

The “Philly Fed Index” Turns 50 with Steadfast Success

What is so telling about the Philadelphia Fed’s monthly manufacturing index? Explore why financial analysts, economists, and the press monitor it closely for clues about the overall U.S. economy.

BY MICHAEL TREBING AND CAROLINE BEETZ FENSKÉ

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This year, the Federal Reserve Bank of Philadelphia is celebrating the 50th anniversary of its monthly Manufacturing Business Outlook Survey (MBOS). The MBOS queries high-level business executives in the Third Federal Reserve District, covering eastern Pennsylvania, southern New Jersey, and Delaware, on the direction of change in business activity. It is the longest-running manufacturing survey compiled by a regional Federal Reserve Bank. Not only has the survey provided valuable information on business cycle swings regionally, it is quite sensitive to shifts in national activity. As such, it has been remarkably successful in providing current-period forecasts of key U.S. economic indicators before official quantitative statistics are published. Consequently, economists, investors, and the media carefully watch the survey. Historically, the MBOS has even moved markets, particularly in times of uncertainty when the stock market has been highly volatile.

The MBOS, formerly known as the Business Outlook Survey, began as a joint effort of economists in the Research Department of the Philadelphia Fed and the Bell Telephone Company of Pennsylvania in Philadelphia as a way to measure local economic activity.¹ Dr. Edward Boehne, a newly hired economist at the Philadelphia Fed, authored the early memos spelling out the objectives and planning of the survey. He was particularly insightful to plan the report release date to coincide with the month being surveyed. Boehne eventually became Research Director and later President of the Philadelphia Fed. In its early years, the survey was mailed out in the beginning of the month to regional manufacturing executives. The resulting report on expectations of business conditions was then mailed mid-month by the Philadelphia Fed to any interested parties. Over time, as the MBOS gained in popularity, the survey was conducted by phone, and a “hotline” was established with pre-recorded results. With technological advances, data gathering and release finally went online, with results of the survey typically published on the third Thursday of the month.

Since the survey’s inception, the Philadelphia Fed has

computed diffusion indexes using the data reported by respondents for overall business conditions and for specific indicators, such as new orders, working hours, employment, and prices paid and received. The longevity of the series, including spanning over seven recessions as reported by the National Bureau of Economic Research (NBER), allows us to measure the performance of the indexes as early indicators of recessions. A notable example occurred when the current general activity index moved from positive to significantly negative during the exact same month as the official start of the Great Recession in December 2007.

Early on, financial market participants began to recognize the MBOS’s predictive value for other indicators of manufacturing activity, such as the Institute for Supply Management’s Purchasing Managers’ Index (PMI). The PMI is published with a lag of one-half month behind the release of the MBOS. Taking advantage of this lead time, the MBOS indexes have been used in many forecast models to predict short-term changes in the U.S. manufacturing industry, which is often a bellwether for other sectors in the economy. Also, the MBOS indexes on prices give early insight into our region’s monthly price changes as well as national price changes that are not available otherwise for at least a month later, thereby providing predictive value ahead of other price data.

Indeed, the MBOS’s timeliness gives it an edge over many other indicators. “This is hugely important,” said Tom Porcelli, managing director and chief U.S. economist at RBC Capital Markets. “It is a ‘live’ index. You can look at what’s going on in the month you are trying to analyze.”

While the core questions in the MBOS have remained constant throughout its history, more recently, new questions have been added on price expectations on the part of manufacturing executives. In addition, timely special questions of interest to the Philadelphia Fed have been introduced. This new and unique survey information available to the public as well as policymakers only adds to the richness of the MBOS.

Given the success of the “Philly Fed Index,” other Federal Reserve Banks have adopted similar surveys, which have also

been shown to generally correlate well with various national indicators, providing further current-period forecasts of regional and national economic activity. The predictive value provided by the MBOS and other Fed surveys factor into policy decisions and is used as an input into publications on regional activity. In light of its 50-year anniversary, it is fitting to provide here a longer view of the usefulness of the MBOS survey and how it has changed since 1968.

Manufacturing Business Outlook Survey: Purpose and Procedure

The original intent of the MBOS was to crudely measure business expectations in the Third District as a means to estimate turning points in the business cycle. According to a 1969 internal Federal Reserve memo by Dr. Edward Boehne, “the survey was modestly intended to provide a ‘feel’ for expectations in the manufacturing sector and a qualitative measure of them.” Moreover, “individual indicators at least may provide some clues to alert us to impending turning points in business activity. Further, the frequency of a monthly survey allows for a faster confirmation (or disconfirmation) of turning point suspicions...”

The format of the MBOS questionnaire was designed to be easy to complete and include a cross-section of leading, coincident, and lagging indicators as well as a question on the general level of business conditions (see Figure 1). Another beneficial feature of the MBOS is that the data has always been reasonably quick to compile and publish. After a few months of experimentation, the survey form was finalized just as it is today. Not only have the questions remained constant but also the survey includes the same time periods, asking for changes from the previous month and expectations six months forward.

Since early on in its history, the MBOS has been considered unique because it asks leaders of manufacturing companies—

owners, CEOs, and plant managers—about changes in business activity.² This approach has been continuous now for 50 years and differs from many other published manufacturing surveys, which often direct questions to purchasing managers and other business contacts rather than high-level officers. Without question, there is substantial value in collecting information from the heads of firms about the direction of change in business activity within their own companies.

Over the past half-century, the Philly Fed has compiled the MBOS data on overall business activity along with data on employment, working hours, new and unfilled orders, shipments, delivery times, and prices of inputs and manufactured goods. In order to put the individual survey responses in a form that can be used to help track regional and national business cycles, the Philadelphia Fed constructs monthly diffusion indexes for overall business activity and for each of the subindicators. The MBOS diffusion indexes are calculated by subtracting the percentage of respondents reporting decreases from the percentage of those reporting increases for each indicator. Index values below zero normally occur during recessions, that is, when more respondents report declines than improvements. Index values above zero typically correlate with periods of economic expansion, that is, when positive responses on the direction of change in an indicator outweigh negative ones. Given the qualitative nature of survey data, it is important to note that a diffusion index does not gauge the magnitude of the change, but rather the scope of the change in economic activity. Using the survey indexes, it is possible to forecast and make inferences about potential changes in economic conditions in the near term that would not otherwise be known until official quantitative data have been published, with the potential to guide policy.

See "Diffusion Indexes." →

FIGURE 1
The MBOS Questionnaire

Core Questions		September vs. August				Six months from	
General Business Activity		No Response	Decrease	No Change	Increase	No Response	Decrease
What is your evaluation of the level of general business activity?		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Company Indicators		No Response	Decrease	No Change	Increase	No Response	Decrease
New Orders		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Shipments		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Unfilled Orders		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

FIGURE 2
The MBOS Leads Other Indicators by Weeks and Correlates Strongly with the Lagging Indicators



Diffusion Indexes

The Manufacturing Business Outlook Survey (MBOS) asks participants in the Third Federal Reserve District—firm owners, CEOs, and other top executives—to report on the direction of monthly business activity at their plants. Specifically, they are asked to indicate the direction of change in overall business activity from the month prior, as well as monthly changes in specific indicators: employment, workweek, new and unfilled orders, inventories, shipments, and delivery times, along with prices paid and received.

The qualitative data derived from the MBOS is collected by asking participants if each indicator has increased, stayed the same, or decreased from the prior month (see Figure 1 for the actual survey questionnaire). Participants are also asked to indicate their expected direction of change for each indicator over the upcoming six-month period, which provides valuable feedback for economists. The individual survey responses are quantified to facilitate tracking of regional and national economic conditions by constructing monthly diffusion indexes, as described below. These are calculated separately for overall business activity and for the subindicators, such as shipments and employment, allowing for comparisons among economic indicators over time and in a given time period.

The current general activity index that tracks overall business activity and each of the subindexes are calculated by subtracting the percentage of respondents reporting a decrease in activity from the percentage of firms reporting an increase. Typically, there are numerous “no change” responses as well. It follows that the theoretical maximum value for the index is +100 while -100 is its minimum. Index values in this extreme range have yet to occur in the 50-year-old series and are unlikely in the future as it would require unanimous responses. The midpoint of zero indicates the percentage of firms reporting an increase equals the percentage reporting a decrease.

Hypothetically, if during a month at the beginning of a business cycle contraction, the percentage of firms reporting an increase in overall business activity is 20 percent and the percentage reporting a decrease is 40 percent, the index value for that month would be -20 (20 minus 40). If, on the other hand, in a month near the peak

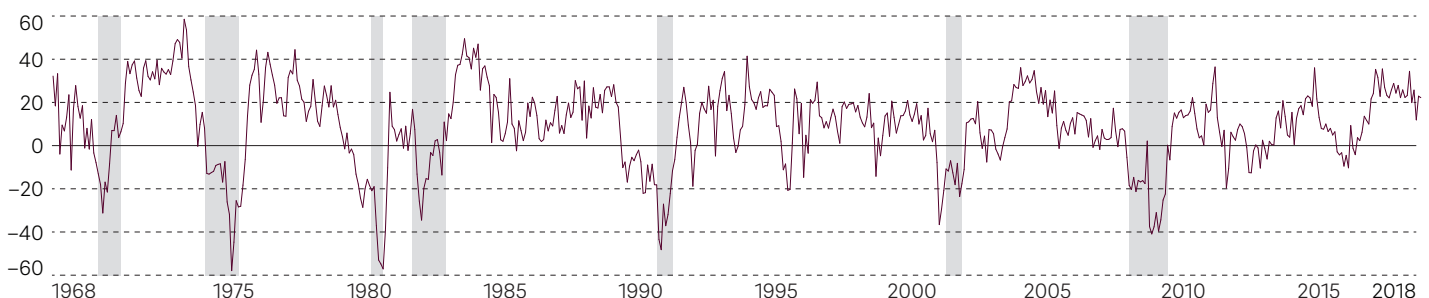
of a business cycle expansion, the percentage of firms indicating an improvement in business outlook is 70 percent and those reporting a decline is 10 percent, the index would equal 60.¹⁶ In general, the more disperse the index toward the extremes of 100 and -100, the more diffuse or widespread is the change in the monthly economic indicator.

In any given month, details from the survey can be gleaned on the breadth and composition of changes in the business cycle, both regionally and nationally. For instance, by examining the index for prices paid by consumers by type of firm, information can be derived on whether price pressures reported in the month are widespread in the region or isolated, which is useful information for policymakers monitoring inflation trends. By examining the spread or diffusion of survey responses over time, the indexes provide key information on how changes are propagated across firms over business cycles—typically this starts with just a few firms and then expands to other firms and industries. This process is well explained by Geoffrey Moore (1961), who was the former director of International Business Cycle Research: “One of the fundamental features of our economic system is that economic movements spread from one firm to another, from one industry to another, from one region to another and from one economic process to another. Moreover, these spreading movements cumulate over time. This being so, it is desirable to have measures showing how this spreading and cumulation goes on. A diffusion index is just such a measure.”

The current general activity diffusion index successfully tracks changes in economic activity at the national level, as illustrated by Figure 3, which depicts how index values have moved over time. Index values below zero are typically associated with recessions, as indicated by the shaded gray bars, showing official recessions as determined by the NBER. Likewise, periods of U.S. economic expansion tend to be associated with index values above zero. The diffusion index is also successful as an early indicator of changes in the business cycle, both regionally and nationally, that is, before official quantitative data are published (see Figure 2).

FIGURE 3

The Current General Activity Diffusion Index over 50 Years



Value of Timely Qualitative Data

As Boehne understood early on, a valuable aspect of the MBOS is in its timing, as it precedes other published statistics by weeks (see Figure 2). An important benefit of collecting qualitative data is the ability to report the findings almost instantaneously. Given its timeliness, the survey results can be used to provide current-period forecasts of regional business activity, that is, to make a prediction in the present about published data that will eventually be available. Not only is the MBOS known to give early indications on regional indicators, it has become increasingly recognized as an early signal of business fluctuations nationally. This fact is not surprising given that turning points in manufacturing tend to lead overall business cycle movements. Furthermore, business conditions of many firms in the Third District mirror what is happening nationwide as they are often part of national companies or at least have extensive interregional business dealings.

See "Current-Period Forecasting Explained."

Value of the MBOS as an Early Indicator of Regional Conditions

Quantitative data on regional conditions are generally scarce, published with a considerable lag, often collected only annually, and are normally from relatively small samples. For instance, data on regional employment, which are among the first available published data that are especially rich in detail, are available with a lag of a month or more. Employment data in the metro areas are not available until even later. Information on production, sales, or any other useful measure of economic change in the region's manufacturing sector is not available until years later.³ Moreover, data on new orders, delivery times, and prices have not been available in any form at the regional level (except through the MBOS) and must otherwise be inferred from national samples. The qualitative data from the MBOS helps to fill in the data gaps in a particularly timely fashion.

Value of the MBOS as an Early Indicator of National Conditions

The availability of timely regional survey data from the MBOS is useful in appraising national conditions because of the combined feature that it is made available ahead of national estimates and it is correlated with national economic statistics. This can be seen by the relationship between the MBOS and its closest national equivalent, the ISM's Purchasing Managers' Index. Results from the PMI indicator are published at the beginning of the month following the month of interest. The MBOS, which is published about two weeks prior, is highly correlated with the PMI—a highly watched early

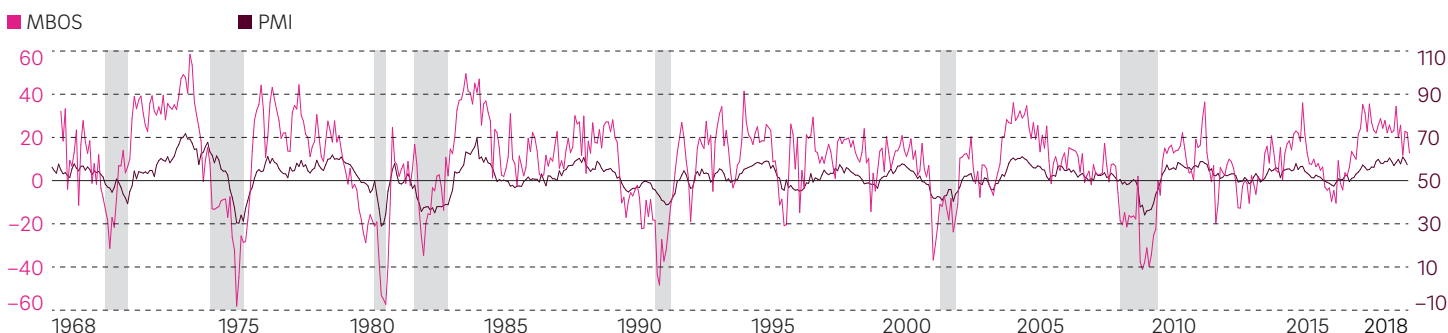
Current-Period Forecasting Explained

Those responsible for making policy have an interest in knowing the current state of economic conditions. Monetary policymakers in their published statements often refer to their deliberations and decisions as being driven by incoming data. Because official statistics are published with considerable lag, there is a need to utilize all available information coming from surveys and other more informal sources. "Current-period forecasting" refers to the methods of estimating current conditions, rather than predicting what hasn't happened yet. The need for current-period forecasting arises from the scarcity of immediate quantitative economic data, as most economic measurements are published in the next calendar period following the date of reference. For example, estimates of GDP for a given period are made in the month following the three months that comprise that quarter. Likewise, the monthly Industrial Production Index is published in the middle of the following month. The exercise of producing early forecasts of published statistics is referred to here as current-period forecasts because they are focused on the current time frame and fill a data gap until more comprehensive estimates and data are available.

In recent years, the academic literature has focused on developing models that consider various inflows of data that may rely on different sample methods or are based on staggered or overlapping collection periods. Current-period forecasting or nowcasting methods have been found to improve forecasts of yet-to-be-published economic variables and supply policymakers with timely and continuously updated real-time information to guide their decisions.¹⁷ Moreover, these methods offer a formal process for evaluating incoming data that avoids hasty judgement that might be based on less formal techniques.

FIGURE 4

MBOS Current General Activity Index vs. PMI Over 50 Years



Note: MBOS ranges from -100 to 100, while PMI range is 0 to 100. Therefore, the charts in Figs. 4 & 9 are constructed with dual y-axes to align the graphs for comparison.

indicator of national economic conditions (see Figure 4). In addition, the MBOS is successful as an early indicator of employment in manufacturing, which is published by the Bureau of Labor Statistics (BLS) in the second week following the month of interest. Similarly, the MBOS tracks industrial production well, which is published by the Federal Reserve Board around the third week of the following month.

In addition to predicting changes in specific regional and national indicators, the MBOS is valuable in predicting turning points in the national business cycle. A survey of manufacturers such as the MBOS is particularly relevant when predicting turning points since changes in the manufacturing sector often precede overall economic cycle upticks and downturns. The MBOS has yielded some impressive results in predicting recessions, as discussed in the section on business cycle movements and the MBOS.

Value of the MBOS as an Early Indicator of Price Changes and Other Advantages

Given the importance of tracking inflation from a policy perspective, information from the MBOS on expected prices set by firms is also very relevant. The MBOS collects responses from firms on the direction of change for prices paid, that is, prices for inputs, as well as prices received, in other words, prices they set for their manufactured goods. Moreover, a new section was added to the MBOS in 2015 asking firm executives to forecast their expectations of inflation regionally and nationally, further adding an important source of information. The value in this type of price data is well expressed by former Fed Chairman Ben Bernanke (2007): “On which measure or combination of measures should central bankers focus to assess inflation developments and the degree to which expectations are anchored? Do we need new measures of expectations or new surveys? Information on the price expectations of businesses—who are, after all, the price setters in the first instance—as well as information on nominal wage expectations is particularly scarce.”

Another advantage of the MBOS is that the core questionnaire can be supplemented with special questions on topics

of interest to the Philadelphia Fed’s understanding of regional and national economic conditions. The special questions section was added to the MBOS in 2001 by Loretta Mester, the former Director of Research, who is now president of the Cleveland Fed. Questions have included evaluating the impact of strictly regional events such as Hurricane Sandy and, more recently, broader questions about the impact of tax policy changes on capital spending and the effects of trade tariffs on business activity. Often the questions are coordinated with other Federal Reserve Banks, providing a wider coverage geographically and across industry sectors.

The Importance of Longevity, Persistent Reporting, and Technology

Sustaining a survey in the same basic structure over a long period offers distinct advantages. One advantage is that it facilitates analysis of economic statistics over distinct business cycle phases and turning points. It also provides a consistent and lengthy time series for forecasting and economic modeling.

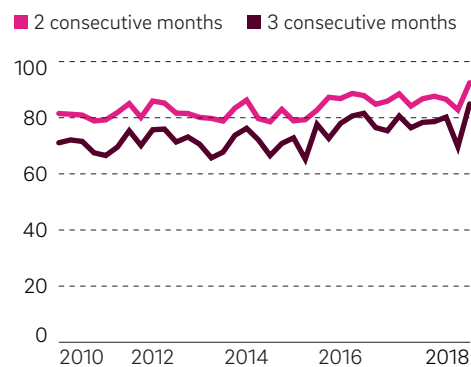
Looking more in-depth at the survey respondents themselves and their reporting frequency can shed light on why the MBOS has high predictive value. Large manufacturing firms had dominated the survey sample early on, but this concentration has since declined. Further, the region’s overall manufacturing sector has diminished over the last 50 years.⁴ Research at the national level on this downward trend reveals that the largest manufacturing firms have drastically cut employment over time, particularly in industries that compete with cheaper unskilled labor overseas, such as apparel and furniture.⁵ Nevertheless, on a percentage basis, manufacturing output has fallen less than manufacturing employment over time due to productivity improvements and technological advances, with a greater number of firms—somewhat smaller in size now—specializing in products that require higher-skilled labor. As a result of this downsizing, the size threshold for participation in the MBOS has been reduced. Having a greater share of smaller manufacturing firms represented in the sample provides further “on the

ground” information on business conditions and provides a more diverse base of firms representing the current manufacturing environment.

The current reporting panel of manufacturing firms for the MBOS has had a very high rate of continuous reporting as shown by the share of firms reporting in consecutive months (see Figure 5). The existence of a stable and persistent group of reporters allows for monitoring overall trends of various subgroups over time. While these samples of subgroups are small, they sometimes provide clues of developing trends, such as price pressures or capital spending shifts.⁶ To help identify trends on a more micro level, respondents are categorized and tracked in terms of whether they are durable or nondurable goods producers. Additionally, firms are grouped according to six product types: final products for the consumer goods market, final products for the business equipment market, equipment parts and components, materials (metals, textiles, chemicals, paper, lumber, energy, etc.), intermediate products (construction supplies or business supplies, etc.), and “other.”

FIGURE 5
MBOS Firms Exhibit a High Degree of Continuous Reporting

Over 83 percent of firms report in consecutive months.

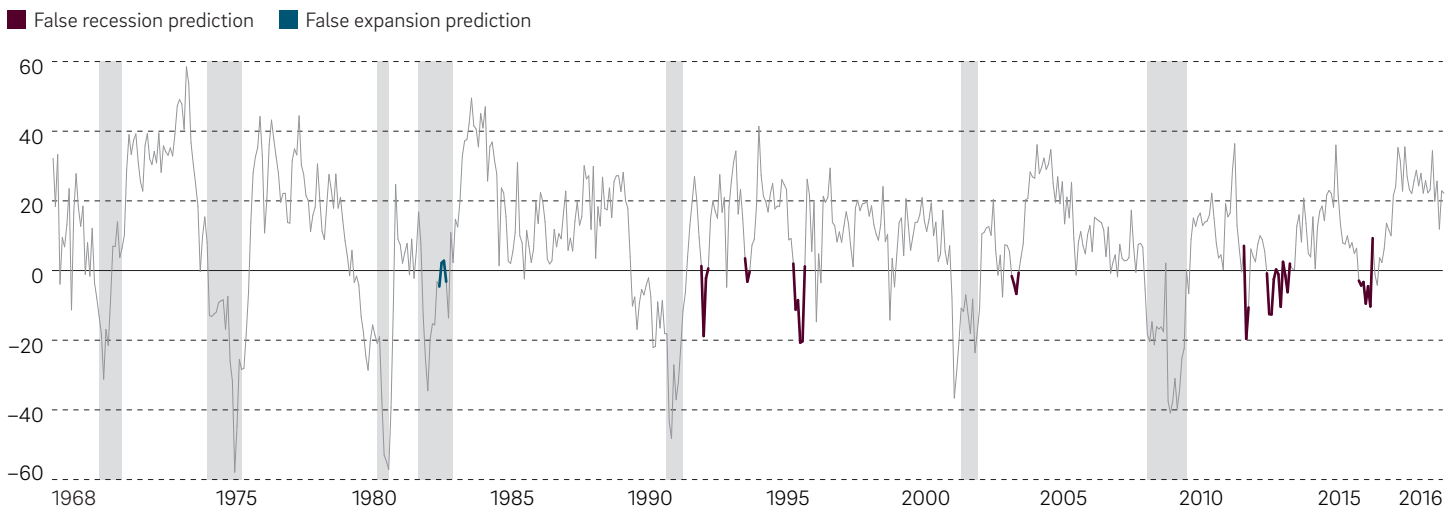


Over the course of the 50-year run of the MBOS, one other important feature is the impact of evolving technology, both on the manufacturing survey itself and on how the survey is published. Surveys are now collected electronically using web forms and e-mail notifications, so that the speed of processing is much faster. Furthermore, since the survey began being

FIGURE 6

Current General Activity Index Performance as a Predictive Tool for Recession and Expansion Periods

Index 1968–2018



published over the Internet, it has vastly improved the survey’s usefulness by facilitating delivery to larger audiences. Early access to the MBOS over the web can be attributed to Jack Siler, a former Philly Fed research employee and an avid Perl and HTML coder, who was instrumental in getting the survey online in 1995. In recent years, thousands of users of the data have downloaded the information, which can be accomplished in a rapid fashion.

Thanks to technological improvements, firms are now also able to capture information within their own organizations much quicker and with greater accuracy. Based on focus groups chosen from the reporting firms, we learned that many of the businesses have access to a “dashboard” real-time picture of their firms, thus allowing them to report more timely information. For example, firms know in real time the current status of their order books, their inventories, and the prices they are paying in their input markets. In many cases, the survey data they are reporting reflect actual data rather than forecasts because a greater portion of the month for which the survey asks about has already been recorded by the firms.

Business Cycle Movements and the MBOS

The survey’s 50-year history has spanned seven recessions of varying duration and severity. In the passages below, a review of the survey’s current general activity, new orders, and employment indexes provides an indication of the survey’s significance in tracking the overall economy with respect to official recessions and expansion periods.

The survey’s current general activity index, which is considered its headline statistic because it provides the most comprehensive information on overall conditions, has often coincided with official U.S. recession dates. The National Bureau of Economic Research (NBER) is the final arbiter that dates the peaks and troughs of the U.S. business cycle. A recession is defined as “a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real

GDP, real income, employment, industrial production, and wholesale-retail sales” (NBER 2008). Conversely, a business cycle expansion, which represents an upturn in overall economic activity, is the period between the trough and the peak.

The current general activity index’s movement, in tandem with official recession dates, is a valuable characteristic inasmuch as a negative reading, by definition, indicates that more firms report declines than those that report increases. During the Great Recession, the current general activity index was very successful in predicting turning points in the economy. The index moved into negative territory in December 2007, which was eventually marked by the NBER as the beginning of the Great Recession. Likewise, the current general activity index turned positive in June 2009 for the first time in essentially 18 months, receded one month, and then returned to sustained positive readings by August 2009. According to the NBER, the recovery period began in June 2009, which indicates that the current general activity index was highly successful in predicting the end of the Great Recession, as well as its start. Of course, in real time the beginning and end of a recession is not known as it is determined with considerable lag by the NBER. Considering the delay in reporting of official business-cycle fluctuations, timely survey data such that the MBOS can provide may have significant value as an indicator of turning points in the economy.

Gauging Turning Points

The historical chart (Figure 3) shows the current general activity index with official recessions (shown as shaded gray bands). As can be seen from the graph, business downturns as reported by firms for the MBOS often coincide with official recessions, especially the most recent one. The severity of the Great Recession is evident in both the duration and the magnitude of its decline. Overall, the MBOS has a mixed record of pinpointing recessions and recoveries over all of the business cycles of the past 50 years. For example, in the shorter recession starting in April 2001, the

MBOS's current general activity index led the beginning of the recession by four months and lagged the beginning of the recovery by one month. One problem with the use of MBOS indicators to forecast turning points is the presence of false signals, defined for recessions as the index changing from positive to negative one month then returning to positive territory. For recoveries, a false signal is defined as the index changing from negative to positive one month then returning to negative territory.⁷

Figure 6 displays the general activity index over the 50-year history of the MBOS; the seven official recession periods during that time are shown by the shaded gray bands on the chart. In each of those seven recessions, the activity index corresponds with significant and sustained negative readings. A return to positive indicators was seen in the recovery, or expansion, period following the recession. The current general activity index gave seven false signals for recessions, but only one for recoveries, as noted on the chart. To compare the predictive ability, only signals that arise from two consecutive months of sign changes were designated as relevant, and the behavior of these readings was compiled for three indexes: current general activity, new orders, and employment. Using this definition, each index was tracked to determine the lead or lag of the indicator with respect to the official recession/expansion periods. The results demonstrated that the current general activity index led the official recession period by an average of four months and the new orders index led by an average of two months, although both indicators predicted the most recent recession nearly correctly. Both of these indicators have been more accurate in pinpointing recoveries, with an average lag of zero months for the current general activity index and one month for new orders. The lead/lag analysis also clearly confirms that employment is a lagging indicator, especially for recoveries, lagging the beginning of a recovery period by an average of 7 months.

It is noteworthy to consider that there are, at times, underlying reasons for false signals of recessions (or expansions), that is, they might represent downturns (or upturns) just in certain sectors. As has been noted by various analysts, there was slow but positive GDP growth in 2015 and 2016, although subsector-level data eventually revealed a significant decline in agriculture- and oil-related manufacturing. Remarkably, the timing of the 2015-16 downturn in these industries coincided with the MBOS false recession signal that started in September 2015 and lasted nine months (with negative readings in the index in eight out of the nine months). Indeed, the MBOS index mirrored data from

the Bureau of Economic Analysis on the percentage change in U.S. nonresidential structures and equipment during this period. This scenario gives strength to the argument that consistent monthly negative readings in the MBOS and other Fed manufacturing survey indexes could in fact signal subsector weakness that might eventually have broader implications for the U.S. economy.

While Figure 6 clearly demonstrates the cyclical pattern of the current general activity index, Figure 7 shows how average values of the current general activity, new orders, shipments, prices paid, prices received, and employment indexes have differed between periods of recession and nonrecession. For the seven U.S. recessions, the average reading of the current general activity index was -17.9, compared with an average reading of 13.3 during nonrecession periods. The current general activity index has the largest difference between recession and nonrecession averages, followed by new orders, shipments, and employment.

Information Gleaned on Business Cycle Trends by Dissecting the Diffusion Indexes

The statistics underlying the diffusion indexes provide a more detailed story of business cycle patterns. Knowing the share and type of firms that reported an increase, decrease, or no change tells us a great deal about the breadth and composition of economic change across the region. For example, employment, which is a lagging indicator, can be evaluated by reviewing what types of firms cut their payrolls and by how much over time. During the 18 months that the Great Recession lasted, for example, an average of 30 percent of the firms reported cutting employment, with a high of 52 percent in March 2009. Similarly, price declines are associated with business downturns. During those 18 months, an average of 20 percent of firms reported cutting their prices, and in one month (December 2008), 42 percent reported price decreases.

Imitation as the Sincerest Form of Flattery

The success of the MBOS as an early indicator of trends in the manufacturing sector has spawned similar surveys across the Federal Reserve System over the years that have achieved usefulness for monitoring their respective regions (see Figure 8). A total of five manufacturing surveys are now being conducted. The second oldest survey, the Richmond Fed's Fifth District Survey of Manufacturing Activity, is in its 25th year. Although similar to the MBOS, the Fifth District Survey utilizes a composite index and has quantitative questions for prices paid and received. The New York, Kansas City, and Dallas Fed surveys are similar to the MBOS such that the diffusion indexes can be compared and combined. The newest arrival, the Texas Manufacturing Outlook Survey, is now in its 14th year. All of the surveys are conducted monthly and results are available before the end of the reference month. The New York Fed publishes their survey on the 15th of the month, while our MBOS is published on the third Thursday of each month. The Dallas Fed survey is published last, on the final Monday of each month.

In addition, since March 2013, the Chicago Fed has produced a Survey of Business Conditions (CFSBC), available eight times

FIGURE 7
Difference in Recession and Nonrecession Years

All 50 years index averages; May 1968–April 2018

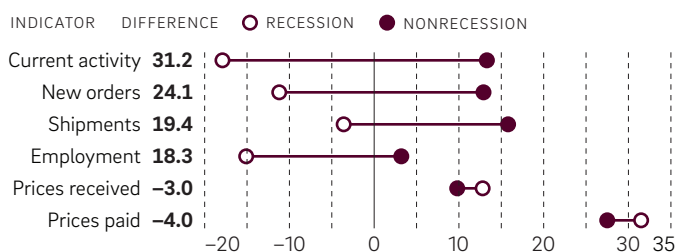
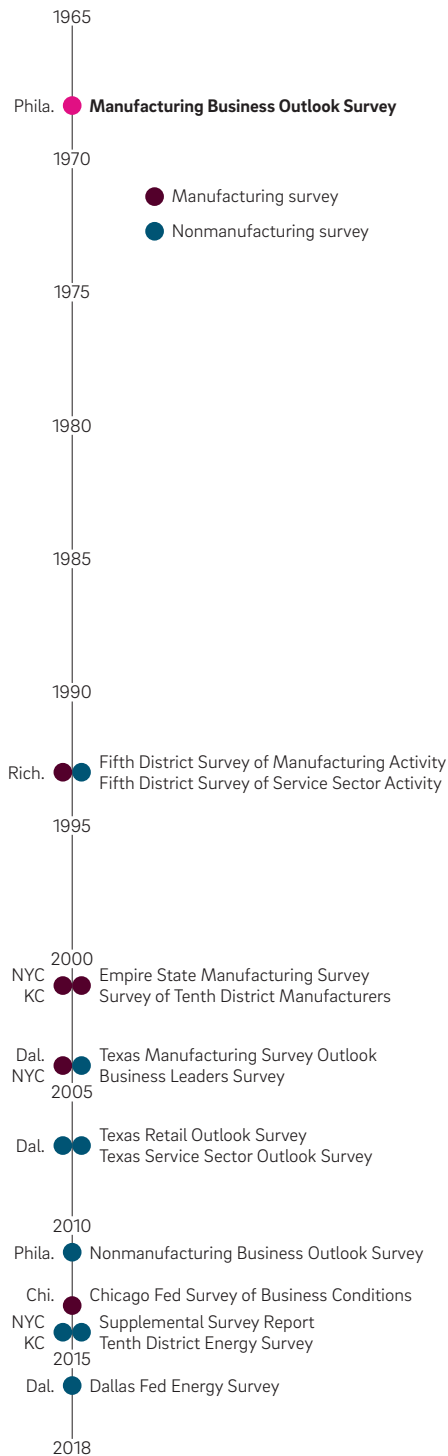


FIGURE 8
Timeline of Introductions



per year to coincide with the Fed’s policy calendar. The CFSBC, which covers a wide range of industries, includes a diffusion subindex for manufacturing. While it is designed to capture changes in manufacturing activity and is on the same scale as other Fed manufacturing survey indexes, including the MBOS, there are differences with respect to how the index is computed in an effort to correct for survey bias.⁸ Another distinction is that the Chicago survey asks for current business conditions within a 4- to 6-week time frame rather than monthly.

Since the share of total employment and output in the manufacturing sector has been in decline, qualitative surveys have also been introduced to cover the expanding share of the service sector.⁹ Our own South Jersey Business Survey has been conducted quarterly for 25 years and was one of the first to cover service companies, albeit for a narrow geographic area. A total of nine regional business surveys covering various nonmanufacturing sectors are now in place across the Federal Reserve System. The Philly Fed’s Nonmanufacturing Business Outlook Survey was first published in March 2011 and uses nearly the same methodology as the MBOS but with slightly different questions tailored to the service sector. Recently, other new surveys have been introduced that focus on specific sectors prominent within the Federal Reserve region (for example, energy surveys were introduced by the Kansas City and Dallas Feds).

The timing of the surveys in most cases supply useful information for each Reserve Bank’s Beige Book, which is a compilation of business conditions in each District, produced eight times a year and published near the dates of the meeting of the Federal Open Market Committee. Each Federal Reserve Bank gathers anecdotal information on current economic conditions in its District through reports from businesses and interviews with key business contacts, economists, market experts, and other sources (including surveys). Following the 50-year legacy of the MBOS, the expanding use of surveys across the Federal Reserve has led to more widespread availability of qualitative data that is timely, continuous, and consistently reported over time.

Uses of the MBOS in Current-Period Forecasting

The importance of the manufacturing sector in providing signals about the health of the economy is well established. The industrial sector, together with construction, account for the bulk of the variation in national output over the course of the business cycle. The cyclical variability of the manufacturing sector has prompted efforts to develop measures to record movements in manufacturing that would give frequent and timely indicators of change in overall economic activity. Discussed in this section are three of these important manufacturing measures and how they tie into current-period forecasts of sector activity.

Industrial Production Index for Manufacturing (IPM) and the MBOS

The most comprehensive data effort for the manufacturing sector is the Federal Reserve’s Industrial Production Index for Manufacturing (IPM), which is constructed to reflect the physical volume of production for the manufacturing sector as a whole.¹⁰ One shortcoming of the IPM is that the estimates are only for the U.S. in the aggregate, and, additionally, the data are not available until around the 15th of the month following the month of reference (see Figure 2). Although there are no quantitative regional data on manufacturing output, the MBOS and other regional qualitative surveys provide measures of local trends and have been found to be useful in producing current-period forecasts of U.S. industrial output (Trebing 2003, Kerr et al. 2014, Dietz and Steindel 2005). These studies have shown that the various regional indexes have statistical significance in forecasting monthly changes in the IPM beyond what is included with other available information. Since the various surveys are all produced before the end of the reference month, it is possible to include an average of all the surveys into a single variable and produce forecasts of the IPM on a monthly basis.

FIGURE 9

Historical Relationship Between MBOS Indexes and ISM Subcomponents of the PMI

Correlation coefficients for both levels and one-month changes.

■ MBOS ■ ISM



Note: MBOS ranges from -100 to 100, while PMI range is 0 to 100. Therefore, the charts in Figs. 4 & 9 are constructed with dual y-axes to align the graphs for comparison.

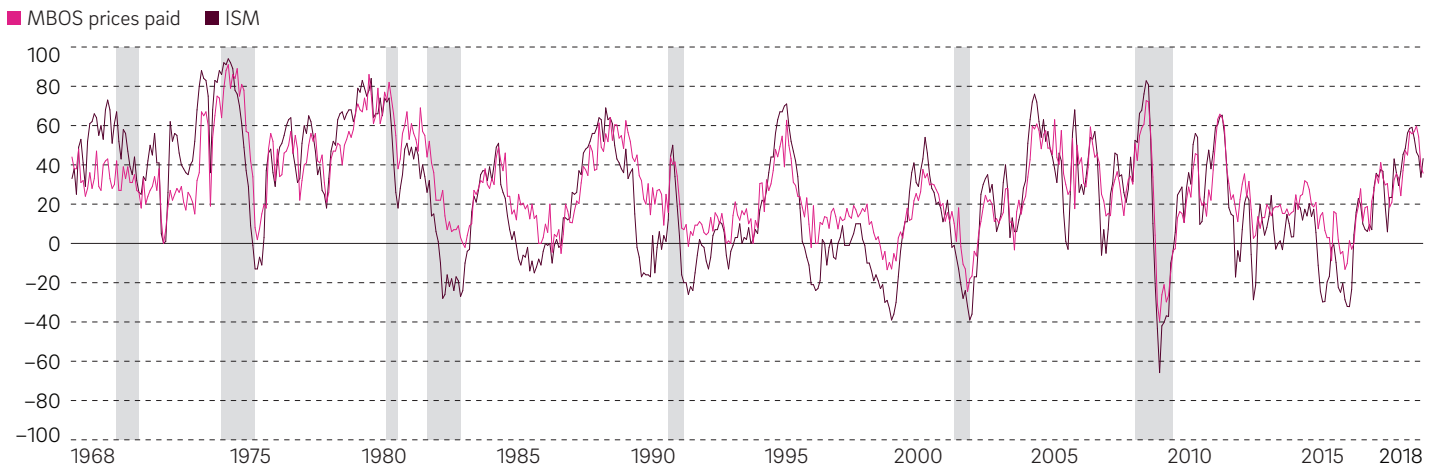
Purchasing Managers' Index (PMI) and the MBOS

Forecasting national manufacturing production is also possible using one of the most widely followed measures of manufacturing activity compiled by the Institute for Supply Management (ISM).¹¹ Its Purchasing Managers' Index (PMI) is published on the first business day following the reference month and is also based on a qualitative survey, like the MBOS. In its current form, the PMI is a composite index that comprises five equally weighted indexes: new orders, production, employment, delivery times, and inventories. The PMI has a reputation for being a comprehensive measure of trends in the U.S. manufacturing sector but also for the U.S. economy generally. For example, Koenig (2002) and Lahiri (2013) have demonstrated the use of the PMI for forecasting U.S. GDP growth. The PMI, along with the regional Fed manufacturing survey indexes, have been incorporated into current-period forecast models of

FIGURE 10

ISM-Man Price Index and MBOS Prices Paid

Same diffusion index scale; 1968–2018



the U.S. economy. Notably, both the New York Fed and Atlanta Fed currently produce nowcasts for quarterly GDP using the most available data as inputs, including the PMI and regional survey data (see Higgins 2014, and Bok et al. 2017).

There is a remarkably high correlation between the subcomponents of the PMI and counterpart statistics of the MBOS over a common 50-year period (see Figure 9). These charts display the counterpart indicators for the MBOS with the PMI (note that a substitution was made so that the MBOS shipments index corresponds to the PMI production index since the PMI does not have a shipments question). The correlations between the MBOS and the PMI in levels range from a high of 0.81 for employment to a low of 0.56 for delivery times. Given that the MBOS is available ahead of the two big measures of U.S. manufacturing activity, it is used to produce current-period forecasts of both the PMI and the IPM.¹²

Manufacturing Employment and the MBOS

Data on employment in the manufacturing sector from the BLS is one of the few solid sources of information on the regional manufacturing sector. Current Employment Statistics (CES) from the BLS provide detailed industry estimates of manufacturing employment in the U.S. that are typically published in the first week following the reference month as part of the Employment Situation report, along with estimates of U.S. total nonfarm employment, hours, and earnings of workers on payrolls. State industry data from the CES are available in the month following the reference month, while metro area industry data are released about two months after the reference month. The MBOS's employment diffusion index has been shown to be useful in evaluating short-term changes in the labor market for manufacturing workers in both the region and the nation. The availability of CES manufacturing employment data, along with survey data on employment, provide additional useful information in forecasting monthly IPM because the data are available for the reference month about one week before the publication of the IPM.¹³

Current-Period Forecasting of Inflation Using Manufacturing Survey Data

Questions about firm pricing are a novel feature of the MBOS and other Fed manufacturing surveys. Price indexes like the CPI, GDP deflator, PCE, and PPI are watched by analysts and policymakers for signs of inflation.¹⁴ Recent research has suggested that business survey measures of price change are potentially useful not only for monitoring short-run changes in price pressures in the manufacturing sector, but also for current-period forecasts of inflation measures.

The ISM's prices paid index is a closely followed indicator of price pressures in the manufacturing sector. The price indexes for the MBOS and ISM are highly correlated. As Figure 10 shows, the indicators (when placed on a common scale) have tracked each other very closely (correlation coefficient of 0.85 in levels and 0.41 in monthly change) over the common 50 years. This is remarkable even though the respondents are different inasmuch as ISM respondents are primarily purchasing managers from a sample of companies across the U.S., while the MBOS respondents are primarily CEOs or top managers from a much smaller region. The advantage of the MBOS, however, is its availability in the middle of the month in question, while the ISM price index is available at the beginning of the next month, covering the prior month.

Several recent papers have demonstrated the usefulness of various business survey price measures in forecasting inflation. For example, Bognanni and Young (2018) find that the ISM's price index has had value in predicting the producer price index (PPI). Armen and Koenig (2017) demonstrated the usefulness of the Federal Reserve's manufacturing survey price indexes when considered together in predicting PCE inflation. Because results for the Federal Reserve Bank manufacturing surveys are available early, the authors found not only evidence of value in forecasting monthly PCE but also in forecasting subsequent revisions of the PCE index.

Surveying Inflation Expectations Using the MBOS

In 2015, the Philadelphia Fed began asking quantitative special questions once a quarter about firms' price and wage expectations. While there are a number of well-known surveys of consumer expectations, surveys of firms about their inflation expectations are few.¹⁵ The Philadelphia Fed has long been associated with two prominent surveys that measure inflation expectations: the Survey of Professional Forecasters (SPF) and the Livingston Survey. They are the longest running continuous surveys of macroeconomic forecasts in the U.S. The Livingston Survey is the oldest uninterrupted survey of economists' expectations, commencing in 1946 as a biannual survey, while the SPF began as a quarterly survey in 1968. Coincidentally, the SPF is also celebrating its 50-year anniversary this year.

The Philadelphia Inflation Expectations Survey (PIES) special questions commenced in the fourth quarter of 2015 as a new section of the MBOS form. For this new quantitative expectations section, a set of five questions was added (see Figure 11). The questions were designed to pair with SPF expectations data collected

quarterly as well as to match in term of months when the information is collected, that is, in the middle of each quarter (February, May, August, and November). Two questions ask about the firms' own business forecast—one question about the expected change in their own manufactured goods prices and the second question asking for a forecast of compensation per employee (wage and benefit cost). The inflation questions follow: one question asks about firms' expectations for U.S. consumer prices, and another is about expected prices of regional consumer goods. This latter question is intended to measure any perceived differences between a concept of regional and national inflation. The final question asks for a 10-year average inflation rate forecast for U.S. consumer prices.

The Philadelphia Fed's PIES data collection project has now been in progress for 13 quarters and has generated interesting data on inflation expectations of firms. For example, among the firms surveyed, one-year national inflation expectations and own price change forecasts have tended to parallel each other, and only in more recent quarters have average forecasts for own prices exceeded their

overall average inflation expectations (see Figure 12). Presumably, firms' inflation expectations play a role when making decisions about pricing of their own products. Expectations about inflation are also monitored by central banks and are often mentioned in their policy deliberations. Surveying executives of firms fills an important gap in research on inflation expectations behavior and, when combined with other information from the same firms about business conditions, it sheds light on the relationship between expectations, pricing, and also wages.

FIGURE 11

Quarterly PIES Questions

For the next year (2018:Q3 to 2019:Q3), please list your expected annual percent change with respect

1. **For your firm:**
 Only numbers may be entered in these fields.

Prices your firm will receive (for its own goods and services sold)

Compensation your firm will pay per employee (for wages and benefits)

2. **For your employees:**
 Only numbers may be entered in these fields.

Prices your employees will pay (for goods and services where they live)

3. **For U.S. consumers:**
 Only numbers may be entered in these fields.

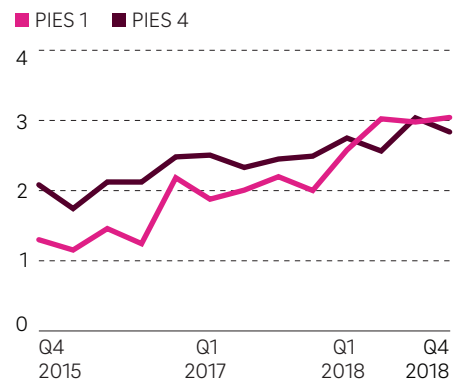
Prices U.S. consumers will pay (for goods and services)

For the next 10 years (2018 through 2027), what is your expected annual average percent change with following (for example, if you think prices will increase 10 percent every year for the next 10 years, the

FIGURE 12

MBOS Supplemental Questions

Quarterly; 2015Q4–2018Q4




Summary

The 50th anniversary of the MBOS is an opportune time to reflect on its long history and its success as an early indicator of regional business activity and an early signal of U.S. business cycle fluctuations. It is because of the interrelationships between manufacturing firms in the Third District and across the nation that trends regionally track closely to those nationally. Further, it is a result of the timeliness of the survey data—published on the third Thursday of every month to predict activity for that same month—that these qualitative indicators can be used for current-period forecasts of various measures of regional and national economic activity.

Thanks to the continuity and stability of the questions asked of high-level executives, the MBOS's lengthy time series can be used to test its predictive value across numerous economic indicators—providing a field day for macro-econometricians. Notably, the MBOS is highly associated with the ISM's Purchasing Managers' Index, which is widely regarded as the premier early measure of U.S. manufacturing trends. It makes sense then that financial analysts and the press pay close attention to the monthly MBOS diffusion indexes, as they provide an early read of trends later supported by the PMI, early in the following month. Quantitative data on various economic indicators, arriving much later, allow for the predictive power of the MBOS to be reaffirmed.

It is indeed the foundation upon which the MBOS is structured, relying on top management at firms across the Third District, that makes the survey results so beneficial in understanding trends in the manufacturing sector. Not only is detailed information

provided on the direction of change in new orders, shipments, and employment, among other indicators, the survey data also include the direction of change for prices for inputs and final prices as reported by many of the very firms that set them. No doubt, it is the success of the MBOS, in terms of its early predictive value of trends locally and nationally, that has led to its replication widely across the Federal Reserve System.

Survey innovations have included recent efforts to measure and monitor changes in inflation expectations of business firms, providing further insights into the theory and practice of firm-level pricing relationships and firm predictions of aggregate price variations across the economy. While it has proven advantageous for the MBOS to maintain its consistency over time, the new special questions initiative also keeps the MBOS dynamic and responsive to changing economic conditions and circumstances facing the Third District and the nation. The consistent feed of new data on the manufacturing sector via the diffusion indexes, new information on expected prices both at the firm level and nationwide, and feedback from business leaders on timely economic issues are all important inputs into Federal Reserve reports on regional business activity. At this notable historic moment for the MBOS, we can say with certainty that the MBOS and the other Fed surveys that have followed in its path have greatly advanced efforts to provide more timely and better-quality data in support of Federal Reserve policymaking. 

Notes

1 For a short period of time, the Cleveland Fed constructed a similar survey for the western portion of Pennsylvania.

2 The current sample comprises 140 manufacturing firms and is broadly representative, encompassing all NAICS and 2-digit SIC industries in the Third District. For analysis purposes, we divide the reporting firms into similar categories that are used for the Industrial Production Index: final business equipment producers (18%), final consumer goods producers (26%), materials producers (20%), equipment parts and components producers (18%), intermediate goods producers (11%), and the remaining firms unclassified (7%).

3 Also, manufacturing value-added data based on the Census Bureau's Census of Manufactures are available only every five years, and data from the Annual Survey of Manufactures are only available with a one-year lag.

4 Nationally, the manufacturing sector has dropped as a share of total nominal GDP from 25 percent in 1968 to about 11 percent in 2017 (Bureau of Economic Analysis). Nevertheless, prices of manufactured goods have risen at a slower rate than those for U.S. goods overall, so shares of real (price-adjusted) manufacturing output have declined only slightly over the last 50 years (currently amounting to about 12 percent of GDP).

Manufacturing employment, however, has declined from 25 percent of total employment in 1968 to below 9 percent currently (Bureau of Labor Statistics).

5 The number of U.S. manufacturing plants with 1,000 or more employees dropped from 2,061 in 1977 to 1,014 in 2007 (51 percent decline), while manufacturing employment across all plant sizes dropped 28 percent over this period. For more on this topic, see Holmes, 2011.

6 Data on individual responders is for internal use only, but the general information filters into Fed policy discussions. Firm-level data can provide interesting insights, for example, into leads and lags between intermediate and final producers, suggesting price pass-through relationships. This type of data can facilitate the testing and validation of correlations, for instance, between prices paid for inputs and final prices of manufactured goods.

7 The choice of a reading of zero as the predictive threshold is based upon both the definition of the diffusion index and empirical findings. Regression analysis allows us to calculate a break-even point, that is, a value for the diffusion index that is consistent with no change in the official statistic. It is equivalent to the negative of the ratio of the estimated intercept and slope coefficients. The break-even point between the

Industrial Production Index and the current general activity index is close to zero, as would be suggested by the analytic model described in the Diffusion Indexes box.

8 The Chicago Fed's diffusion indexes are computed as the difference between the number of respondents with responses above their respective average responses and those with responses below their respective average responses divided by the number of respondents. The value is then multiplied by 100 so that its range is -100 to +100. By definition, respondents without a history of responding are not included in this calculation.

9 In 1998, the ISM began publishing a nonmanufacturing survey, the Non-Manufacturing ISM Report on Business.

10 The Industrial Production Index for manufacturing (IPM) is a separate index from the total Industrial Production Index, which also includes the output of mining and utilities. Manufacturing represents 75.4 percent of total industrial production. (<https://www.federalreserve.gov/releases/G17/SandDesc/table1.02.htm>)

11 Prior to 2002, the Institute for Supply Management was called the National Association of Purchasing Management.

12 The Dallas Fed has reported that the MBOS is the best predictor of the PMI using their model for the time period studied (Kerr et al. 2014). Nevertheless, using information from all of the Fed manufacturing surveys to predict the PMI generally outperforms individual survey measures (see Trebing, "Notes on the Value of the MBOS in Current-Period Forecasting," forthcoming).

13 The first estimate of this manufacturing production data by the Federal Reserve is based on only about 75 percent of available production data, and the remaining portion relies on model estimates using the most recent data on employment and work hours.

14 While all of these measures of inflation are considered useful, the Federal Reserve's favored price index is the PCE, the Implicit Price Deflator for Personal Consumption Expenditures constructed by the Department of Commerce, Bureau of Economic Analysis. (https://www.federalreserve.gov/faqs/economy_14419.htm)

15 In the U.S., the Federal Reserve Bank of Atlanta has been surveying business firms since 2011, but that survey focuses on firms' unit costs rather than a measure of inflation per se. The two most prominent surveys of consumer inflation are the Michigan Survey and the Federal Reserve Bank of New York's Survey of Consumer Expectations.

16 There are cases when the diffusion index might have the same value and yet represent two very different sets of responses by firms. For instance, if 50 percent of respondents had positive responses and the same percentage had negative responses, the outcome would be an index value of zero; this would have the same index value as if 5 percent gave positive and negative readings and 90 percent reported no change. To address this possible scenario, the Philadelphia Fed publishes information on the distribution of responses as well as index values.

17 The academic literature commonly refers to current-period forecasting as nowcasting. For more on these methods by specific economic indicator, see Schreyer and Emery (1996) for production; Higgins (2014) and Giannone et al. (2008) for GDP; and Lahiri (2013) for GDP and the PMI.

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