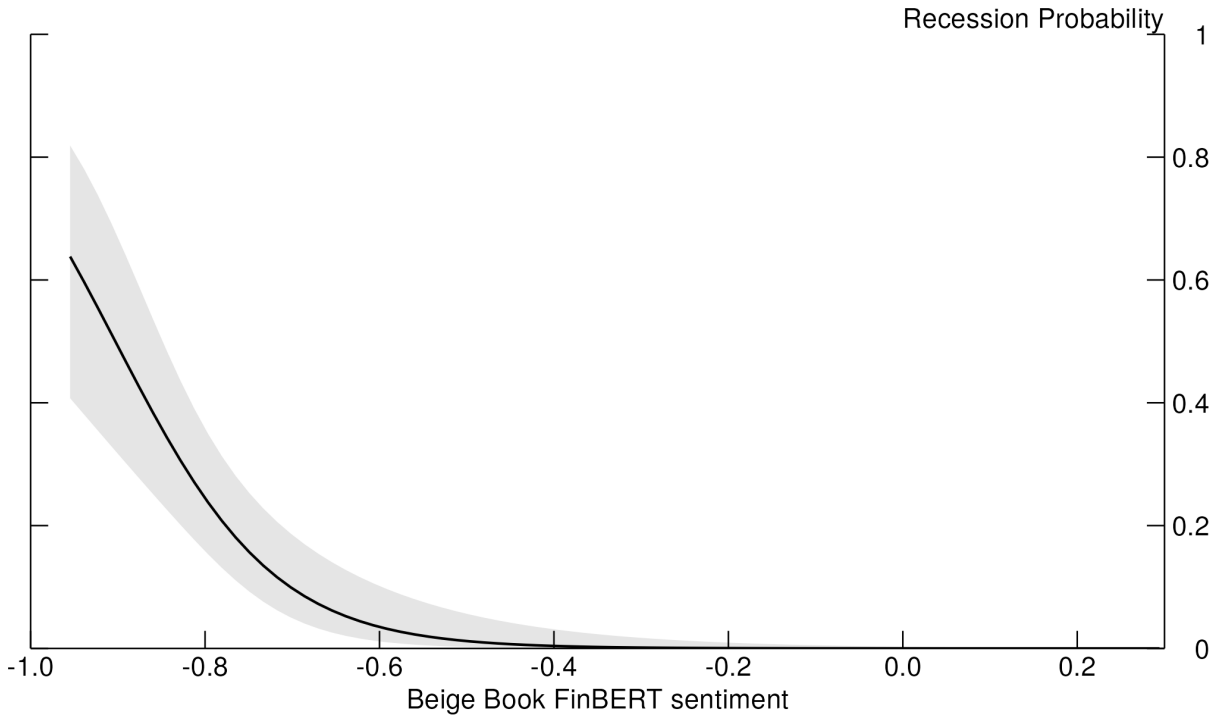
Table 5: Economic Recession Forecasting Results (COVID excluded)

	Recession					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged2 Real GDP Growth	-0.370^{***}	-0.145	-0.285^{***}	-0.084	0.100	-0.152
	(0.095)	(0.104)	(0.109)	(0.109)	(0.142)	(0.220)
Lagged Yield Spread	-0.407				-1.241^{**}	-2.165^{***}
	(0.286)				(0.551)	(0.783)
Lagged News Sentiment		-11.006^{***}			-10.453^{***}	-15.354^{***}
		(2.753)			(3.975)	(4.827)
Median SPF Real GDP Growth (forecast)			-0.275			0.969^{**}
			(0.187)			(0.451)
Lagged Beige Book FinBERT sentiment				-17.337^{***}	-20.477^{**}	-26.262^{**}
				(4.791)	(8.024)	(10.387)
Observations	159	159	159	159	159	159
Akaike Inf. Crit.	97.358	72.011	97.362	60.850	49.945	45.597

Note: This table presents logistic regression results for nowcasting U.S. economic recessions one quarter ahead. All regressions are based on 159 observations from 1980:Q2 to 2019:Q4, excluding the COVID-19 period. The dependent variable is a binary indicator equal to 1 if the quarter is classified as a recession and 0 otherwise. Each column represents a different model specification, with standard errors in parentheses below coefficient estimates. Lower Akaike Information Criterion (AIC) values indicate better model fit. Standard errors appear in parentheses: $^{*}p< 0.1$; $^{**}p< 0.05$; $^{***}p< 0.01$.

Figure 4 displays the forecasted recession probability by the Beige Book sentiment. When the sentiment index is larger than -0.7, the probability of economic recession is very low. It starts to increase significantly when the index is lower than -0.7. Our logistic regression models also display strong out-of-sample forecasting performance, especially the nowcasting model.

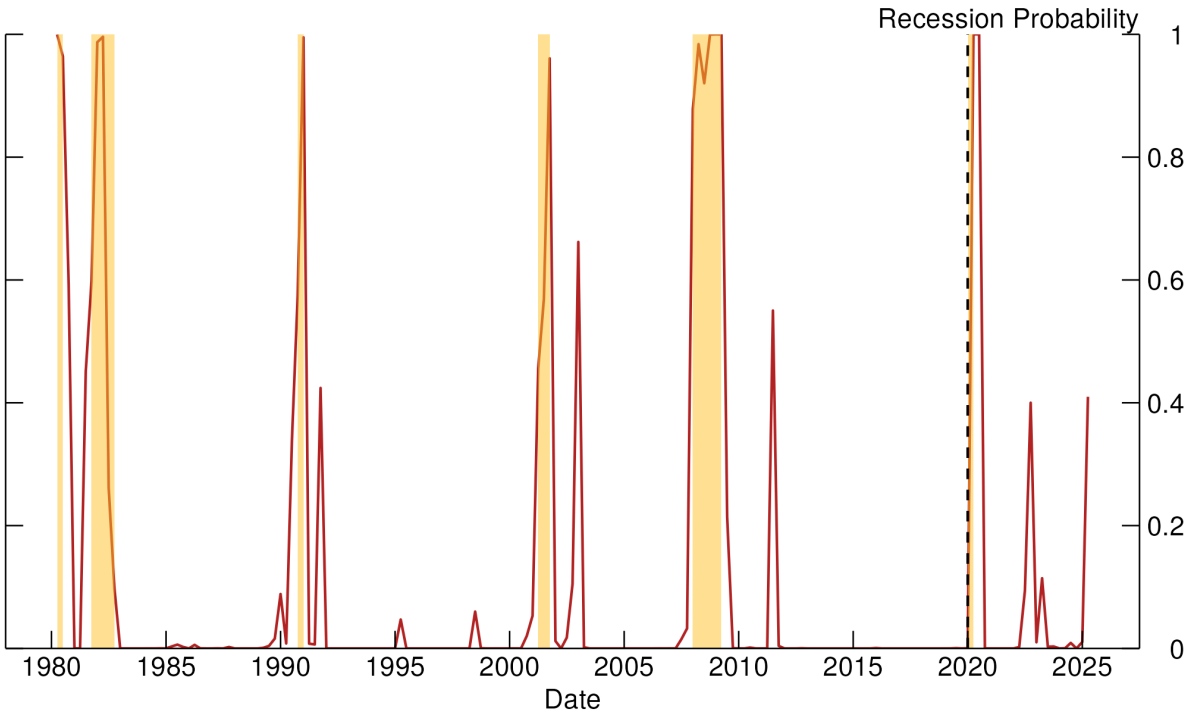
Figure 4: **Recession Probability Forecasting with 95% CI**



Note: Forecasted recession probability by Beige Book FinBERT sentiment with 95% confidence interval. The probability of economic recession is low when Beige Book sentiment is over -0.7 and increases significantly when the sentiment is lower than 0.7.
Sources: Federal Reserve Bank of St. Louis, NBER based Recession Indicators for the United States from the Period following the Peak through the Trough, retrieved from FRED; Beige Book FinBERT from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

As figure 5 demonstrates, the nowcast model can nowcast the major economic recession and pick up the COVID recession with high confidence. Some of the near false positives may have to do with bank failures in the early 1990s and more recently in 2023. 2003 may have been due to widespread corporate malfeasance and 2012 the Eurpean sovereign debt crisis. Also notice that the probability of recession increased somewhat at the end of 2025 based on our nowcast model.

Figure 5: **Out-of-Sample Recession Nowcast**



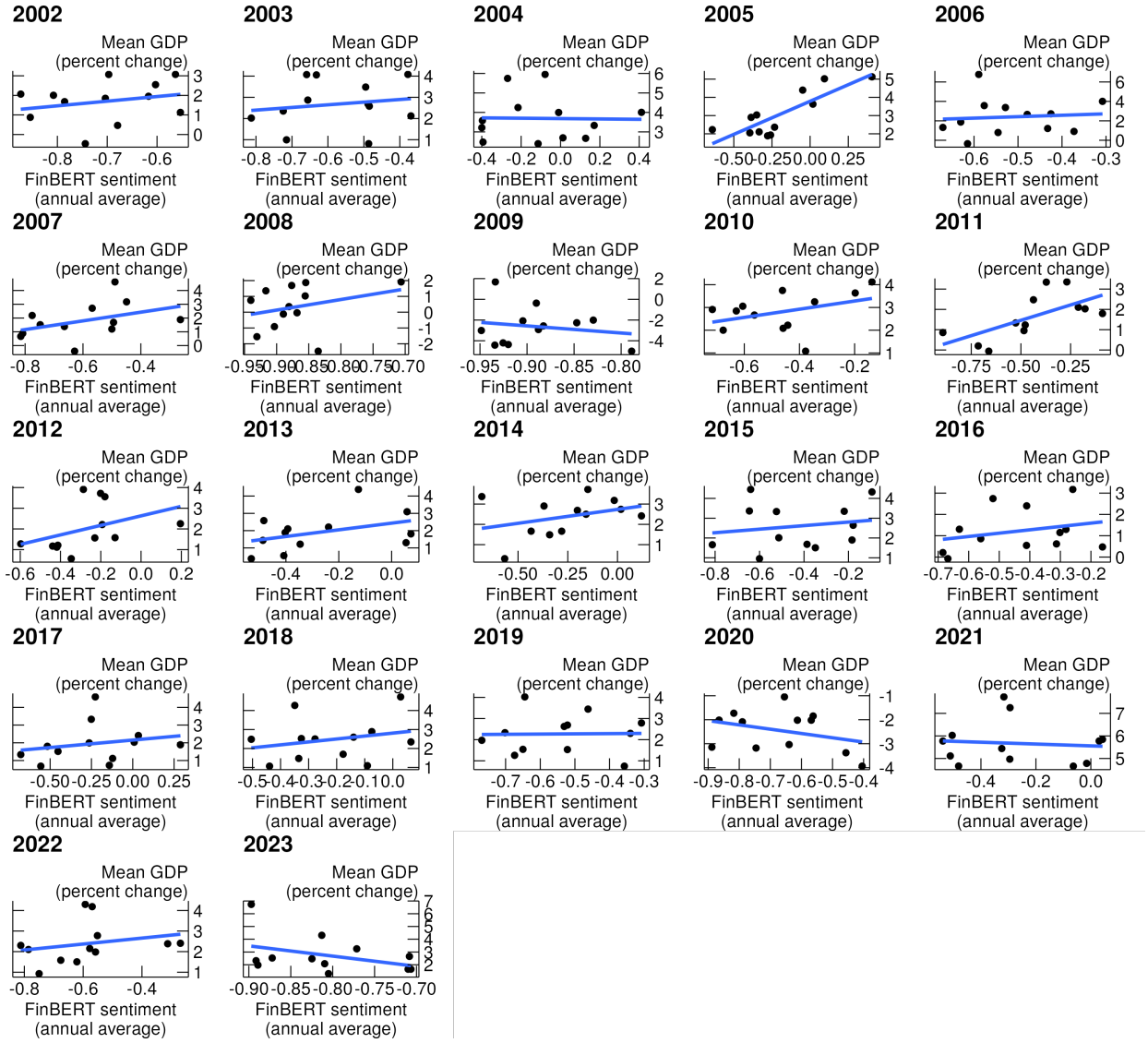
Note: Actual v.s. nowcasted recession probability based on Beige Book FinBERT sentiment. Out-of-sample period begins 2020:Q1. Shaded areas represent NBER recessions. Results display strong out-of-sample forecasting performance.
Sources: Predicted nowcast recession probability values from model in Table 4, Column 6; Federal Reserve Bank of St. Louis, NBER based Recession Indicators for the United States from the Period following the Peak through the Trough, retrieved from FRED; Beige Book FinBERT from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

5.3 Beige Book Sentiment and Regional Economic Activity

We are also interested in whether Federal Reserve Bank-level Beige Book FinBERT sentiment can explain regional economic activity. To get the economic growth statistics for each of the 12 Reserve Banks, we collect the economic data from FRED at the county level and consolidate them to the Reserve Bank level. We calculate the annual FinBERT sentiment score for each Reserve Bank by taking the average sentiment score for the year. Figure 6 shows the relationship between regional economic growth and Beige Book sentiment for 21 years, while Figure 7 plots the historical relationship between regional GDP growth and

the sentiment for each of the 12 Reserve Banks. In general, the Beige Book sentiment and regional economic growth are positively correlated, within Reserve Banks through time and across Reserve Banks at a particular point in time, respectively. In particular, Figure 7 shows every Reserve Bank exhibiting a positive correlation between the Beige Book sentiment and Reserve Bank-level economic growth.

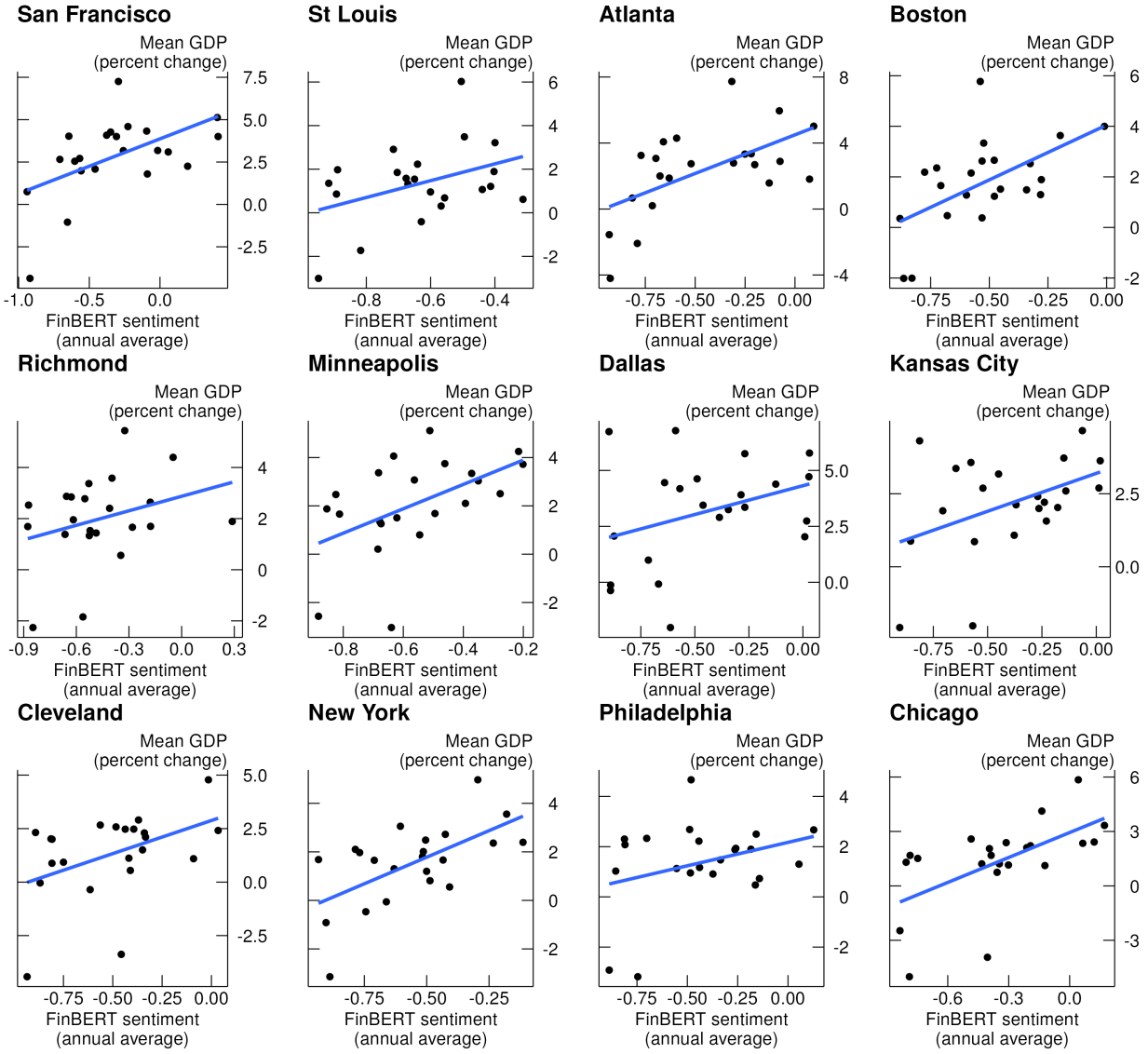
Figure 6: **Beige Book FinBERT Sentiment and Regional GDP Growth by Year**



Note: Scatter plots showing Beige Book FinBERT sentiment and average GDP change by year (2002-2023). Data points represent observations for each Reserve Bank. Each panel displays a best fit line. Results show a generally positive relationship between Beige Book FinBERT sentiment and average GDP growth, except for 2004, 2009, 2020, 2021, and 2023.

Sources: U.S. Bureau of Economic Analysis, Gross Domestic Product: All Industries by County, retrieved from FRED; Beige Book FinBERT from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

Figure 7: **Beige Book FinBERT Sentiment and Regional GDP Growth by Federal Reserve District**



Note: Historical relationship between Reserve Bank-level GDP growth and the Beige Book FinBERT sentiment for each of the 12 Reserve Banks. Results generally a positive relationship between Beige Book FinBERT sentiment and GDP growth.

Sources: U.S. Bureau of Economic Analysis, Gross Domestic Product: All Industries by County, retrieved from FRED; Beige Book FinBERT from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

We apply the regression model to regional economic growth and Beige Book sentiment, and

Table 6 presents the results. Controlling for region and time fixed effects, FinBERT Beige Book sentiment at the specific Reserve Bank level is statistically significant in explaining variation in real activity, both within and across regions, in Specification (1). In Specification (2), we also include the Beige Book sentiment of the 11 other Reserve Banks to see if the national Beige Book sentiment, excluding the particular Reserve Bank's own sentiment, has a statistically significant reflection of regional economic activity after dropping the time fixed effects. Indeed, it shows up with a higher coefficient (though both sentiment measures are statistically significant), indicating that regional activity is influenced greatly by what other Reserve Banks are going through economically. The R Squares are relatively high, indicating that a lot of the variation in economic growth rates across Reserve Banks and through time can be captured by our panel model.

Table 6: Federal Reserve Bank-Level Panel Regressions

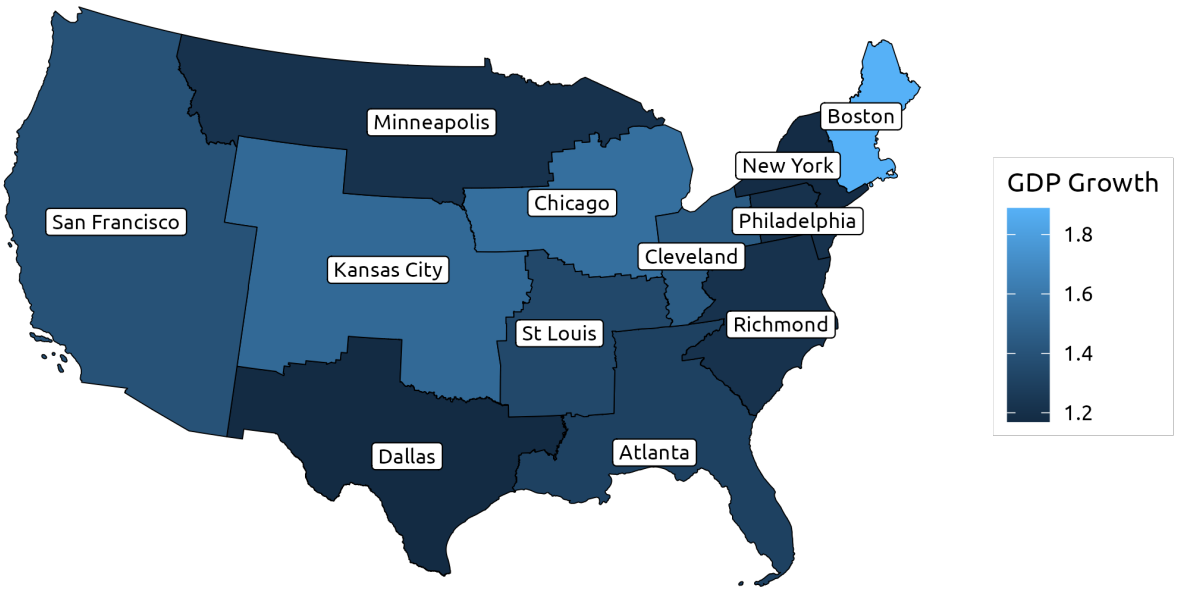
	Bank-level Real GDP Growth (percent change)	
	(1)	(2)
Beige Book FinBERT sentiment (Bank-level)	1.053^{**}	1.380^{**}
	(0.409)	(0.618)
Beige Book FinBERT sentiment (excl. Bank)		3.085^{***}
		(0.733)
Bank FE	Y	Y
Year FE	Y	N
Observations	264	264
R^2	0.028	0.270
Adjusted R^2	-0.111	0.232
F Statistic	6.635^{**} (df = 1; 230)	46.149^{***} (df = 2; 250)

Note: This table presents panel regression results examining the relationship between Federal Reserve Bank-level Beige Book FinBERT sentiment and Bank-level economic growth. All panel regressions are based on 264 observations from 2002 to 2023. The dependent variable is Bank-level real GDP growth (percent change). Model 1 includes both bank and year fixed effects, while Model 2 includes only bank fixed effects. Standard errors appear in parentheses: $^{*}p< 0.1$; $^{**}p< 0.05$; $^{***}p< 0.01$.

Finally, since local economic activity data comes with a lag, the Beige Book offers a regional

perspective on where economic activity is less robust at the moment. Indeed, if we estimate the same panel model as in Specification (2) without year fixed effects and apply this to the Beige Book data of 2025, in Figure 8, we see that the Federal Reserve Banks of Minneapolis, Dallas, Richmond, Philadelphia, and New York appear to have the weakest economic activity as measured by expected real GDP growth for this year; whereas, the Federal Reserve Bank of Boston's economic activity appears quite robust according to our model.

Figure 8: **Reserve Bank Nowcast GDP Growth in 2025**



Note: Reserve Bank-level Beige Book nowcast of Bank-level GDP growth in 2025. Nowcast predictions based on Specification (2) of the Federal Reserve Bank-level panel regressions in Table 6 (with Bank FE and without Year FE). Lighter shading indicates larger predicted GDP growth. Results show that the Federal Reserve Banks of Minneapolis, Dallas, Richmond, Philadelphia, and New York appear to have the weakest economic activity.
Sources: Predicted nowcast GDP growth from model in Table 6, Column 2; Beige Book FinBERT from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

6 Topical Analysis

Given the textual nature of the Beige Book data, it also offers a window to the past as well as shedding light on the entire economic and financial history of the U.S. Specific words allow us to contextualize what was going on from the lens of anecdotes across the United States.

For example, Figure 9 illustrates how recent supply chain issues since the COVID pandemic have been a relatively new phenomenon compared to the entirety of the sample by just searching the counts of keywords related to "supply chain". This metric follows closely the Global Supply Chain Pressures Index (GSCPI) mentioned in Benigno et al. (2022) that measures supply chain issues based on a principal component analysis based on 27 variables, which can only be calculated with a lag. In fact, Soto (2023) also provides a more rigorous way to gauge supply chain issues using a broader set of words and more sophisticated natural language processing methods, especially related to supply-chain sentiment that also picks up supply-chain issues in the late 1970s during the oil embargos, but again based on the Beige Book.

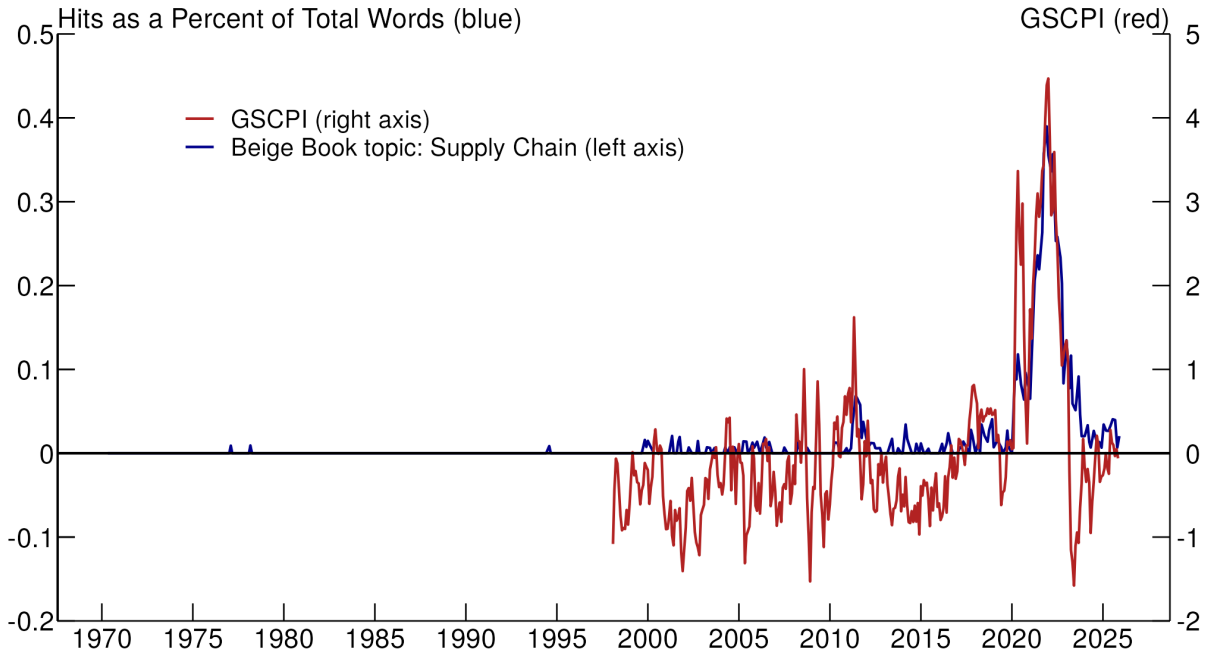
For broader macro-financial variables, simple keyword searches are useful as well. Figure 10 displays the hits on the mentions of inflationary pressures or high inflation. During the 1970s when the US economy had a high inflation rate, inflation was a topic consistently discussed in the Beige Book and mentions of related words were relatively high compared to other words. It dropped significantly after 1980 when inflation became more under control. The hit rate spiked again in 2022 when high inflation came back to be a key issue for the US economy. This series is highly correlated with actual inflation.

Figure 11 shows the relationship between what is mentioned in Beige Book when it comes to certain keywords related to unemployment and job losses. We see that the Beige Book metric often shows a notable spike right before peaks in the unemployment rate as well, which could indicate the Beige Book information may have early warning indicators for various macro-financial metrics.

Finally, Figure 12 provides a glimpse of all the foreign shocks affecting the U.S. economy over the past half century, with one of the most recent being the Russian invasion of Ukraine. Both metrics are normalized by the total number of tokens in the Beige Books. This metric is also highly correlated with the US Geopolitical Index (GPR) specific to the United States as in Caldara and Iacoviello (2022). Given the nature of the series, there are important differences, however. For example, the Beige Book does not capture 9/11 given that that

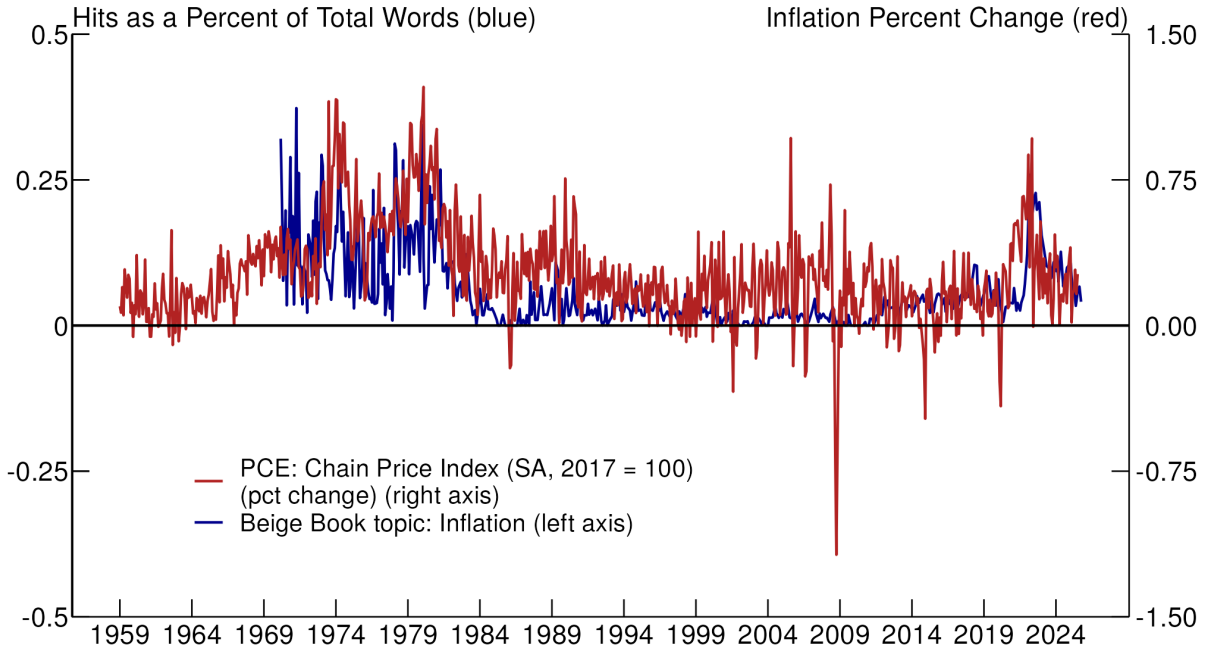
was something that happened within the United States and the US GPR does not capture the European Debt Crisis as that was more of an economic and financial event as opposed to something related to geopolitics.

Figure 9: **Topics: Supply Chain Hits vs GSCPI**



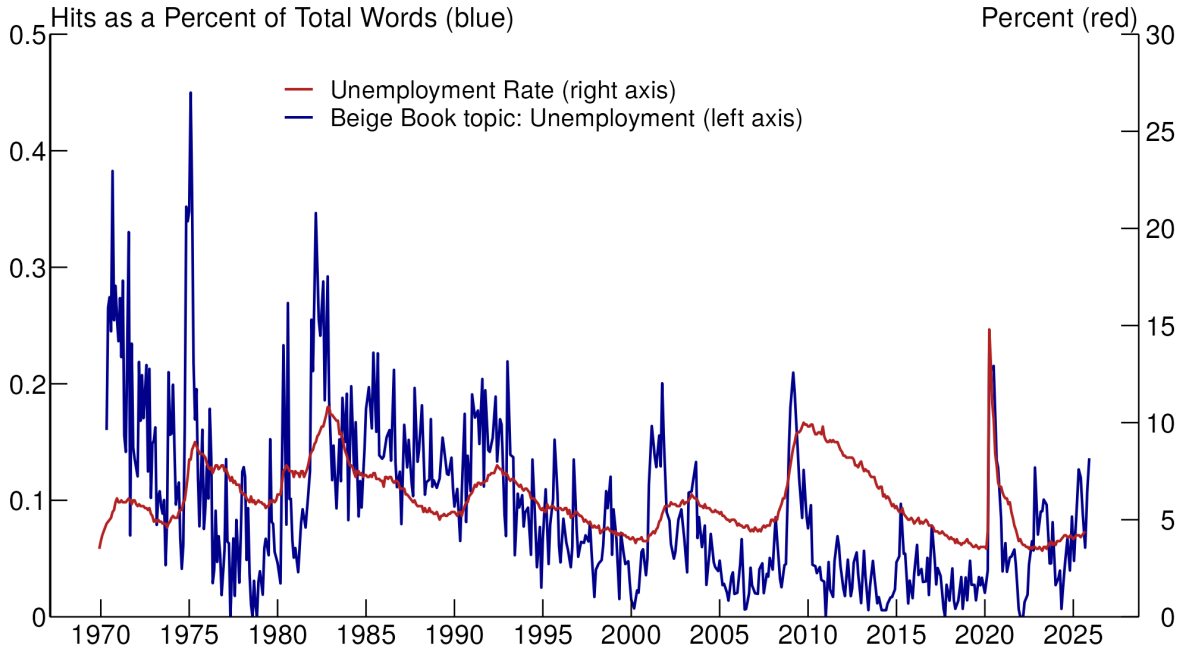
Note: Beige Book Supply Chain Hits (based on supply chain-related terms as a percent of total words) and Global Supply Chain Pressure Index (GSCPI). Supply chain-related terms include: "supply chain" OR "supply-chain" OR "supply disruption".
Sources: Federal Reserve Bank of New York, Global Supply Chain Pressure Index, https://www.newyorkfed.org/research/policy/gscpi; Beige Book text from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

Figure 10: **Topics: Inflation Hits vs Inflation Rate**



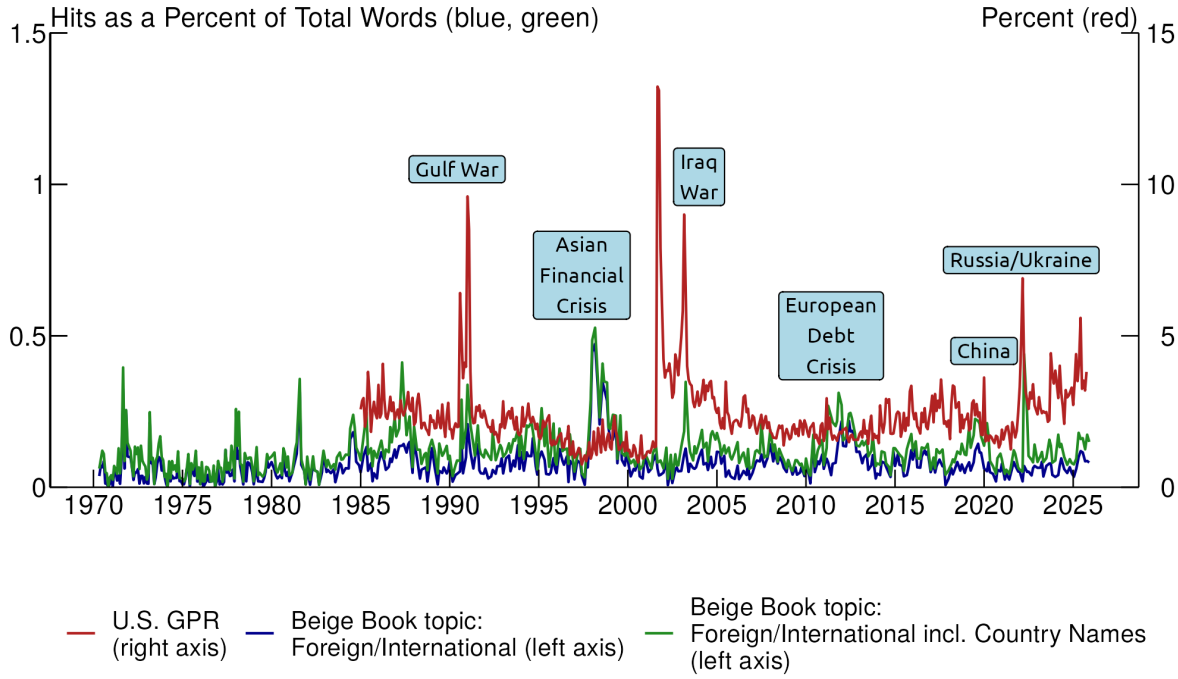
Note: Beige Book Inflation Hits (based on inflation-related terms as a percent of total words) and PCE: Price Chain Index. Inflation-related terms include: "inflation" OR "inflationary" OR "price level".
Sources: Bureau of Economic Analysis via Haver Analytics; Beige Book text from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

Figure 11: **Topics: Unemployment Hits vs Unemployment Rate**



Note: Beige Book Unemployment Hits (based on unemployment-related terms as a percent of total words) and Unemployment Rate. Inflation-related terms include: "unemployment" OR "hiring freeze" OR "job loss" OR "payroll reduction" OR "layoff".
Sources: U.S. Bureau of Labor Statistics, Unemployment Rate, retrieved from FRED; Beige Book text from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

Figure 12: **Topics: Foreign/Int'l Hits**



Note: Beige Book Foreign/Int'l Hits (based on foreign and international-related terms as a percent of total words) and the U.S. Geopolitical Risk Index. International and foreign-related terms without country names (blue line) include: "international" OR "internationally" OR "exchange rate" OR "foreign" OR "global" OR "globally" OR "europe" OR "european" OR "asia" OR "asian" OR "africa" OR "african" OR "north america" OR "north american" OR "south america" OR "south american" OR "latin america" OR "latin american" OR "middle east" OR "middle eastern". International and foreign-related terms including country names is shown in the green line.
Sources: GPR Index from https://www.matteoiacoviello.com/gpr.htm; Beige Book text from Board of Governors of the Federal Reserve System. Summary of commentary on current economic conditions by Federal Reserve district (Beige Book archive) [Data set]. https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm; authors' calculations.

We can do more sophisticated analysis based on Latent Dirichlet Allocation (LDA) topical analysis. We use the LDA model for topic modeling to distinguish which topics were emphasized during a certain period of time. This is an unsupervised model that identifies latent topics in the text and groups tokens into clusters of topics. We use the UMass coherence score measure to select the best number of topics clustered from the text and then interpret the clusters to name each topic set.

Because the LDA model is utilized primarily as a robustness check, the process of labeling

is not an exact science. For each recessionary period, we create a coherence score chart and find the local maximum in the usual range (between 4 and 10) to identify a tentative number of topics. We use this to cluster the terms, check for high overlap or sparseness, and increase or decrease the number of topics until a distinct set emerges. We interpret each term's absolute frequency (which terms have the highest count within the topic) and relative frequency (which terms have the highest proportion of occurrences of the term within the topic), as well as the relatedness between terms, to create a label for each topic set.

Table 7 lists topic set labels identified for each recessionary period. Each label describes at least one cluster of topics (denoted in parentheses alongside the label), but some labels can describe multiple if certain terms have a high frequency within the text. Using this information, we can contextualize a selection of periods in the history of the U.S. economy. For example, the early 1970s was marred by high fuel and energy prices (among others), while the 2007-2008 period was suffering from issues related to real estate, loans, and credit quality. More recently in the 2023-2024 period, we can see the negative coverage in the Beige Book was related to commercial real estate, manufacturing conditions, and price increases; on the other hand, positive coverage pointed to increase in consumer spending and home sales.

Table 7: LDA Analysis in Beige Books

Period	Topics (Negative Sentiment)	Topics (Positive Sentiment)
1972-1974	• Savings, credit, and loans • Raw materials and prices • Construction • Fuel and energy prices	• Agriculture and food prices • Consumer and business confidence • Supply chain • Employment and labor market • Construction and loans
2007-2008	• Commerical real estate and construction • Wages, prices, and costs • Real estate, loans, and credit quality • Business activity and employment • Cars, inventories, and sales	• Prices and raw materials • Real estate and construction • Business activity and employment
2023-2024	• Commercial real estate • Manufacturing activity and price increase • Wage pressure, interest rates, and labor • Price increase and consumer spending • Vacancy rates in real estate	• Increase consumer spending • Flat employment • Financial conditions • Home and sales, economic conditions

7 Conclusion

This paper demonstrates that anecdotes matter—and matter substantially—for understanding macroeconomic conditions. Using natural language processing tools applied to over five decades of Beige Book publications, we provide evidence that qualitative business intelligence systematically contains valuable information about economic activity beyond what is

captured by traditional quantitative indicators.

Our most robust finding is the Beige Book's remarkable predictive power for economic recessions. The FinBERT sentiment index demonstrates statistically significant explanatory power in both nowcasting and forecasting recessions. Notably, this predictive power persists even when controlling for the yield curve spread (a canonical recession predictor), general news sentiment, and the Survey of Professional Forecasters. The Beige Book appears particularly adept at identifying turning points in the business cycle. This superior performance for recession prediction compared to GDP growth forecasting suggests that anecdotal business intelligence may be especially valuable for detecting downside risks to the economy.

For GDP growth, we find that Beige Book sentiment provides meaningful explanatory power in nowcasting specifications. While the Beige Book's forecasting power for GDP growth diminishes somewhat when controlling for professional forecasts and news sentiment—likely because these forward-looking indicators already incorporate Beige Book information—its nowcasting capability remains robust and economically significant.

A major contribution of our analysis is demonstrating that the Beige Book's informational value extends to regional economic activity. Our panel regression results, controlling for region and time fixed effects, show that Reserve Bank-level Beige Book sentiment significantly explains variation in regional GDP growth. Even more intriguingly, we find substantial spillover effects: each district's economic activity is strongly correlated with sentiment expressed about other districts beyond its own sentiment. This finding has important implications for understanding how regional economic conditions propagate through the national economy. Furthermore, because official regional economic data arrives with considerable lag, the Beige Book provides valuable real-time intelligence about geographic variation in economic conditions—intelligence that our 2025 nowcasts suggest may be particularly relevant for identifying pockets of weakness within different Federal Reserve Districts.

Beyond predictive modeling, the textual richness of the Beige Book corpus offers unique insights into the evolution of economic concerns over time. Simple keyword searches reveal that supply chain mentions spiked to unprecedented levels during COVID-19 (at least compared to recent history), tracking closely with the Global Supply Chain Pressure Index but available more immediately. Similarly, inflation-related terms correlate highly with actual inflation, with mentions elevated during the 1970s stagflation and again in 2022. Our unemployment-related keyword metric shows spikes that often precede peaks in the unemployment rate, suggesting potential early warning capabilities. International and foreign

affairs mentions provide a window into external shocks affecting the U.S. economy throughout the past half-century, from the European debt crisis to the Russian invasion of Ukraine.

Our topic modeling via LDA reveals how the substance of economic concerns varies across recessions. The early 1970s featured anxiety about fuel prices and raw materials; the 2007-2008 crisis centered on real estate, credit quality, and lending; while the 2023-2024 period reflected concerns about commercial real estate, manufacturing conditions, and price pressures alongside positive sentiment about consumer spending and home sales. This ability to contextualize different episodes provides policymakers with a richer understanding of the unique characteristics of each downturn.

Our findings illustrates the Beige Book's utility in helping to gauge current conditions and forecast turning points—drawing on distributed intelligence from business contacts across the Federal Reserve System—which provides information complementary to model-based forecasts and market indicators. The regional granularity offers particular value for understanding heterogeneous economic conditions across the United States, which is especially important for a central bank covering a large, diverse economy.

The Beige Book represents an underutilized treasure trove of structured qualitative data. With modern advances in artificial intelligence and large language models, the potential applications extend far beyond what we demonstrate here. Future research could develop more sophisticated extraction of important information, sentiment about particular sectors or financial conditions, or early warning indicators for emerging risks. A query-able knowledge base spanning 50 plus years of business intelligence could become an invaluable tool for real-time policy analysis, historical research, and understanding economic transmission mechanisms.

Our work also speaks to broader questions in economics and finance about the value of qualitative versus quantitative information. The fact that carefully aggregated anecdotes contain systematic information about macroeconomic outcomes—information that may not be fully captured by traditional hard data—suggests that business contacts possess valuable "soft information" that deserves analytical attention. In an era of increasingly sophisticated data science and artificial intelligence tools, the Beige Book demonstrates that human judgment and qualitative assessment, when systematically collected and analyzed, remain important for understanding economic reality.

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