

The *Chicago Fed Survey of Business Conditions*: Quantifying the Seventh District's Beige Book report

Scott A. Brave, Thomas Walstrum, and Jacob Berman

Introduction and summary

The Beige Book is a Federal Reserve System report describing current business conditions in each of the Fed's 12 Districts that is released to the public two weeks prior to each meeting of the Federal Open Market Committee (FOMC), the monetary policymaking arm of the Fed.¹ Each Federal Reserve Bank prepares a report for its own District by surveying business contacts on topics such as demand for their products or services, capital spending, hiring, prices, and wages. Information collection methods for the Beige Book vary across the Reserve Banks, ranging from formal surveys to face-to-face interactions.

By design, the Beige Book is an anecdotal, or qualitative, account that is meant to provide context for understanding trends in existing quantitative data. The timeliness of the report plays a key role in this function, as the gap between information collection and the public release of the report can be as short as one to two weeks. This feature of the Beige Book has led some researchers to try to quantify the information contained in the report so that it can be incorporated in real time into quantitative economic models. But because prose is open to different interpretations, it is far from obvious how to quantify the information. Thus, researchers have attempted a variety of techniques to quantify the language of the Beige Book, ranging from simple numerical scoring and word counts to more sophisticated analyses of linguistic patterns.²

In this article, we describe a new survey methodology used by the Federal Reserve Bank of Chicago in constructing its District's Beige Book report called the *Chicago Fed Survey of Business Conditions* (CFSBC). The design of the survey allows us to create a new set of quantitative indexes that track economic activity in real time. The survey contains both quantitative and qualitative questions. We use answers to the quantitative questions to construct diffusion indexes that cover

a variety of aspects of economic activity, and we ask qualitative follow-up questions that provide context for the indexes and the Beige Book. The survey is timed to match the Beige Book schedule and has been operating since the Beige Book cycle for the March 6, 2013, report, although only a limited portion of the survey's quantitative results have been published prior to this article.³ Survey respondents represent a wide range of industries in the Seventh Federal Reserve District,⁴ including construction, finance, manufacturing, real estate, retail, and a variety of other service industries.

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TABLE 1
CFSBC respondent composition

	percent
Banking and finance	17
Construction and real estate	18
Manufacturing	32
Nonfinancial services	34

Note: The average number of respondents to the *Chicago Fed Survey of Business Conditions* (CFSBC) is 75.
Source: Authors' calculations.

A number of organizations conduct similar surveys, such as the Institute for Supply Management (ISM) and other Federal Reserve Banks. However, the design of the Chicago Fed survey and the method used to construct the diffusion indexes differ from what is done for other business surveys in two important respects. First, the CFSBC asks respondents about both *current* and *expected* economic activity. And second, the resulting diffusion indexes are *adjusted for inherent biases in measurement and interpretation*. We do this by calculating the diffusion indexes based on whether survey participants' answers are above or below their respective average answers. Expressing the indexes in this way is novel and is possible because most CFSBC respondents regularly participate in the survey. While the indexes remain works in progress, we believe that in their current form they offer useful insight into current conditions in the Seventh District and U.S. economies. Beginning with the release of the January 13, 2016, Beige Book, the Chicago Fed will make the CFSBC indexes publicly available at <https://www.chicagofed.org/cfsbc>.

In what follows, we provide details on the CFSBC and the diffusion indexes we calculate from it. We first describe the survey's quantitative questions and then explain how we turn them into diffusion indexes. Next, we explore how the unique adjustments we make to the formula for a traditional diffusion index affect its properties. We then assess how well our headline index, the CFSBC Activity Index, aligns with other indicators of economic activity. Finally, we discuss the additional information collected in the course of the survey that covers hiring, capital expenditures, and cost pressures.

The survey and diffusion indexes

Beginning with the cycle for the March 6, 2013, Beige Book, the Chicago Fed has been gathering information from its business contacts using an online survey system. The Bank's regional analysis staff oversees the operation of the survey and invites individuals to join based on interactions at business roundtables, advisory councils, board meetings, conferences, speeches, and

other Bank events. Table 1 shows that survey respondents come from a variety of industries, with the largest representation coming from the nonfinancial services sector and the manufacturing sector. Over 600 invitations to participate in the survey are sent out each Beige Book reporting period, with a typical response rate of about 17 percent per survey. About 70 percent of survey participants are repeat responders.

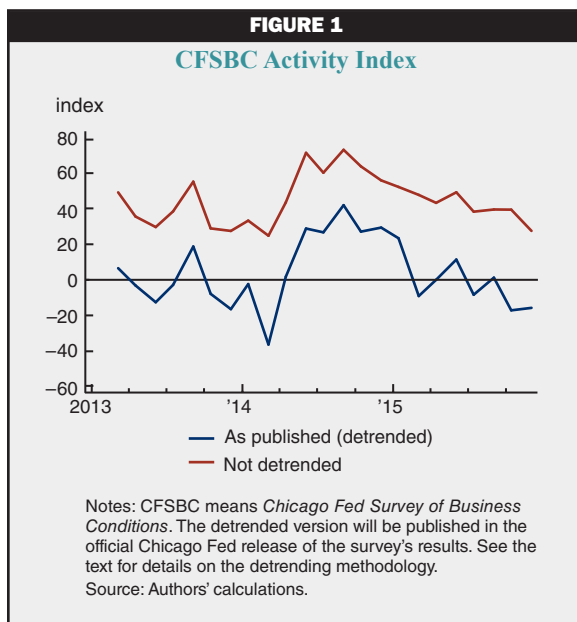
The survey asks respondents to quantify how aspects of their businesses have changed over the past four to six weeks (or are expected to change in the next six to 12 months) using a seven-point scale: increased substantially (+3), increased moderately (+2), increased slightly (+1), no change (0), decreased slightly (-1), decreased moderately (-2), and decreased substantially (-3). The survey covers a variety of topics, including product demand, prices, and productivity. We also ask sector-specific questions. For example, we ask our real estate contacts about changes in home prices. As a follow-up to each quantitative question, we ask respondents to provide anecdotes that explain why they answered the way they did. We then use this combination of quantitative and qualitative data as background material for the Seventh District's Beige Book report.

Using the responses to the quantitative questions in the survey, we construct diffusion indexes in order to track growth in economic activity in real time. The appendix lists the set of survey questions used to construct the indexes. The indexes cover the following topics: 1) overall activity (based on demand for products and services), 2) manufacturing activity, 3) nonmanufacturing activity, 4) the outlook for the U.S. economy, 5) hiring, 6) hiring plans, 7) capital spending, 8) capital spending plans, 9) wage costs, and 10) nonwage costs.

Diffusion indexes are intended to be leading indicators, capturing changes in the prevailing direction of economic activity. The formula for CFSBC diffusion indexes is

$$100 * \frac{\#Above-Average (Positive) Responses - \#Below-Average (Negative) Responses}{\#Responses (smoothed)}$$

In many ways, this is a very traditional formula for a diffusion index, but we make a couple of adjustments that we would argue improve it. The first and most novel adjustment is to measure individuals' responses relative to their respective average responses.⁵ To calculate a respondent's average response, we assign numerical values ranging from +3 to -3 along a seven-point scale, and take the average across all responses, including the current one. We then count a response as positive if it is above a respondent's average response and negative if it is below a respondent's average response.



For example, if a respondent's average response is +1.5, substantial and moderate increases are counted as positive responses and all other answers are counted as negative responses. Given our formula, the index ranges from +100 to -100 and will be +100 if every respondent in a given survey has an above-average response to a question and -100 if every respondent has a below-average response.⁶

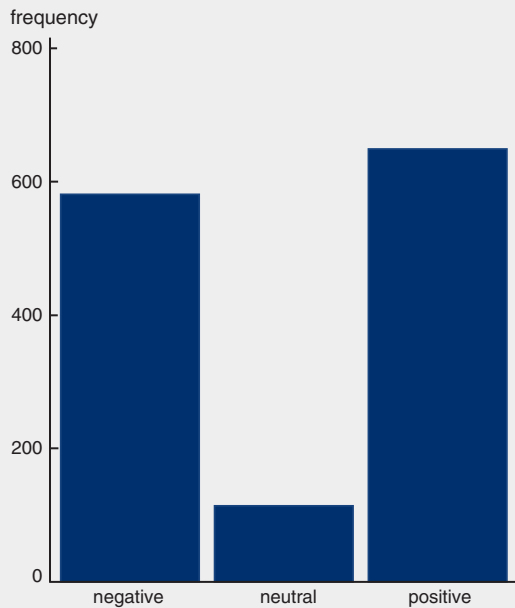
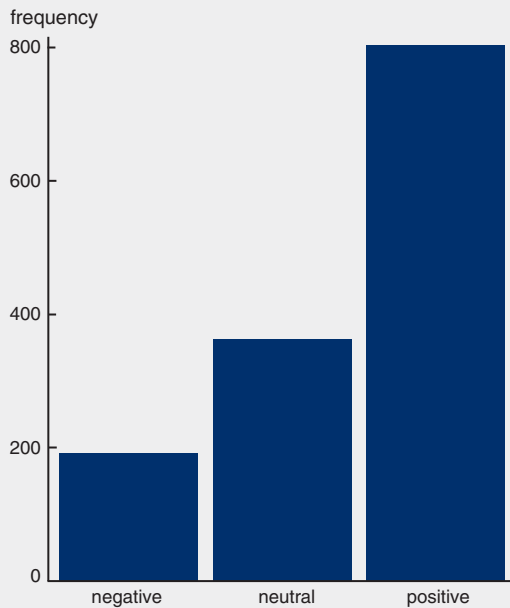
We do not include respondents' answers in the index until they have answered the survey twice. This is because those who respond only once would have neutral answers by definition, as a single response is necessarily the average response. Note, too, that over time, the index could change because respondents' averages will change with each response. Of course, the longer the history for a respondent, the more stable his average will be, so that this source of variation will become less important over time. And, as discussed later, in practice, changes in average responses do not appear to be an important concern in interpreting the CFSBC indexes.

Calculating the indexes using a survey participant's average response as a baseline—also known as detrending—allows us to correct for two types of potential biases. First, individuals may interpret phrases such as “substantially increased” differently, so that our numerical scores have different meanings for different people. A common criticism of the Beige Book is that the wording used to describe changes in economic activity seldom varies and can often be so broad as to make it difficult to interpret differences across regions and industries. So we rely upon individuals' own assessments of “average” growth in order to assess how far from “normal”

business conditions currently are. This process amounts to a rescaling of the responses to the survey questions that is unique to each respondent prior to constructing what would otherwise be a traditional diffusion index.

The second type of potential bias is that the industries and firms represented in our data may have different growth trends than the overall economy, which could bias the indexes because we do not have a random sample of respondents. For example, because manufacturers represent a significant share of our respondents, our index could overrepresent trends in the manufacturing sector. The share of manufacturing output and employment in the U.S. economy has been declining for decades, so that in general, trends in the manufacturing sector are becoming less and less representative of trends in the overall economy. For this reason, other similar surveys often report separate manufacturing and nonmanufacturing indexes and either refrain from combining them into a single index or weight them based on their representativeness. However, because calculating a CFSBC index relative to respondents' average responses removes respondent-, firm-, and industry-specific trends, we can safely combine manufacturers and nonmanufacturers into the same respondent pool and mitigate some of the bias from having a nonrandom sample of respondents. Like the researchers conducting similar surveys, we calculate manufacturing and nonmanufacturing indexes separately, and these indexes also benefit from detrending because it removes respondent- and firm-specific trends.

Another adjustment we make to the standard diffusion index formula is to smooth the denominator, which is the total number of repeat responses in a given period. We do this by calculating the denominator as a three-period moving average of the lag period, the current period, and the lead period.⁷ We do this because there are a few periods over the history of the index where there was a notable increase in the number of repeat respondents.⁸ A large increase in repeat respondents from one period to the next could cause a change in the value of an index that is unrelated to a change in the distribution of responses. To better understand why, consider the following scenario. Suppose that there are two adjacent periods where, initially, all respondents are present in both periods and their responses are identical in both periods. In this case, the diffusion index will indicate that activity did not change from the first period to the second. Now suppose that we add 20 new repeat respondents in the second period and that ten give above-average reports and ten give below-average reports. In this scenario, the numerator of the index is unaffected, but the denominator is larger, so that the diffusion index is now lower in the second period, even

FIGURE 2**Distribution of responses, by type, for the CFSBC Activity Index****A. Detrended****B. Not detrended**

Notes: CFSBC means *Chicago Fed Survey of Business Conditions*. Panel A shows the distribution of responses, by type, for the detrended index—which is the CFSBC Activity Index that will be published in the official Chicago Fed release of the survey’s results (also shown as the blue line in figure 1). See the text for details on the detrending methodology.
Source: Authors’ calculations.

though the difference between above-average and below-average responses is unchanged from the first period. We would view such a decline in the index as misleading. Smoothing the denominator helps to mitigate the distortion, though not perfectly. In practice, we find little difference between our preferred versions of the indexes (which will be published in the official Chicago Fed release of the survey’s results) and versions without a smoothed denominator.

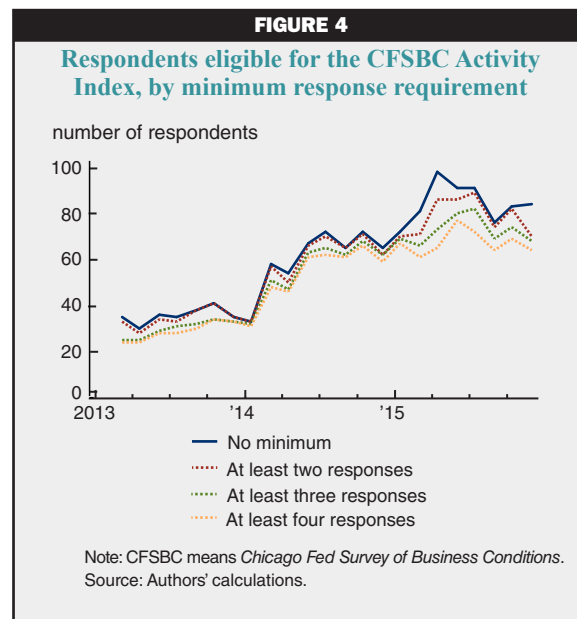
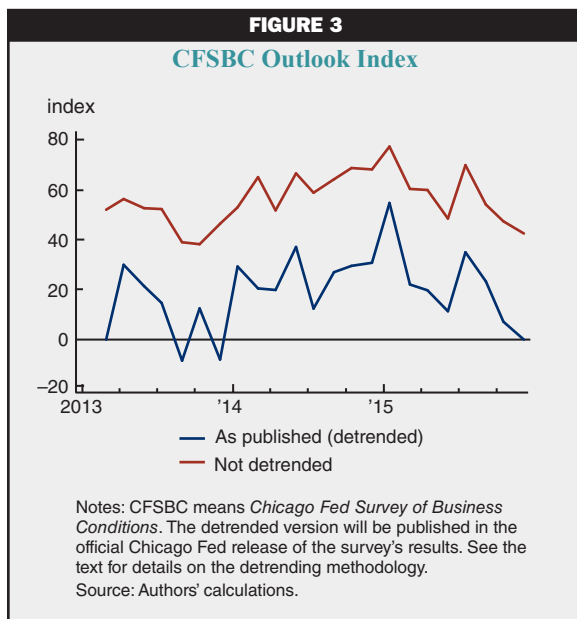
How does detrending influence the CFSBC diffusion indexes?

To explain the implications of our detrending methodology, we examine how two of our indexes, the CFSBC Activity Index and CFSBC Outlook Index, would differ if we instead calculated them using the traditional diffusion index formula.

Figure 1 (p. 79) shows the CFSBC Activity Index and a version calculated from the traditional formula. The activity index is based on respondents’ answers to questions about demand for their products or services. Respondents typically report that demand increased slightly, so detrending shifts the index down. In general, the shapes of the paths of both indexes are quite similar: Both indexes capture the slowdowns in the first quarters of 2014 and 2015 and the strength of growth in the

second half of 2014. That said, compared with the version calculated from the traditional formula, the official CFSBC Activity Index (which has been detrended) indicates that the downturns were sharper. This is not surprising, since detrending will increase the variance of respondents’ answers if their answers always fall in a limited range (in this case mostly positive). To clarify why the variance of the index increases when the index is detrended, we show in figure 2 the distribution of positive, neutral, and negative responses to the demand questions across all survey rounds before and after detrending. Because the average response for many respondents is that demand increased slightly, detrending converts many of the neutral responses into negative responses. There are also some respondents who typically report a moderate increase in demand, so that detrending converts responses indicating a slight increase in demand into negative responses. The new distribution created by detrending is more spread out, increasing its variance, and, not surprisingly, increasing the variance of the diffusion index as well.

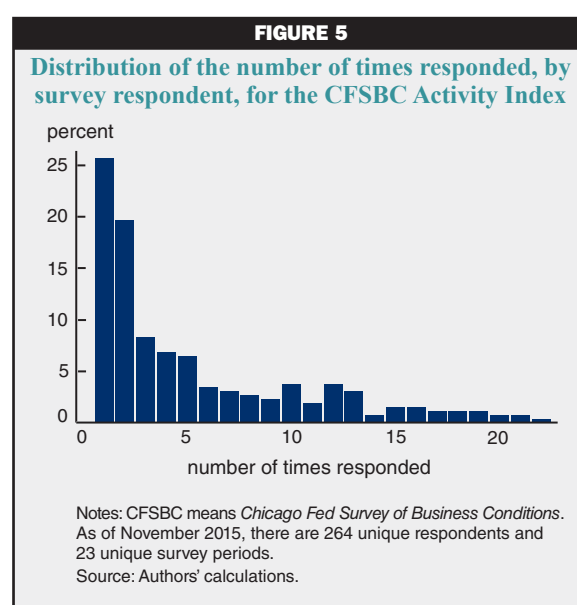
As noted in the previous section, detrending is also useful because it adjusts for differences in the respondents’ interpretations of the quantitative scale that we use. For example, some respondents may be more optimistic or pessimistic in general, and detrending



(or, more appropriately, demeaning) allows us to put them on equal footing. This particularly applies to when the survey asks for respondents' outlooks for the U.S. economy over the next six to 12 months. Detrending makes it so that our moderately optimistic respondents are counted as having a positive outlook only when they are feeling very optimistic and our moderately pessimistic respondents are counted as having a positive outlook even when they are feeling slightly pessimistic.

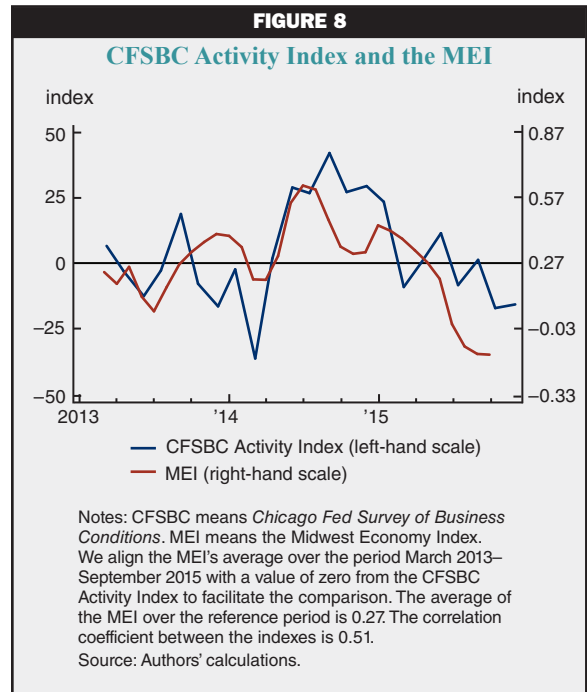
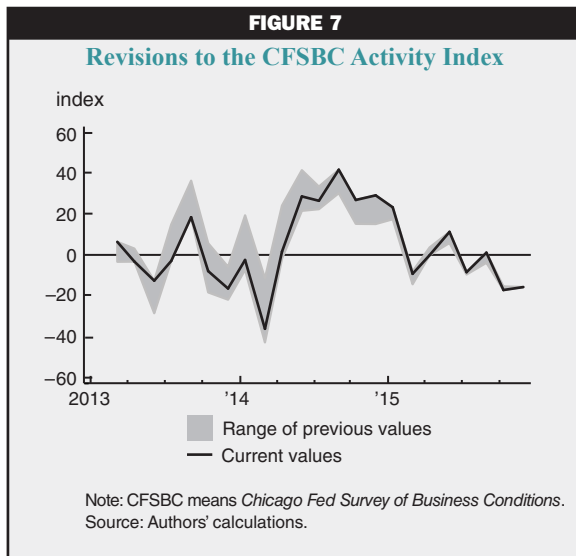
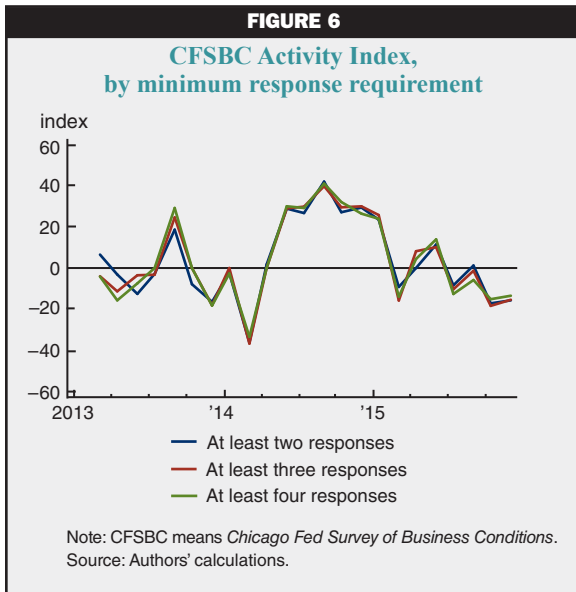
Figure 3 shows the CFSBC Outlook Index and a version constructed in the traditional way (that is, without detrending). Here, as with the CFSBC Activity Index, respondents typically report that they have a positive outlook, so the line for the official CFSBC Outlook Index is below the line for the index without detrending. Moreover, the shapes of the paths of both indexes are quite similar, though the detrended index has a greater variance than the index constructed using the traditional formula. In other words, we see that the two outlook indexes in figure 3 behave similarly to the two activity indexes in figure 1 (p. 79).

As noted previously, detrending also leads us to exclude survey participants who have responded only once to the survey from the respondent pool because all of their responses are neutral by definition. In addition, we expect that survey participants' average responses will change as their response histories grow. The longer the history is, the more stable the average response is—and the more reliably we can identify deviations from a long-run trend. Thus, because some survey participants respond more consistently than others do, we face a trade-off between maximizing



the quantity of respondents and the quality of responses in calculating the indexes.

Figure 4 shows how the number of respondents used to calculate the CFSBC Activity Index declines as we increase the minimum number of responses per respondent required. The vast majority of survey participants who contributed to the index prior to 2015 have responded at least four times. Throughout 2015, we have added a number of new survey participants, and most of them have not yet responded four times. Figure 5 provides another perspective on the CFSBC Activity Index's respondent pool. It shows the distribution of the number of survey responses by respondent as of



November 2015. Just under 75 percent of the respondent pool (made up of 264 unique respondents) has responded at least two times, allowing that share to be included in the least restrictive version of the index, which is our preferred version (displayed as the blue line in figure 1 on p. 79).

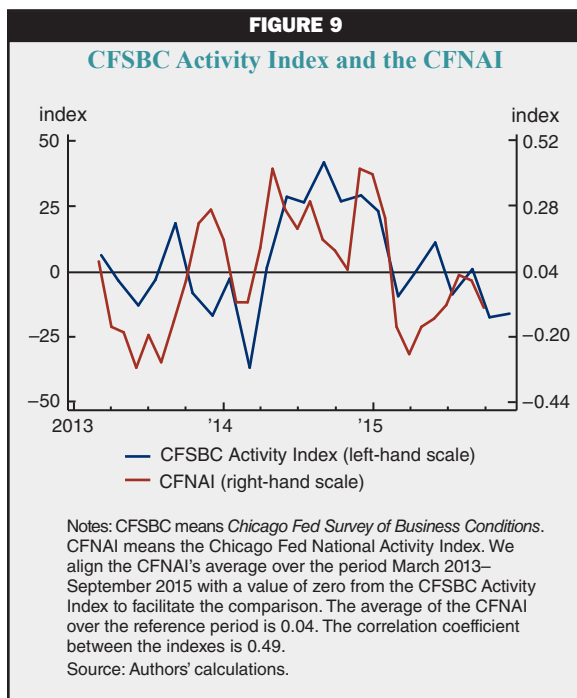
Figure 6 shows how the CFSBC Activity Index would change if we altered the minimum number of responses required for a survey participant's response to be counted in the calculation of the index. Increasing the requirement from two to four has little effect on the index except at the very beginning when the respondent pool was small in comparison to its current size. There are some differences in 2015 related to the large number of new respondents without a long history,

but they are small and do not substantially change how we would interpret the index.

A bigger concern is the fact that as we add to the histories of our respondents, their average responses evolve, sometimes changing whether we treat earlier responses as positive, neutral, or negative, which in turn changes earlier values of the CFSBC indexes. Figure 7 shows the current CFSBC Activity Index as well as the range of values it has had in the past. The range of values provides some indication of how much more-recent values may change as future survey rounds are completed. In our view, the ranges are small enough that they have little effect on how one would interpret the index's value. Moreover, we expect the size of such revisions to decline in the coming years as we continue to add to our respondents' histories and their respective average responses become more stable.⁹

Comparing the CFSBC Activity Index with other measures of activity

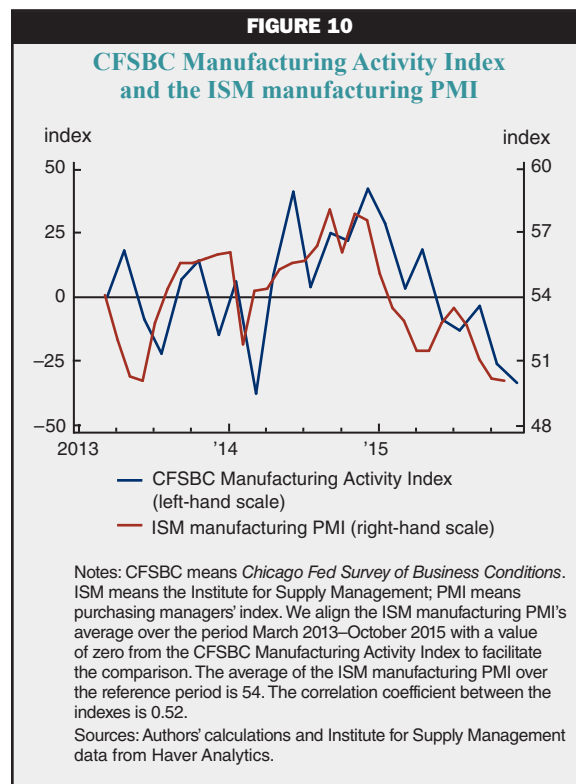
In this section, we explore how well the CFSBC Activity Index aligns with other indicators of economic activity at the District and national level, such as the Chicago Fed's Midwest Economy Index (MEI), the Chicago Fed National Activity Index (CFNAI), and the national surveys of manufacturing and nonmanufacturing activity conducted by the Institute for Supply Management. The CFSBC Activity Index (as well as its manufacturing and nonmanufacturing subindexes) largely traces a path similar to the paths of these indicators, but



the timeliness of the information it provides gives it an advantage over some of these indicators. We also show that the CFSBC Activity Index correlates quite well with the Seventh District's real gross state product (GSP) growth and U.S. real gross domestic product (GDP) growth, suggesting that the index may have some value to researchers interested in forecasting these measures in real time.

Figure 8 presents the CFSBC Activity Index and the Midwest Economy Index together. The MEI is a weighted average of 129 Seventh District state and regional indicators measuring growth in nonfarm business activity from four broad sectors of the Midwest economy: manufacturing, construction and mining, services, and consumer spending.¹⁰ Thus, it summarizes a wide range of information about economic activity in the Seventh District. Because the MEI has been above its long-run trend for most of the time since March 2013, we equate the MEI's average over this reference period¹¹ to a value of zero from the CFSBC Activity Index to facilitate the comparison.

The CFSBC Activity Index and MEI demonstrate considerable co-movement, such as the ramp up in activity in the middle of 2014 and the more recent slow-down. However, there are also times when they move in different directions. One possible explanation for this is that the MEI tends to be subject to large revisions, as much of its underlying data series are subject to benchmark revisions. In previous work, we showed that an early version of the CFSBC Activity Index was



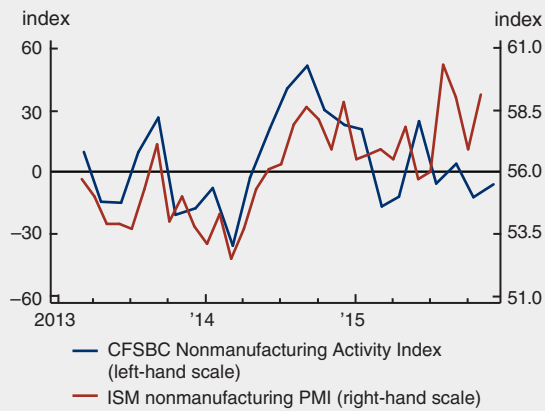
predictive of the direction of these revisions in recent years.¹² Another possible explanation is that the CFSBC Activity Index is capturing a combination of regional and national economic activity because many of the firms in the survey sample have a national footprint.

Figure 9, therefore, compares the plots of the CFSBC Activity Index and the Chicago Fed National Activity Index, which is a weighted average of 85 national indicators measuring growth in production and income; employment, unemployment, and hours; personal consumption and housing; and sales, orders, and inventories.¹³ As with the MEI comparison, we equate the CFNAI's average over the reference period to a value of zero from the CFSBC Activity Index to facilitate the comparison. Comparing figures 8 and 9, one can see that at least some of the periods of divergence between the CFSBC Activity Index and the MEI align with periods where the CFSBC Activity Index instead more closely follows the CFNAI. Overall, the CFSBC Activity Index appears to capture similar information on growth in economic activity as the MEI and CFNAI, which is confirmed by its correlation coefficients of 0.51 with the MEI and 0.49 with the CFNAI.

It is important to keep in mind, though, that the CFSBC Activity Index is timelier than the MEI and CFNAI. New releases of the CFSBC indexes will typically come out one to two weeks after the survey is completed, while both the MEI and CFNAI are released with a

FIGURE 11

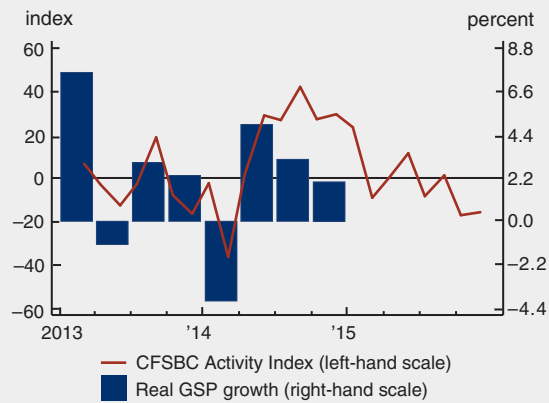
CFSBC Nonmanufacturing Activity Index and the ISM nonmanufacturing PMI



Notes: CFSBC means *Chicago Fed Survey of Business Conditions*. ISM means the Institute for Supply Management; PMI means purchasing managers' index. We align the ISM nonmanufacturing PMI's average over the period March 2013–October 2015 with a value of zero from the CFSBC Nonmanufacturing Activity Index to facilitate the comparison. The average of the ISM nonmanufacturing PMI over the reference period is 56. The correlation coefficient between the indexes is 0.58.
Sources: Authors' calculations and Institute for Supply Management data from Haver Analytics.

FIGURE 12

CFSBC Activity Index and real GSP growth for the Seventh Federal Reserve District



Notes: CFSBC means *Chicago Fed Survey of Business Conditions*. GSP means gross state product. Seventh District GSP is the sum of the GSP of the Seventh District states (Illinois, Indiana, Iowa, Michigan, and Wisconsin). We align the Seventh District's average real GSP growth over the period 2013:Q1–2014:Q4 with a value of zero from the CFSBC Activity Index to facilitate the comparison. The average quarterly (annualized) real GSP growth rate over the reference period is 2.2 percent. The correlation coefficient between the index and the growth rate is 0.54.
Sources: Authors' calculations and U.S. Bureau of Economic Analysis data from Haver Analytics.

one-month lag. Thus, while the CFSBC Activity Index contains similar information as the MEI and CFNAI, it can signal movements in Seventh District and national economic activity sooner.

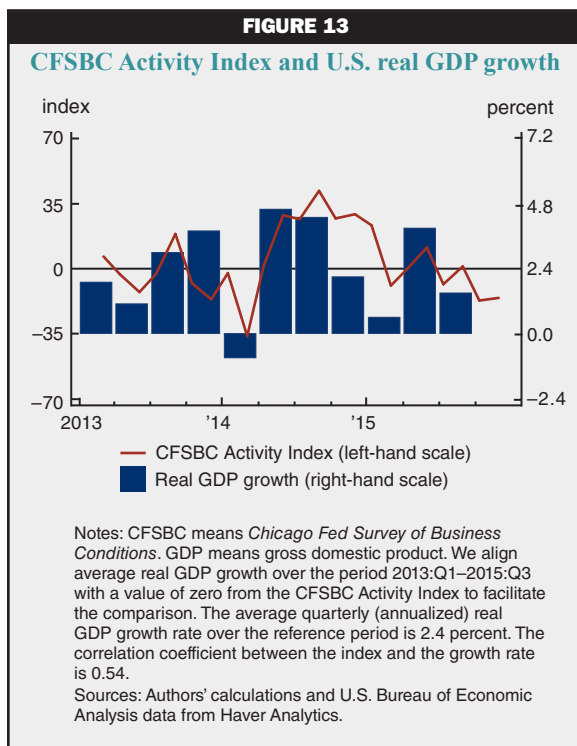
We next compare the CFSBC Manufacturing and Nonmanufacturing Activity Indexes with the Institute for Supply Management's manufacturing and nonmanufacturing purchasing managers' indexes (PMIs).¹⁴ The ISM's PMIs are quite similar to the CFSBC indexes in that they are also diffusion indexes constructed from a survey that asks purchasing and supply executives whether their production, employment, orders, and inventories are higher or lower than (or the same as) in the previous reporting period. While ISM PMIs exist for some cities and regions in the Seventh District, the ISM only calculates manufacturing and nonmanufacturing indexes separately at the national level.

Figure 10 (p. 83) shows the CFSBC Manufacturing Activity Index and ISM manufacturing PMI together. In this figure, we equate the average value of the ISM manufacturing PMI over the reference period to the baseline of the CFSBC Manufacturing Activity Index to facilitate the comparison. The indexes largely move together, with the exception of the first half of 2013. In addition, the ISM manufacturing PMI declined faster than the CFSBC Manufacturing Activity Index did in the first half of 2015, likely because of strong

growth in the Seventh District's auto industry. Figure 11 shows the CFSBC Nonmanufacturing Activity Index and the ISM nonmanufacturing PMI together; similar to previous comparisons, we equate the average value of the ISM nonmanufacturing PMI over the reference period to the baseline of the CFSBC Nonmanufacturing Activity Index. They, too, generally move together. Similar to what we saw for the CFSBC Activity Index vis-à-vis the MEI and the CFNAI, the co-movement of the CFSBC activity indexes and the ISM PMIs is notable: The correlation coefficient between the manufacturing indexes is 0.52, and the correlation coefficient between the nonmanufacturing indexes is 0.58.

Figures 10 and 11 suggest that the CFSBC Activity Index also aligns quite well with other survey measures of economic activity. This finding highlights one advantage that the overall CFSBC Activity Index has over the individual ISM indexes: It efficiently combines the information from both manufacturers and nonmanufacturers into a single index that accounts for the differences in trend growth in each sector.¹⁵

Another advantage of the CFSBC Activity Index over the ISM's PMIs is that it shares much conceptually with traditional measures of gross output because of its focus on the demand for firms' products and services. Figures 12 and 13 explore this relationship by comparing the CFSBC Activity Index with the real



growth rates of Seventh District GSP¹⁶ and U.S. GDP. In these figures, we have aligned the average of the gross output measures over the reference period with the baseline of the CFSBC Activity Index. One can see from the figures that the CFSBC Activity Index and growth in both gross output measures often move together, with periods where the activity index is above zero tending to correspond with quarters characterized by above-average gross output growth and vice versa. While the time series of the CFSBC Activity Index is not quite long enough to allow for a formal test of these relationships, the strong correlations in these figures do suggest that the index might be a valuable input into nowcasting models of both gross output measures.¹⁷

Additional current and forward-looking indexes

We also use the CFSBC to construct current and forward-looking diffusion indexes for a number of additional topics typically covered in the Beige Book: current and expected hiring and capital spending, as well as wage and nonwage cost pressures. These indexes are also constructed using detrended responses, so that they share the same interpretation as that for the activity and outlook indexes—where a positive value reflects above-average growth and a negative value reflects below-average growth. Figure 14 presents all of these indexes, and also includes the latest results from follow-up questions that we ask about the types of workers firms are looking to hire, the types of capital spending firms

are undertaking, and the types of wage and nonwage cost pressures firms are facing.

These additional indexes, particularly those related to hiring and capital spending, provide further context for the responses underlying the CFSBC Activity and Outlook Indexes shown in the top left panel of figure 14. Both the indexes for current hiring and capital spending tend to rise and fall with the CFSBC Activity Index, while the indexes for hiring and capital spending plans (for the next six to 12 months) tend to more closely follow the CFSBC Outlook Index. The current hiring and capital spending indexes are also highly reflective of the mild nature of the expansion in activity over the past few years, with both measures generally exhibiting below-average growth for most of this time. Similarly, the muted inflation that has persisted during this period is consistent with the below-average index values for both wage and nonwage cost pressures.

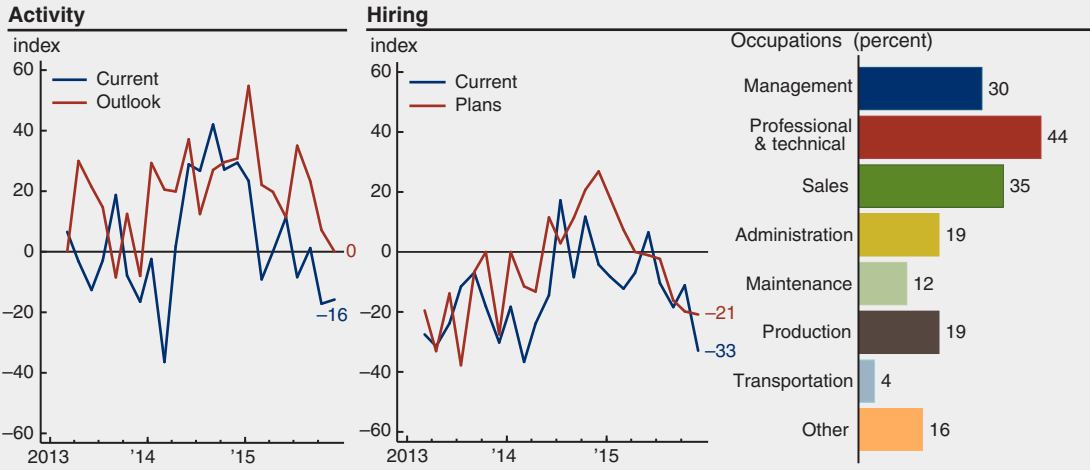
The bar charts in figure 14 provide further information about the forces driving the values of the indexes. When tracked over time, they, too, provide valuable information for the Seventh District's Beige Book report. For instance, when asked to identify the types of occupations that their firms are hiring for, respondents have long indicated stronger demand for professional and technical occupations than for other categories. Consistent with this, respondents tend to report greater wage pressure for such occupations. Respondents have also tended to describe capital spending as being confined mostly to replacement of existing information technology and industrial equipment. As both hiring and capital spending trended up in 2014, respondents noted a broadening in the types of occupations in demand, sources of wage pressures, and types of capital spending. More-recent values of these indexes reflect a weakening of business conditions in 2015.

Conclusion

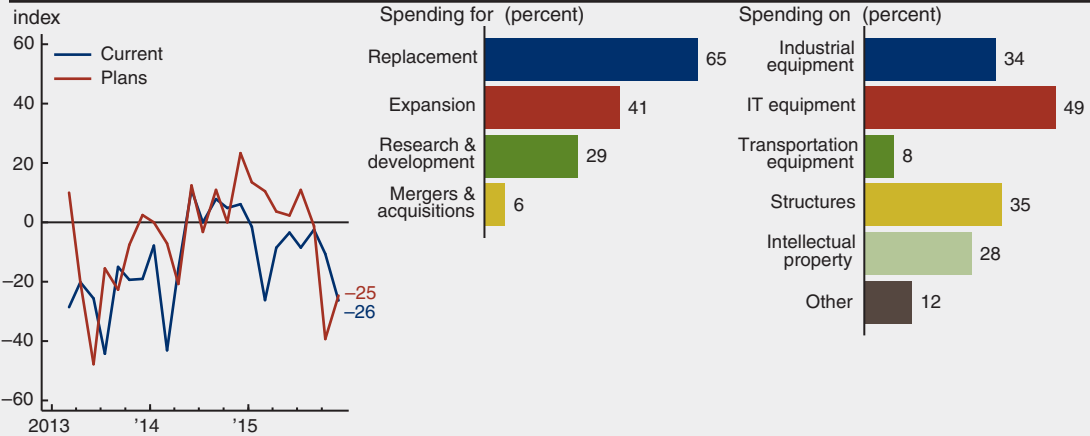
The *Chicago Fed Survey of Business Conditions* offers a new set of diffusion indexes for tracking economic activity in real time. The design of the survey and the method used to construct the diffusion indexes are unique in that the survey asks respondents about both *current* and *expected* economic activity and the resulting diffusion indexes are *adjusted for inherent biases in measurement and interpretation*. By calculating our diffusion indexes based on whether participants' answers are above or below their respective average answers, we address potential biases from respondent-, firm-, and industry-specific trends that arise because our respondent pool is not a random sample. The correlation of the resulting diffusion indexes with other regional and national indexes of economic activity, as well as

FIGURE 14

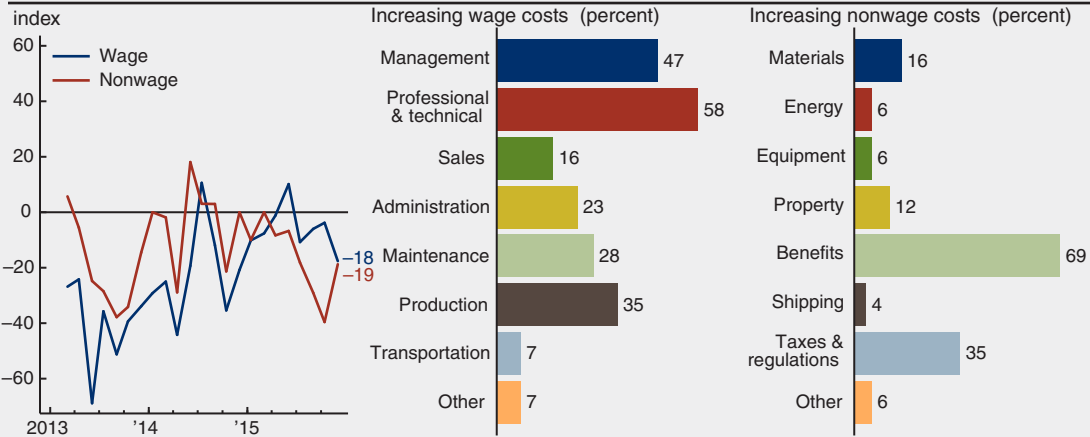
CFSBC diffusion indexes and related data



Capital spending



Cost pressures



Notes: CFSBC means *Chicago Fed Survey of Business Conditions*. This multipaneled figure will be featured on the back page of the official Chicago Fed release of the survey's results. For details on how to interpret the various line graphs, see the text. The bar graphs report the percentage of responses for types of occupations currently in demand; reasons for capital spending and its allocation; and sources of wage and nonwage cost pressures. The numbers may add up to more than 100 percent because more than one option can be chosen. Source: Authors' calculations.

gross output growth, is solid. Additionally, the CFSBC diffusion indexes offer insight into the hiring and capital spending decisions of business contacts surveyed for the Seventh District's Beige Book report.

As we have demonstrated, the indexes in their current form offer useful insights into current conditions in the Seventh District and U.S. economies. However, they remain works in progress. For example, as the

time range of observation grows, we will be able to adjust for potential seasonality in the indexes. We also plan to calculate standard errors for the indexes based on work by Pinto, Sarte, and Sharp (2015). Finally, we may be able to release indexes based on other questions we ask our respondents, such as those regarding prices, productivity, and credit conditions.

NOTES

¹More specifically, the Beige Book is always released on a Wednesday two weeks ahead of the final day of an FOMC meeting. For the official description of the Beige Book and to view the latest report as well as the archives, visit <https://www.federalreserve.gov/monetarypolicy/beigebook/>. Information about the 12 Federal Reserve Districts and Banks is available at <https://www.federalreserve.gov/otherfrb.htm>.

²Balke and Petersen (2002) go through 14 years of Beige Book reports and assign numerical scores (ranging from -2 to 2) to the level of growth described in the text. Both authors read passages in a random order and use the average of their two scores. They then use their measure to predict current and next quarter real gross domestic product (GDP) growth and are able to outperform the consensus forecasts in the *Blue Chip Economic Indicators* for some specifications. Armesto et al. (2009) use linguistics software to measure the degree to which language in the Beige Book is either optimistic or pessimistic. They employ the resulting index in an econometric model that explicitly accounts for the irregular schedule of the Beige Book. They find that the national Beige Book summary can predict both GDP and employment growth. They also find that the District Beige Book reports can predict regional employment growth. Balke, Fulmer, and Zhang (2015) use textual analysis techniques developed in Fulmer (2014) to quantify Beige Book language. They find that their measure provides unique information about current economic conditions, particularly during recessions, in the context of a dynamic factor model of U.S. business conditions.

³In a related article, Brave and Walstrum (2014) introduce a subset of these indexes and show how they are useful for understanding turning points in economic activity.

⁴The Seventh Federal Reserve District (which is served by the Chicago Fed) comprises all of Iowa and most of Illinois, Indiana, Michigan, and Wisconsin; for more details, see note 1 and <https://www.chicagofed.org/utilities/about-us/seventh-district-economy>.

⁵This adjustment is akin to controlling for respondent fixed effects in terms of a traditional linear regression model.

⁶While not a concern in practice, it is possible for the diffusion indexes to breach these bounds (of +100 and -100) given the smoothing procedure that we employ for the denominator in the formula. We explain the smoothing procedure a little later in this section (describing the survey and the construction of the diffusion indexes).

⁷The denominator for the latest period is a two-period moving average of the current and lag period, since the lead period is unknown.

⁸Notable jumps in the number of repeat survey respondents (visible in figure 4 on p. 81) coincide with initiatives undertaken to increase the sample size of the survey.

⁹It is worth noting, however, that the timing of respondents' entrances into the survey relative to the business cycle will have an important effect on our estimate of their long-run trends. For example, we will underestimate the long-run growth trends of respondents who enter during a recession until we have sufficient observations of their responses during an expansion. If we add a large number of respondents to the survey when the economy is not growing near its long-term trend, this could bias the indexes. Because data for the indexes cover a period of growth that is near trend, we do not believe this concern is currently a major source of bias.

¹⁰For more information on the MEI, see <https://www.chicagofed.org/mei>.

¹¹Reference periods will vary depending on the availability and frequency of the index or gross output measure to which a CFSBC index is compared in figures 8-13 (the precise periods appear in the figures' notes).

¹²See Brave and Walstrum (2014).

¹³For more information on the CFNAI, see <https://www.chicagofed.org/cfnai>.

¹⁴For more information on the ISM's PMIs, see <https://www.instituteforsupplymanagement.org/news/content.cfm?ItemNumber=28965&&navItemNumber=28882>.

¹⁵There are, however, other ways in which to combine the information from manufacturers and nonmanufacturers. For instance, some analysts have combined the ISM manufacturing and nonmanufacturing PMIs into a composite index by weighting them by the relative contribution of manufacturing and nonmanufacturing industries to GDP.

¹⁶Seventh District GSP is the sum of the GSP of the Seventh District states (Illinois, Indiana, Iowa, Michigan, and Wisconsin).

¹⁷The term *nowcasting* is derived from combining the words *now* and *forecasting*. Nowcasting techniques are commonly used in economics nowadays because they permit economists to predict today the present (and recent past) of standard measures of the economy (such as real GDP), which are often determined after a long delay. For more information on nowcasting real GDP growth with indexes of economic activity, see Brave and Butters (2014). For more information on forecasting real GSP growth, see Brave and Wang (2011).

APPENDIX: CFSBC DIFFUSION INDEX QUESTIONS

1. In the past four to six weeks, demand for my firm's products or services has
 - increased substantially.
 - increased moderately.
 - increased slightly.
 - not changed.
 - decreased slightly.
 - decreased moderately.
 - decreased substantially.
2. My outlook for the U.S. economy in the next six to 12 months is
 - very positive.
 - moderately positive.
 - slightly positive.
 - neutral.
 - slightly negative.
 - moderately negative.
 - very negative.
3. In the past four to six weeks, my firm's work force has
 - increased substantially.
 - increased moderately.
 - increased slightly.
 - not changed.
 - decreased slightly.
 - decreased moderately.
 - decreased substantially.
4. In the next six to 12 months, I expect my firm's work force to
 - increase substantially.
 - increase moderately.
 - increase slightly.
 - not change.
 - decrease slightly.
 - decrease moderately.
 - decrease substantially.
5. My firm is hiring or looking to hire for these occupations:
 - managerial (executive, accountant, HR manager, marketing, etc.)
 - professional and technical (engineer, IT support, lawyer, etc.)
 - sales
 - administrative support
 - maintenance (mechanic, custodian, etc.)
 - production (operator, assembler, quality assurance, laborer, etc.)
 - transportation (driver, material handling, etc.)
 - other
6. In the past four to six weeks, my firm's capital spending has
 - increased substantially.
 - increased moderately.
 - increased slightly.
 - not changed.
 - decreased slightly.
 - decreased moderately.
 - decreased substantially.
 - A. My firm's capital spending has been for:
 - replacing equipment or remodeling structures
 - capacity expansion
 - research and development
 - mergers and acquisitions
 - B. My firm's capital spending has been on:
 - industrial equipment
 - IT equipment
 - transportation equipment
 - structures
 - intellectual property
 - other
7. In the next six to 12 months, I expect my firm's capital spending to
 - increase substantially.
 - increase moderately.
 - increase slightly.
 - not change.
 - decrease slightly.
 - decrease moderately.
 - decrease substantially.

8. In the past four to six weeks, my firm's overall wage costs have

- increased substantially.
- increased moderately.
- increased slightly.
- not changed.
- decreased slightly.
- decreased moderately.
- decreased substantially.

A. Please select the occupations for which wage costs have increased:

- managerial (executive, accountant, HR manager, marketing, etc.)
- professional and technical (engineer, IT support, lawyer, etc.)
- sales
- administrative support
- maintenance (mechanic, custodian, etc.)
- production (operator, assembler, quality assurance, laborer, etc.)
- transportation (driver, material handling, etc.)
- other

9. In the past four to six weeks, my firm's overall nonwage costs have

- increased substantially.
- increased moderately.
- increased slightly.
- not changed.
- decreased slightly.
- decreased moderately.
- decreased substantially.

A. Please select the areas where nonwage costs have increased:

- raw materials or wholesale goods
- energy
- equipment
- property
- benefits (health insurance, retirement, etc.)
- shipping costs
- taxes and regulations
- other

REFERENCES

Armesto, Michelle T., Rubén Hernández-Murillo, Michael T. Owyang, and Jeremy Piger, 2009, "Measuring the information content of the Beige Book: A mixed data sampling approach," *Journal of Money, Credit and Banking*, Vol. 41, No. 1, February, pp. 35–55.

Balke, Nathan S., Michael Fulmer, and Ren Zhang, 2015, "Incorporating the Beige Book into a quantitative index of economic activity," Southern Methodist University and Federal Reserve Bank of Dallas, mimeo, August 26, available at <http://www.ssc.upenn.edu/~fdiebold/NoHesitations/Balkeetal2015.pdf>.

Balke, Nathan S., and D'Ann Petersen, 2002, "How well does the Beige Book reflect economic activity? Evaluating qualitative information quantitatively," *Journal of Money, Credit and Banking*, Vol. 34, No. 1, February, pp. 114–136.

Brave, Scott A., and R. Andrew Butters, 2014, "Nowcasting using the Chicago Fed National Activity Index," *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 38, First Quarter, pp. 19–37, available at <https://www.chicagofed.org/publications/economic-perspectives/2014/1q-brave-butters>.

Brave, Scott A., and Thomas Walstrum, 2014, "Using the Federal Reserve's Beige Book to track economic activity," *Chicago Fed Letter*, Federal Reserve Bank of Chicago, No. 328, November, available at <https://www.chicagofed.org/publications/chicago-fed-letter/2014/november-328>.

Brave, Scott A., and Norman Wang, 2011, "Predicting gross state product growth with the Chicago Fed's Midwest Economy Index," *Chicago Fed Letter*, Federal Reserve Bank of Chicago, No. 293, December, available at <https://www.chicagofed.org/publications/chicago-fed-letter/2011/december-293>.

Fulmer, Michael, 2014, "A text analytics analysis of the Federal Reserve Beige Book corpus," Southern Methodist University, doctoral dissertation.

Pinto, Santiago, Pierre-Daniel Sarte, and Robert Sharp, 2015, "Learning about consumer uncertainty from qualitative surveys: As uncertain as ever," Federal Reserve Bank of Richmond, working paper, No. 15-09, August, available at https://www.richmondfed.org/publications/research/working_papers/2015/wp_15-09.