

IOWA STATE UNIVERSITY

Development of a Purchasing Managers' Index for Biobased Products

CIRAS Pilot Project Report

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Project Overview

This project explores the feasibility of developing a composite economic indicator to evaluate the expected performance of the biobased product sector. Biobased products are defined as those composed either in whole or in significant part of renewable agricultural or forestry materials, and they include commercial and industrial products as well as intermediate ingredients or feedstocks.¹

The diversity of industries, products, and firms comprising the biobased products sector makes it difficult to characterize overall sector performance trends. Currently available sources of secondary economic data do not allow isolating and measuring the numbers of biobased products firms, their employment levels, and their output levels over time. These data gaps complicate the development of policies to effectively promote growth in the biobased sector.

The federal government has strong motives for monitoring and encouraging the growth of biobased products industries. To the extent that they displace their fossil-fuel-based counterparts, biobased products will help reduce greenhouse gas emissions. Should these industries take hold and expand, they may boost rural development by providing new business opportunities in rural areas as well as helping to stimulate demand for agricultural commodities, which in turn bolsters prices.

One tool employed by the federal government to promote biobased product development is a preferential procurement system for biobased products. The U.S. Department of Agriculture (USDA) BioPreferred program promotes new uses for agricultural commodities by encouraging their use throughout the federal government.² In developing its BioPreferred program, the USDA has completed and sponsored research that has helped to better define and identify biobased products and biobased products firms.

USDA-sponsored research has provided a foundation for more detailed analysis of potential barriers to growth in biobased products industries. Still to be answered are questions regarding how feedstock availability and prices, volatility and uncertainty of demand, and other factors affect these firms' prospects. Are such challenges unique to bio-based products firms, or are they typical of other manufacturing firms? These and other questions provided the motivation for this study.

This study first discusses various types of composite indicators and their appropriateness for describing trends in the overall biobased products sector. Next, the feasibility of using purchasing managers' expectations to discern various characteristics of sector performance is tested. Finally, several methodological and administrative issues involved in moving from a pilot study to a full-scale biobased products purchasing managers' survey are considered.

¹ Although definitions vary, bio-based products were defined for federal government purposes in the 2002 Farm Bill and amended in the 2008 Farm Bill.

² With the emphasis on new uses, federal government definition of biobased excludes many products that would otherwise, considering their content, technically qualify as biobased. For example, food and feed are excluded from the definition of biobased products. The USDA's BioPreferred program also excludes "mature market" products that achieved market saturation before 1972. Examples of mature market products include cotton shirts and towels, paper napkins and plates, and wood windows and furniture.

Part 1. Economic Indicators

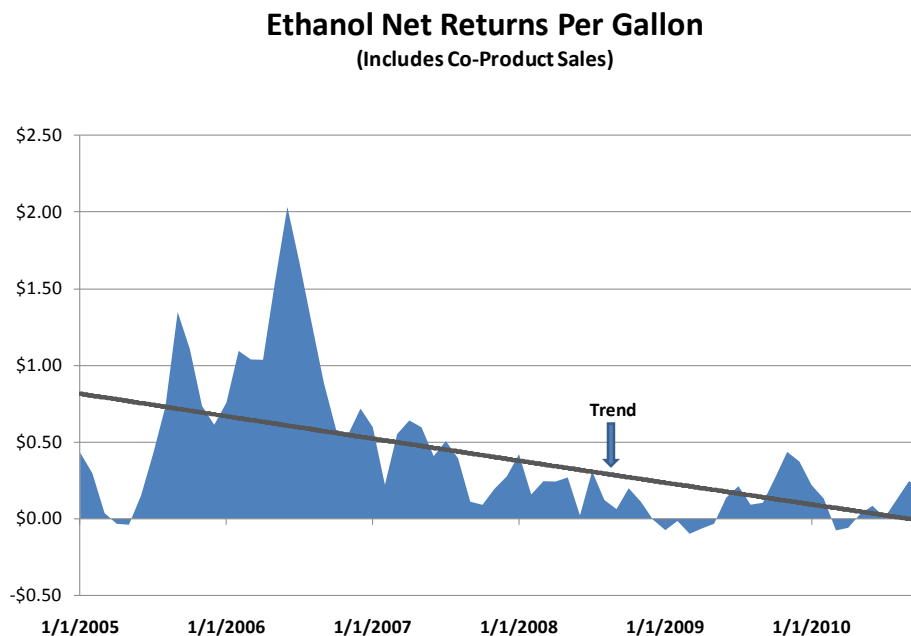
When analyzing the economy broadly, or specific industrial or commodity groups in particular, it is often useful for decision making and policy development to compile indicators describing changes over time against a standardized foundation. For example, monetary values are standardized over time in terms of purchasing power. Stock market indexes, which combine weighted values for the stock prices of individual companies, represent another class of standardized indicator. Particularly useful for industrial analysis are measures that distill several, multi-dimensional indicators into a single, aggregate measure.

Aggregate indicators can be narrowly or widely configured, and they can be applied to single industries or whole classes of industrial activities. They range in complexity from simple profitability measures to more complex composite indicators and diffusion measures.

Profitability Measures

Figure 1 displays the modeled net returns per gallon of production for a state-of-the-art 100 million gallon per year ethanol plant considering a detailed array of capital, fixed, and variable costs over time. It clearly demonstrates on a per-gallon of production basis both profitability cycles as well as the long term trend in profitability. Such a measure might have a wide audience including the ethanol industry in specific, policy planners owing to the public subsidy required of biofuels, and potential investors or other groups interested in discerning the overall well being of the industry and its patterns of performance.

Figure 1



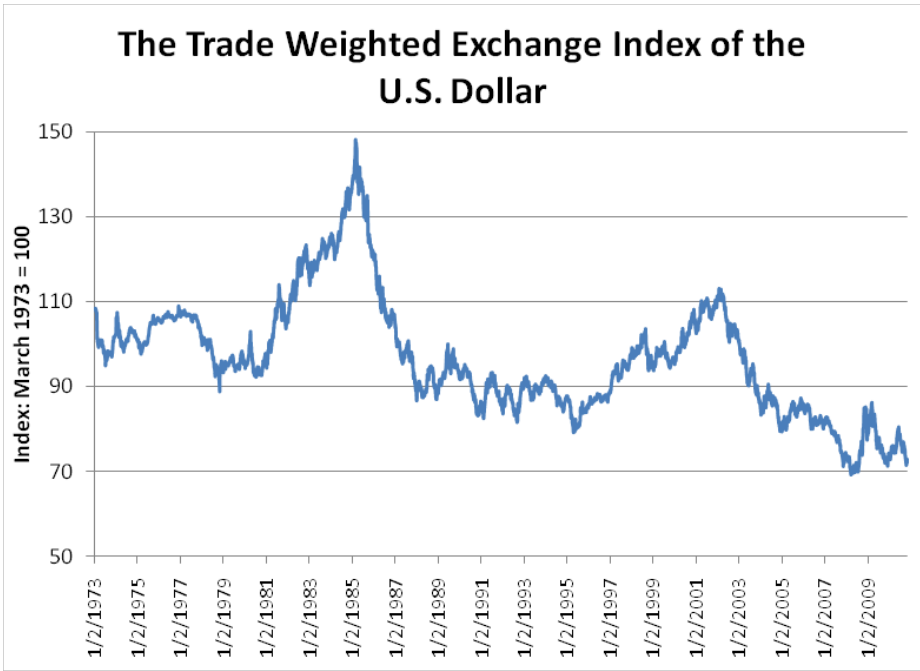
Single sector or limited variable indicators like the preceding example are useful for specific types of industrial production planning or investment, but they have limited applicability to the overall performance of the biobased products sector.

Composite Indicators

Composite indicators often combine several measures whose movements over time reflect either the standing of that class of indicator or that broader segment of the economy. Often, a composite indicator is constructed using a theoretical framework or foundation that informs the selection and weighting of the component indicators. Aggregate indicators can be devised using governmental data or through the use of survey information.

Figure 2 is an example of a composite indicator that applies to the U.S. dollar. While the overall rate of inflation determines our capacity to purchase goods and services relative to our incomes, we also exchange goods and services with other countries' economies. Figure 2 displays the weighted value of the U.S. Dollar in exchange with a bundle of commonly traded currencies, as estimated by the Federal Reserve Board. The index is useful for determining the potential for U.S. producers to sell to the rest of the world and the willingness of the rest of the world to invest in U.S. production capacity. When the comparative value of the dollar is low, other countries' currencies can buy more units of U.S. goods and services. When the value rises, U.S. goods become more expensive and they buy fewer of them. Accordingly, this index can be useful for understanding productivity in the U.S. that is geared towards export sales, like manufactured goods and agricultural commodities.

Figure 2



The value of the dollar in trade is a composite indicator that pegs U.S. purchasing power relative to many other currencies. Another common composite indicator is the Consumer Price Index (CPI), which is compiled by the U.S. Bureau of Labor Statistics. It is based on a monthly survey of a “basket of goods and services” that would be consumed by a typical household. Changes from month to month reflect overall changes in the prices paid given some base period. Prices in October, 2010, were 27 percent higher than they were in October, 2000, for example. A similar index is compiled for producer prices, and it is composed of the many separate components of producer prices.

With regard to biobased products, it is procedurally straightforward to compile a composite measure of the biofuels portion of biobased production owing to the relatively simple and short supply chain into that industry coupled with the vast amount of official information relative to that industry and its major supply components. It is not simple, however, to devise composite measures of non-energy related biobased products.

Following Miranowski, 2009, industry and academic analysts would have little trouble gathering long-term monthly information on, for example:³

- Ethanol prices (either net or gross of federal subsidies)
- Corn prices (as the most prominent input)
- Natural gas prices (as another critical production cost)
- Unleaded gasoline prices (ethanol is a substitute for gasoline)
- By-products (distillers’ grains – an important component of firm profitability)
- Capital-costs (return on investment)
- Total employment (as a measure of aggregate economic activity)

All of these variables could be standardized and weighted in so far as they correlated over time with, in this case, the gross margin of ethanol producers (ethanol price minus major inputs) to arrive at a moving indicator of the industry’s performance given multiple supply and demand factors.

Regarding non-energy biobased products manufacturing, however, such easily analyzable information does not exist. Instead, the industry has a wide range of products, both as intermediate and finally demanded goods, with equally wide ranges of prices. Biobased inputs are diverse and include forest, crop, animal, and value-added ag-related manufacturing byproducts as inputs. Products range in complexity from simple components and compounds, to those with intricate chemical compositions and involved production stages. While it is possible to devise a biofuels component, it is not practical to attempt to devise a composite indicator for the vast array of other biobased products. The industry is too diverse.

³ Miranowski, John. 2010. “Analysis of Economic Indicators” in *Biobased Economy Indicators: A Report to Congress (Draft)*. Prepared for Office of Energy Policy and New Uses. Pp 109-120.

Diffusion Measures

Survey data have also been used over the years to produce diffusion indices to gauge broad industrial performance relative to business cycles or other variations in the national economy. Diffusion indicators describe how widely experienced a particular type of industrial behavior is during the normal patterns of expansion and contraction that underscore our growth and recessionary periods. Diffusion indexes provide a convenient way to summarize the direction and magnitude of expected change considering the behavior of all survey respondents.

One of the most commonly cited diffusion indicators is the monthly Purchasing Managers (PMI) Index by the Institute for Supply Management (ISM). The ISM produces both a manufacturing and non-manufacturing series based on monthly surveys that monitor conditions at individual firms.

Components of the manufacturing series include:

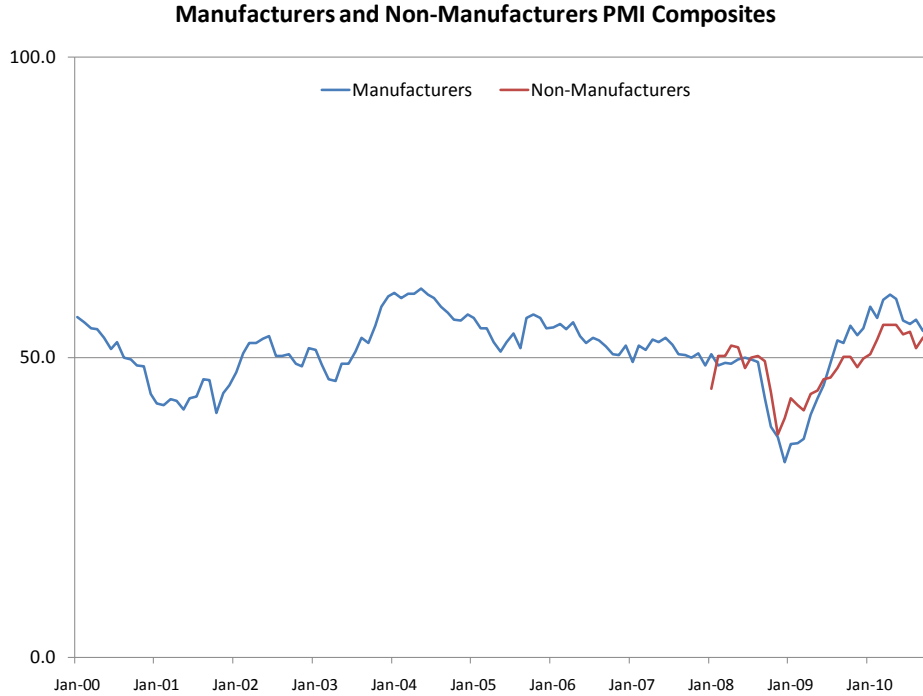
- New orders
- Production
- Employment
- Supply delivery lead times
- Inventories of raw materials

Survey respondents are asked to compare conditions in the current month to the previous month by indicating an increase, no change, or decline in each category. Responses that would be considered positive are: increases in new orders; rising production, sales, and employment levels; longer delivery lead times; and higher inventory levels.

For each category, a diffusion index is computed as sum of the percentage of respondents who reported improving conditions (multiplied times 1.0), the percentage that did not change (multiplied by 0.5), and the percentage that reported declines (whose values are scored zero, 0.0). The score of 50 is considered neutral, a score under 50 is considered a contraction, and a score of over 50 indicates expansion. Figure 3 displays the survey performance for the five components of the manufacturing PMI since 2000.

The overall PMI is computed by averaging the diffusion index scores for the component categories, all of which are adjusted for seasonal variations. Figure 3 shows the performance of the composite indicators for both manufacturing and non-manufacturing series. The non-manufacturing series begins in January 2008, the month after the most recent recession. Both measures track similarly, although the manufacturing series declined more sharply during the depth of the economic downturn as would be expected in goods producing industries. The manufacturing series also moved above 50 much sooner than for non-manufacturers. Non-manufacturers continued to post below-neutral scores through October, 2010, and appeared to be expanding at a slightly slower pace than manufacturers.

Figure 3

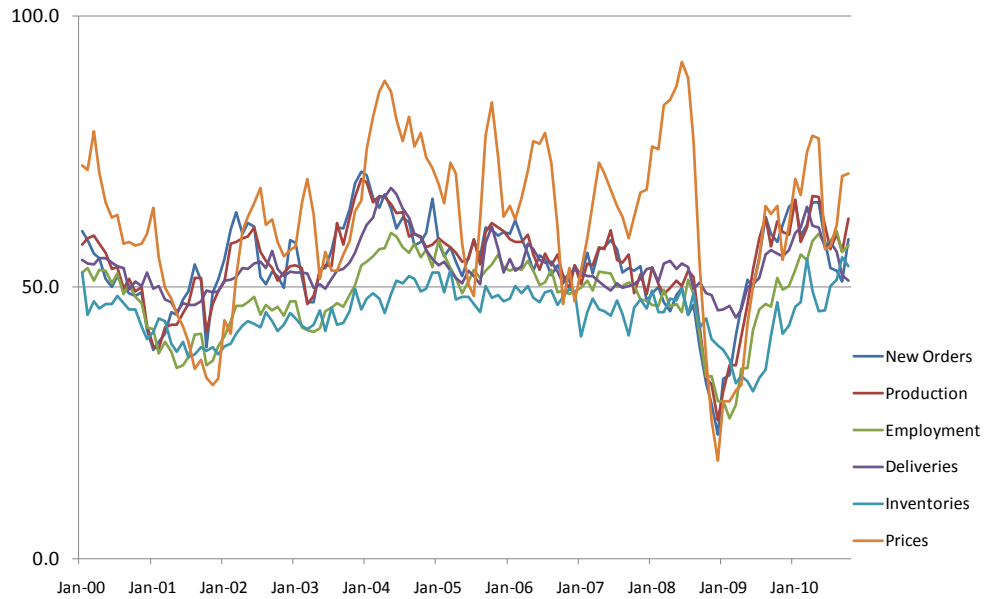


The influence of input price changes is notably absent from both the manufacturing and non-manufacturing PMI. Although ISM does produce a separate diffusion measure for input prices, that series is excluded from the calculation of the overall PMI because it does not meet ISM criteria for seasonal adjustments. In addition to input prices, other ISM-published series that fail to meet the criteria for seasonal adjustment include the backlog of orders, customers' inventories, imports, and new export orders.

It is evident in Figure 4 that prices are more volatile of than the core PMI components, which tend to follow basic business cycles. We see too that sharp reports of price declines coincide, as they should, with periods of national contraction as evidenced clearly during the most recent recession that lasted from December, 2007, through June, 2009.

Figure 4

PMI-Manufacturing Components



Due to the importance of the agricultural inputs in both the definition and profitability of the bio-based sector, the exclusion of prices from a diffusion index would be an important limitation to its value for understanding and describing changes in sector performance over time.

While PMI-type measures are often interpreted as leading indicators of business activity, they are in fact based on the recent past. Accordingly, these help to describe common production-related experiences, but they may be of limited value in gauging industrial outlook.

Part 2. Purchasing Managers' Survey

This demonstration project explored the feasibility of developing a diffusion measure to describe conditions in the biobased products sector. The project involved a six-month pilot survey of purchasing managers in firms that produce or distribute biobased products. The project design was modeled on the Institute for Supply Management monthly Purchasing Managers (PMI) Index for the national manufacturing sector and numerous smaller, regional purchasing managers' surveys. In particular, the researchers drew upon the expertise of Dr. Ernie Goss, who conducts the monthly Midwest Purchasing Managers' Survey at Creighton University.

The survey solicited information on a monthly basis from individuals who were believed to possess in-depth knowledge about conditions affecting their firm's operations. In smaller firms, these were often owners or chief executive officers. In larger firms, the survey participants were more likely to be general managers, sales and/or purchasing, and technical managers.

Survey participants were asked to report their levels of new orders, production levels, raw materials inventories, delivery lead times, and employment compared to the previous month. In addition to these five core questions, the surveys include supplemental questions on other topics of interest. The Creighton survey occasionally includes additional questions on special topics or questions to provide context for interpreting responses to the core questions.

As typical with similar surveys, the questions contributing to the overall index had three possible responses: "up, down, or no change." All firms reporting changes that are considered positive (usually "up") for business conditions were scored 100. Firms indicating no change were scored 50. Firms reporting "down" in a specific category were scored zero (or effectively eliminated from the calculation). The weighted responses for each question were then summed to derive a "diffusion index" value. Finally, an overall index was derived by averaging the index scores for the five components. In general, a diffusion index value above 50 percent indicates expansion and a value below 50 percent indicates contraction or decline. The distance from 50 indicates the relative strength of the expansion or decline, with higher values indicating strength.

This diffusion index developed for this project differed in three notable ways from the PMI produced by ISM. First, this survey asked respondents about their expectations for the upcoming month based on their experience in the month just ending, rather than comparing the current month to the previous month. Second, no seasonal adjustments were made to the diffusion index measures. Third, a diffusion measure for input prices was included in the computation of the overall index.

Methods

The six-month pilot survey for this project was coordinated and conducted by the Iowa State University Center for Survey Statistics & Methodology (CSSM). Their detailed methodology report is included in Appendix A. Highlights from the methodology report are summarized here.

Selection and Recruitment of Participant Firms

Research conducted previously at Iowa State University in support of the U.S. Department of Agriculture's BioPreferred program provided a foundation for this pilot study. Participants in the study were recruited from a pool of firms that had previously been identified in an earlier survey as biobased products firms. The firms were invited to participate in the six-month pilot survey project.

The initial pool of potential participants included nearly 900 domestic firms that had previously participated in bio-based products surveys conducted by Iowa State University. Each firm in this pool was classified on the basis of its business type, primary product type, employment size, and geographic location. The classifications were all determined using information that had been self-reported by the firm in the earlier survey.

Two business types were identified based on whether the firms had characterized themselves as primarily manufacturing firms, wholesale or retail firms, or some other type of firm. For this project, the wholesale, retail, and other firms were combined into a group called Distribution/Other.

Four product type groupings were determined using two pieces of information from the prior survey. The first item was the North American Industry Classification System (NAICS) code the firms had reported for their primary biobased product. The second item was their response to a question about whether they produce or distribute biobased fuels. Firms indicating yes to that question were categorized in a biofuels group regardless of their NAICS code. The remaining firms were assigned to one of three groups based on the NAICS code information: soaps and related products, all other chemicals, and other products.

Two firm size groupings were determined based on the reported employment size of the firms. Small firms included those with fewer than nine employees and large firms had 10 or more employees. Finally, three geographic regions were defined using the locations of firms by state. States were grouped into regions based on aggregations of U.S. Bureau of Economic Analysis regional definitions.

The categories and criteria used for classifying the firms are summarized in Table 1. Based on these classifications, the firms in the original pool were then assigned to one of 20 panel groups described in Table 2.

Table 1 Criteria Used for Classifying Firms

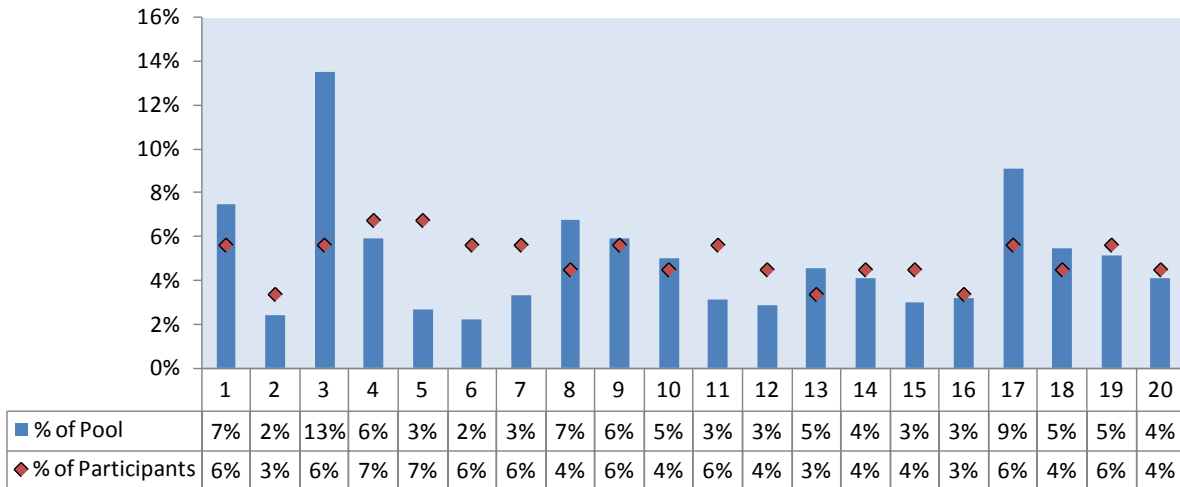
Category	Options	Criteria
Business Type	Manufacturer	Self-identified
	Distribution/Other	Self-identified
Product Type	Biofuels	Self-identified (NAICS 325193 and 325199, primarily)
	Soaps and Related	NAICS 325611 Soaps and Other Detergents, NAICS 325612 Polish and Other Sanitation Goods, NAICS 325620 Toilet Preparation Manufacturing
	Other Chemicals	NAICS 325
	Other Products	All Other NAICS
Firm Size	Small	Fewer than 10 employees
	Large	10 or more employees
Geographic Region	East	New England, Mideast and Southeastern states
	Midwest	Midwest and Great Plains states
	West	Rocky Mountain, Southwest , and Far West states

Table 2 Panel Group Definitions

Panel ID	Business Type	Product Type	Firm Size	Geographic Region
1	Manufacturing	Biofuels	All Sizes	Midwest
2		Biofuels	All Sizes	All Other Regions
3		Soaps, etc.	Small	All Regions
4		Soaps, etc.	Large	All Regions
5		Other Chemicals	Small	Midwest
6		Other Chemicals	Small	East
7		Other Chemicals	Small	West
8		Other Chemicals	Large	Midwest
9		Other Chemicals	Large	East
10		Other Chemicals	Large	West
11		All Other Products	Small	Midwest
12		All Other Products	Small	All Other Regions
13		All Other Products	Large	Midwest
14		All Other Products	Large	East
15		All Other Products	Large	West
16	Distribution/Other	Biofuels	All Sizes	All Regions
17		Other Chemicals	Small	All Regions
18		Other Chemicals	Large	All Regions
19		All Other Products	Small	All Regions
20		All Other Products	Large	All Regions

With a goal of obtaining equal representation, a subset of firms was selected for recruitment from each panel group. The stratification process was employed to prevent any one type of firm from dominating the results of the survey. The recruitment process began with a goal of obtaining 5 to 6 participants from each panel group; however, the final number of firms agreeing to participate ranged from 3 to 6 per group. Figure 5 compares the actual distribution of firms in the original sample pool and the number of survey participants by group. There is no reason to assume that the distribution of firms in the original sample pool represents their actual distribution in the U.S. economy as a whole. Consequently, no attempts were made to weight the survey responses to reflect the distribution of firms in the original pool. Because this was a non-random, non-representative sample of firms, it is important to note that the results of the survey cannot be generalized beyond the participants with statistical confidence.

Figure 5 Distribution of Firms in the Sampling Pool and Final Sample by Group



Survey Design and Administration

The survey instrument contained a series of questions designed to elicit information about the expectations of purchasing managers about conditions that would affect their firm during the next month. Six questions were asked of the manufacturing firms and five questions were asked of the distribution/other firms. Each question had three possible responses generally indicating an increase or improvement in the indicator, no change in the indicator, or deterioration or decline in the indicator. The topic areas and wording of the questions and possible responses are illustrated in Table 3.

Table 3 Questions and Possible Responses for Manufacturing Firms and Distribution/Other Firms

Subject	Manufacturers	Distributors/Others	Possible Responses
Production/Sales	How do you expect your overall production next month will compare to this month?	How do you expect your overall level of sales next month will compare to this month?	Higher/Same/Lower
New Orders	How do you expect the total volume of new orders from your customers next month will compare to this month?	<i>Not applicable</i>	Higher/Same/Lower
Inventories	How do you expect your raw materials inventory levels next month will compare to this month?	How do you expect your product inventory levels for next month will compare to this month?	Higher/Same/Lower
Prices	How do you expect the per-unit prices of the goods and services that you will buy next month will compare to this month?	How do you expect the per-unit prices of the goods and services that you will buy next month will compare to this month?	Higher/Same/Lower
Delivery Lead Times	How do you expect the lead time for your suppliers' deliveries next month will compare to this month?	How do you expect the lead time for your suppliers' deliveries next month will compare to this month?	Shorter/Same/Longer
Employment	How do you expect the overall level of employment in your firm next month will compare to this month?	How do you expect the overall level of employment in your firm next month will compare to this month?	Higher/Same/Lower

The same questions were asked each month for six months. The survey was administered by e-mail. Follow-up on non-responses was conducted by both e-mail and telephone.

Results

Participation Levels

A total of 394 surveys were completed over the six month period, ranging from 63 to 70 completed per month. Of the 89 companies that originally agreed to participate, 82 (92%) completed at least one of the six surveys. There were 44 companies (49%) that completed all six surveys and 13 (15%) completed five of the six. Seven of the 89 companies (8%) did not complete any surveys; one agreed but subsequently refused and the other six simply never responded. The monthly response rate ranged

from 71 to 79 percent of the total number of firms that originally agreed to participate. Appendix A provides more detail on the overall participation levels by month.

Firms in Group 13, which included large manufacturers of “all other” products in the Midwest, demonstrated the highest response rate with all three firms in the group completing a survey every month. Group 20, which included large distributors of “all other” products, had the lowest response rate among all the groups. Three of Group 20’s original four firms completed surveys in Months 1-3, but only 1 firm completed a survey in Months 4-6.

The distribution of total responses received during the six-month period is summarized below by broad category of firm.

- ▶ Small firms represented a slight majority of participants, with 52 percent of responses coming from firms with fewer than 10 employees.
- ▶ Firms in eastern states accounted for 36 percent of all responses. Midwestern firms accounted for 34 percent, and western firms accounted for the remaining 31 percent.
- ▶ Manufacturing firms accounted for 72 percent of all responses, and wholesale, retail, or other types of firms accounted for 28 percent.
- ▶ Firms producing or distributing chemical products including biofuels accounted for 69 percent of all responses received during the six-month pilot project.

Appendix B shows provides detailed information on the monthly number of responses by firm size, geography, business type, and product type.

Diffusion Index Values

A monthly diffusion index value was calculated for each question in each month. In the simplified calculations employed here, half of the “no change” responses were considered negative and half were considered positive. Any negative responses were ignored. The index values were calculated as percentages with the sum of the positive responses and half of the neutral responses divided by the total number of responses. The individual index values were averaged to obtain an overall index value for manufacturing firms and an overall index value for distribution/other firms. For this study, the individual components received equal weights in calculating the overall index values.

Figures 1 and 3 illustrate the diffusion index values for the six questions asked of manufacturing firms on a monthly basis. Figures 2 and 4 illustrate the monthly diffusion index values for the five questions asked of distribution firms. In each chart, a value of 50 would indicate that expectations for the next month were unchanged. An index value greater than 50 would indicate that most respondents expected an increase in that particular indicator next month compared to the current month. An index value below 50 would indicate that most respondents expected a decline in the indicator.

Figure 6 Diffusion Index Values for Manufacturing Firms: Production, New Orders, and Employment

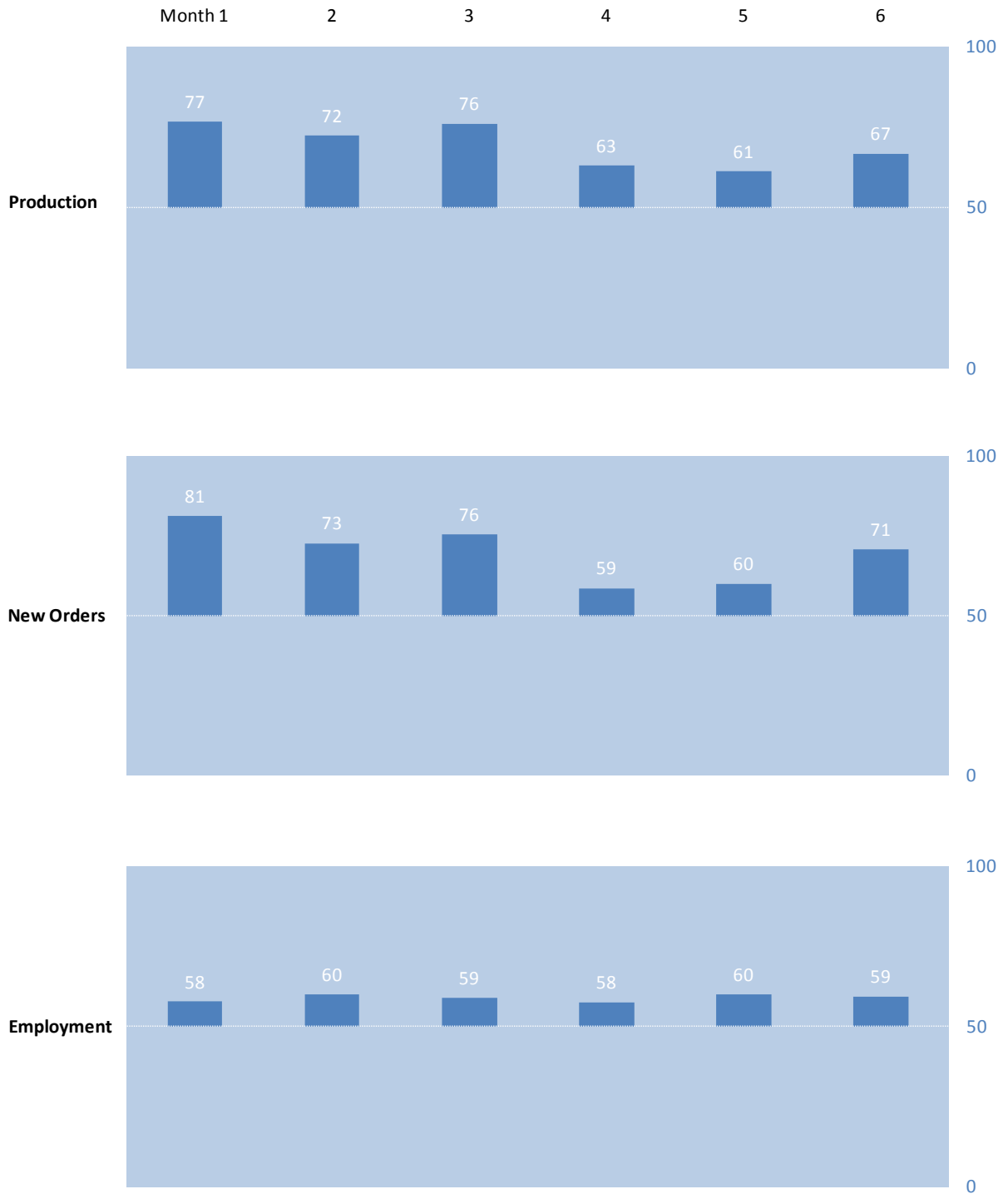


Figure 7 Diffusion Index Values for Distribution Firms: Sales and Employment

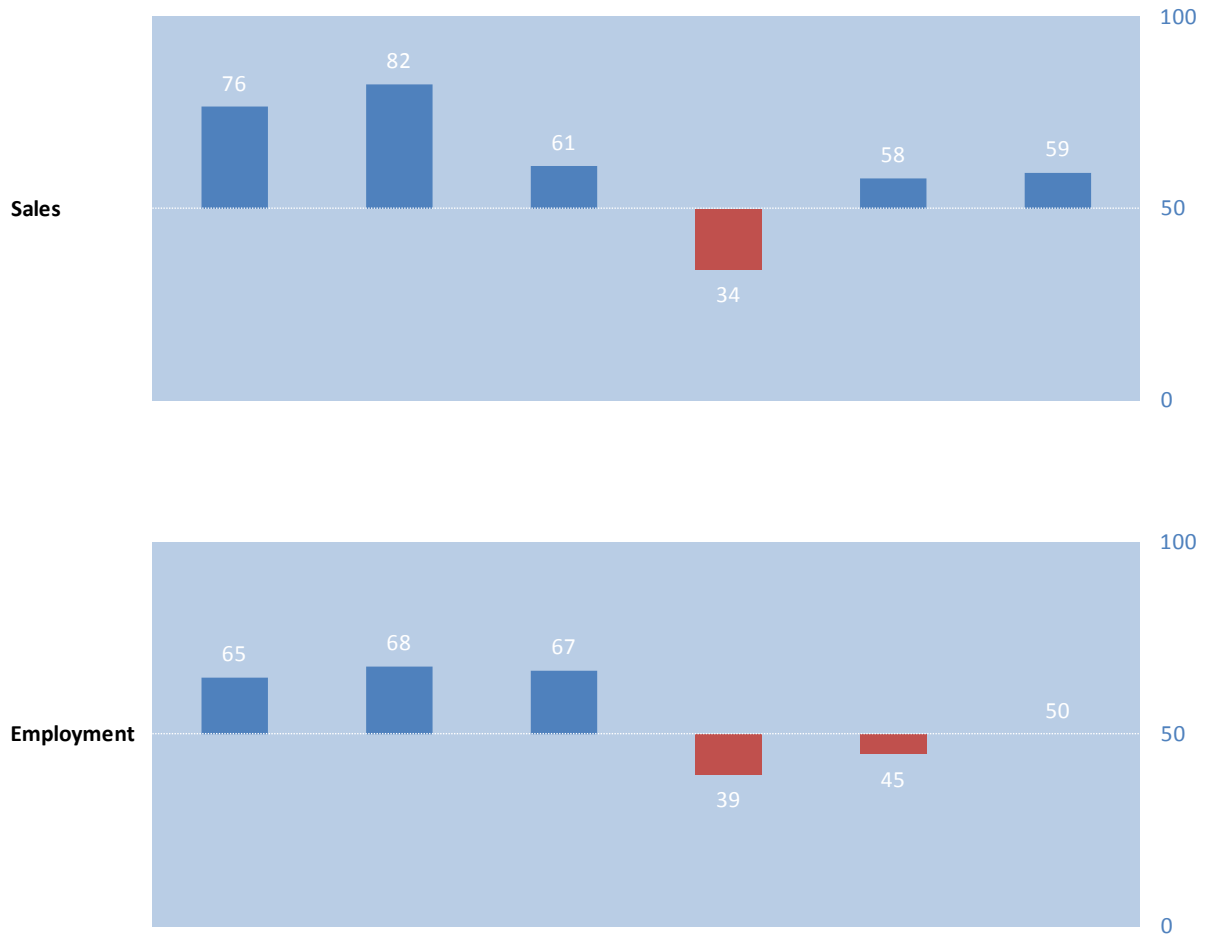


Figure 8 Diffusion Index Values for Manufacturing Firms: Inputs Inventories, Prices, and Delivery Lead Times

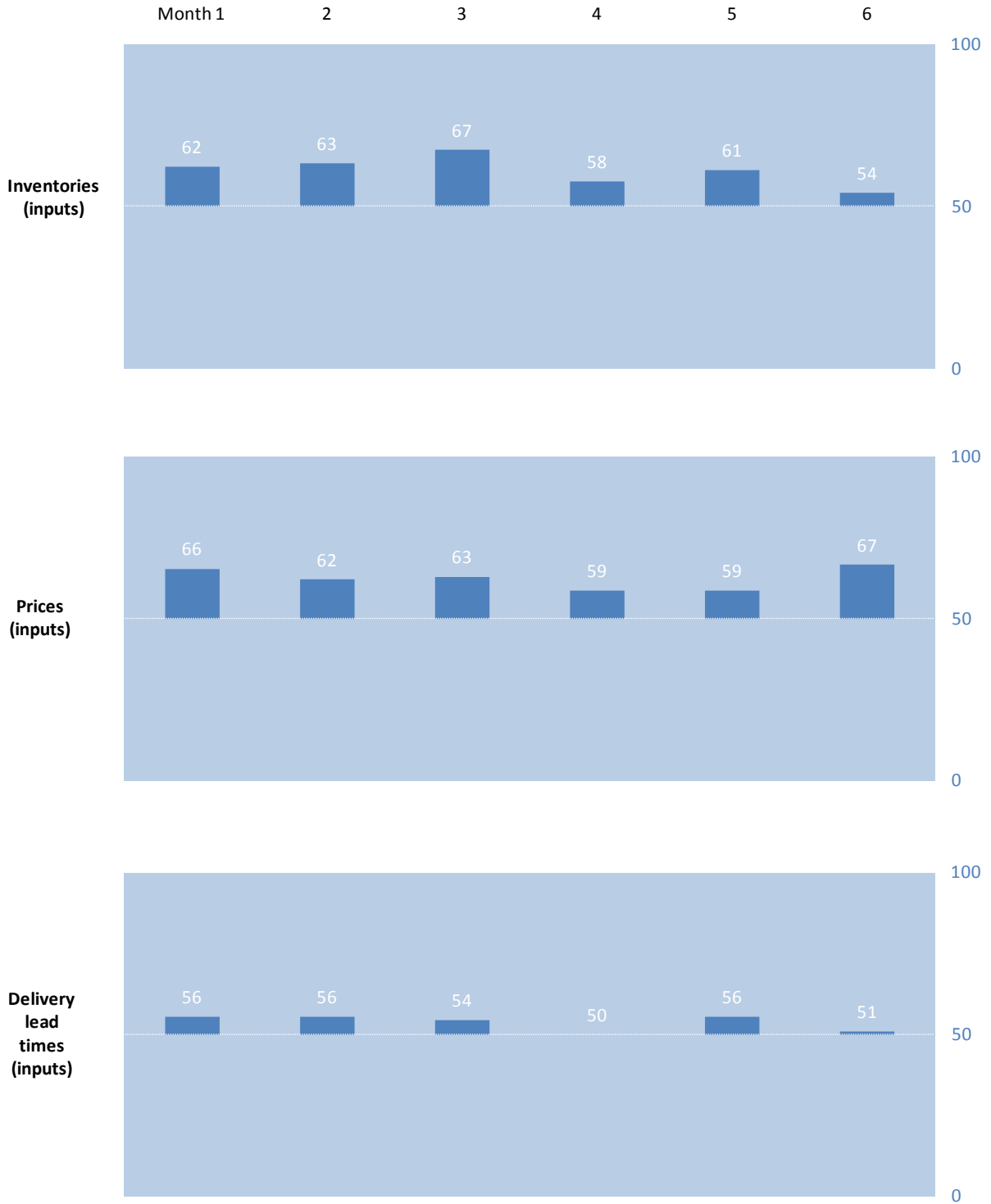


Figure 9 Diffusion Index Values for Distribution Firms: Purchased Inventories, Prices, and Delivery Lead Times

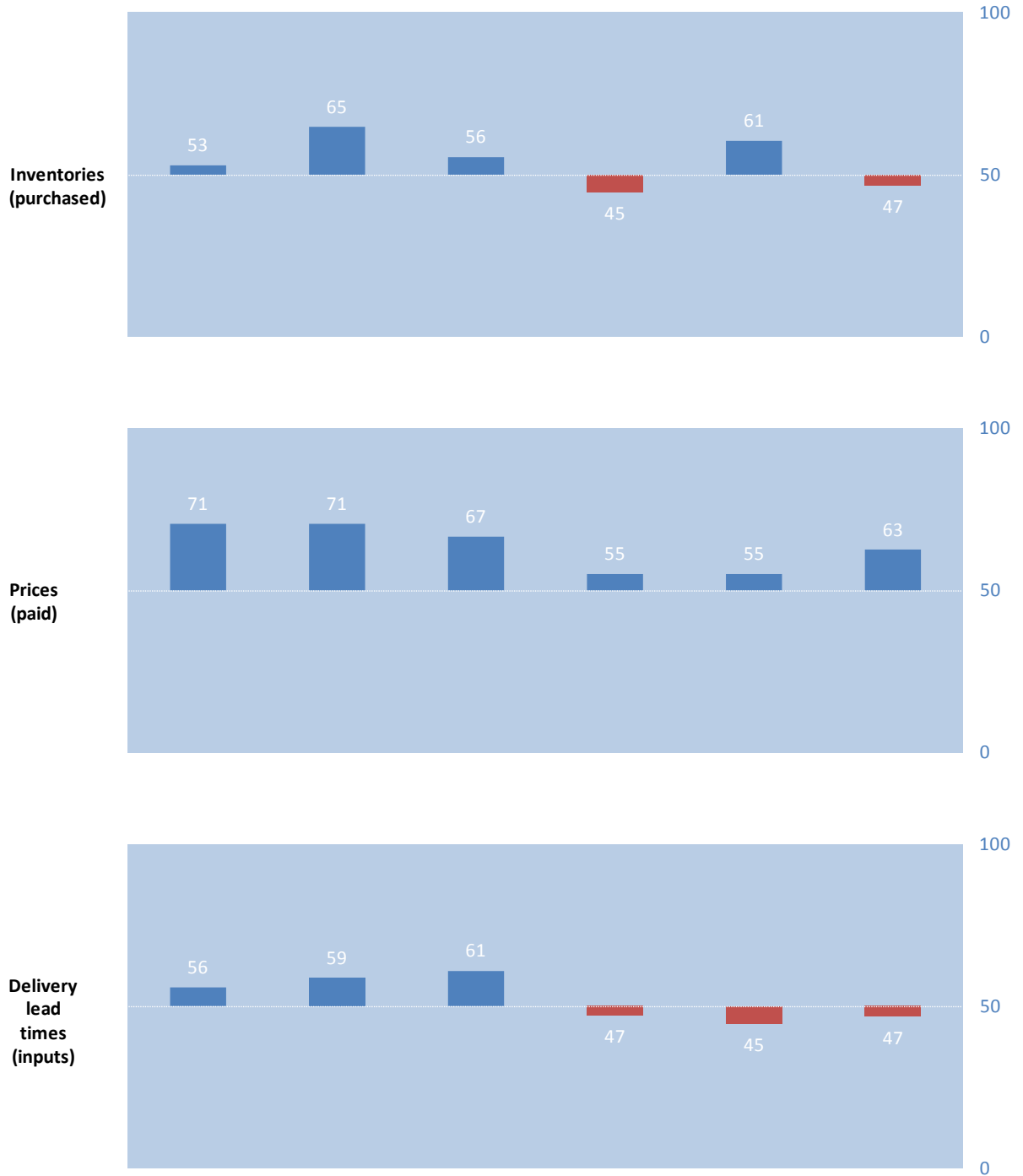


Figure 10 Diffusion Index Values for Manufacturing Firms: Overall Results

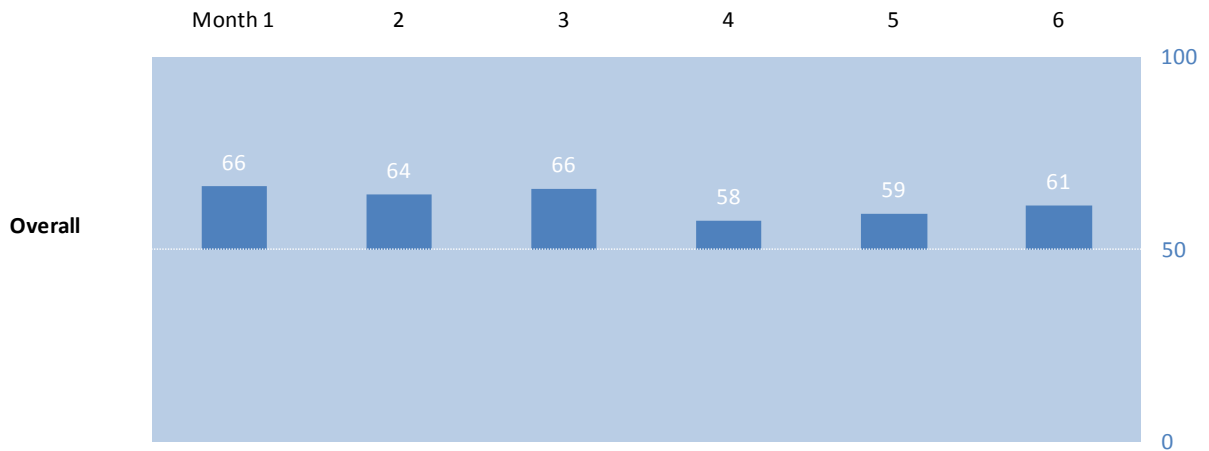
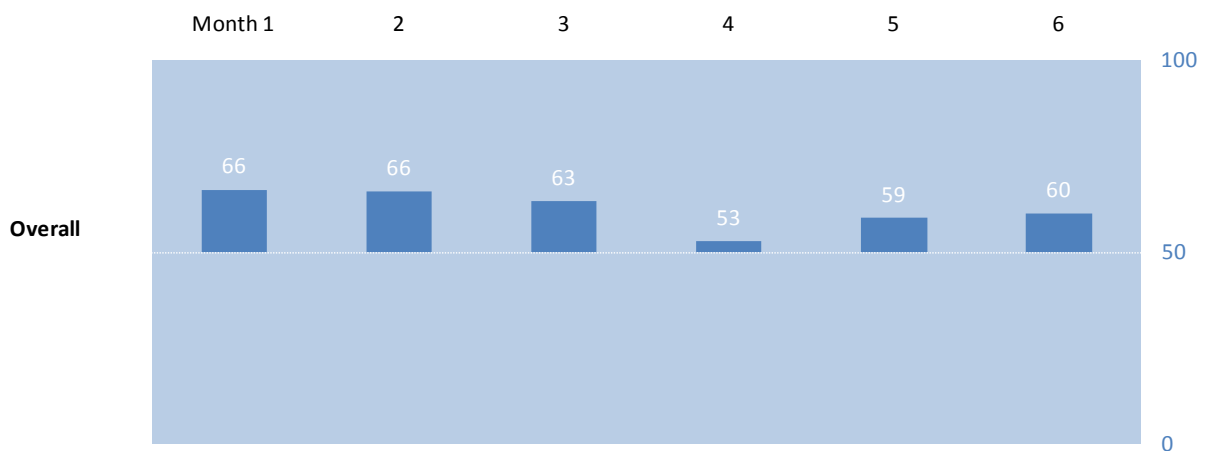


Figure 11 Diffusion Index Values for Distribution Firms: Overall Results



The questions relating to production and new orders elicited the most optimistic responses from the participating manufacturing firms. For manufacturing firms, the index values for the production question were highest (77) in Month 1 and lowest (61) in Month 5. The scores for the new orders question followed a similar pattern, with the highest value occurring in Month 1 (81) and the lowest in Month 4 (59).

Sales expectations for the wholesale/distribution firms were more variable. Purchasing managers in those firms were very optimistic in Month 2, when the index value reached 82. By Month 4, a preponderance of the respondents expected sales declines as indicated by a diffusion index value of 34.

The responses to the employment question suggested moderate but steady expectations for hiring growth among the manufacturing firms, as evidenced by index values ranging from 58 to 60 for the

entire six-month period. The wholesale/distribution firms had stronger hiring expectations in the first three months (index values of 65-68), but their outlook dimmed in the second three months when the index values dropped below 50, suggesting possible employment declines.

Three questions relating to manufacturers' input purchases elicited more positive than negative responses during the whole six-month period. More respondents expected to increase their raw materials inventories as opposed to decreasing them; more respondents expected the prices paid for raw materials to increase; and more respondents expected increases in their suppliers' delivery lead times. While the index values for inventories and prices ranged from 54 to 67, the delivery lead times index values did not exceed 56 in any month.

The distribution firms had somewhat different expectations regarding their upcoming purchases compared to the manufacturing firms. The index values for inventory levels suggest weak expectations for higher inventory levels in Months 1 and 3, stronger expectations for gains in Months 2 and 4, and inventory declines in Months 4 and 6. Index values for the prices of purchased goods and services suggest rather strong expectations for price increases in Months 1-3 (with index values above 65) and weaker expectations for price increases in Months 4-6. Index values below 50 for the delivery lead times index suggest that distributors expected the delivery lead times required for their purchases to decrease in Months 4-6 after increasing in Months 1-3.

When the individual component questions were combined, the overall results for manufacturing firms closely resembled the results for wholesale and other distribution firms. Expectations in both types of firms were highest in Month 1 and slightly lower in Month 2. Expectations improved slightly for the manufacturing firms in Month 3, but they declined slightly for the distribution firms. Expectations were lowest for both types of firms in Month 4 and improved slightly in Months 5 and 6, although not to the levels seen in the first month of the project period.

Participants' Comments

An open-ended "comments" question on the survey instrument allowed the participants to further explain their responses to the core questions or to discuss economic and other conditions affecting their firms. A total of 45 comments were provided during the six-month period, accounting for 11 percent of 394 completed surveys. More comments were received in the first month of the survey (13) than in any other month.

The greatest number of comments related specifically to the core survey questions, providing more detailed explanations of business conditions specifically affecting their firms. Several respondents commented on the volatility of input prices and delivery lead times, others described changes in their production or sales levels, and still others discussed staffing and employment issues. Examples follow:

- ▶ "Feedstock is getting more expensive, and intermediary toll chemical plants seem to be charging higher prices to make green products."
- ▶ "We are maintaining higher inventories of material as lead times and cost are increasing at an unprecedented rate. We are now getting quotes that are good for six weeks or less for all kinds

of items, where quotes used to be good for six months. Lead times are up from 10 days to 6 weeks.”

- ▶ “Lead times for raw materials and the price structure for them are somewhat unstable. This makes it very difficult to maintain sufficient profit margins with price commitments that extend for 6-9 months.”
- ▶ “Overseas business has improved for the month but domestic business remains very weak.”
- ▶ “After a little delay, we will use up temp work and lay off some temp people come July.”

Six of the comments pointed out the seasonal nature of the respondent’s business, although the peak times varied by respondent. For example, one respondent reported peak months from December through May. For another, peak times were April through July. For a third, the respondent reported peak months of March and April.

Other comments from respondents were less firm-specific and highlighted instead issues facing their broader industry or the U.S. economy as a whole. Some of these comments related to the national recession and recovery, while others suggested improvements to government policy that would help stimulate business activity. For example:

- ▶ “The economy continues to struggle with many companies hunkered down and consumers inactive.”
- ▶ “The economy seems to be slowing. Businesses are afraid to spend money.”
- ▶ “If they would pass the \$1 credit for the biodiesel to make it a little more reasonable to use the whole market would turn around.”
- ▶ “It is very frustrating that local, state, and federal government programs intended to stimulate the economy, create job growth, and care for our citizens are often ultimately misguided policies addressing the hardships of unemployment when they ought to really find ways to support small businesses so we can create jobs and allow individuals to be self-sufficient.”

Slightly more than one third of the comments related to survey administration. For example, some respondents used the comments section to apologize for late response, others provided corrections to their contact information, and still others provided feedback on the content of the survey.

- ▶ “What does this survey have to do with biobased products? My answers had absolutely nothing to do with such products since our organization has only limited exposure to them.”
- ▶ “If this survey is continued, it should include questions regarding preferences for government policies - either existing or proposed - that impact biobased products and companies manufacturing biobased products. I believe responses to such questions would provide greater context to the health and viability of biobased products and companies.”

Part 3. Comparison of Purchasing Managers Survey Results with Other Indicators

Given the relatively short duration of the biobased production pilot survey, it is not possible to conduct an evaluation of trends. The values, however, can be measured side-by-side with the nationwide PMI manufacturers and non-manufacturers indexes by specific category. Those values are displayed in Figure 12 below.

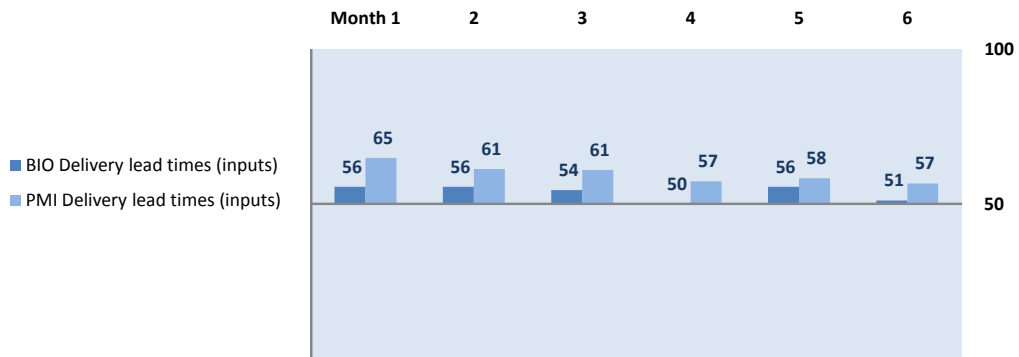
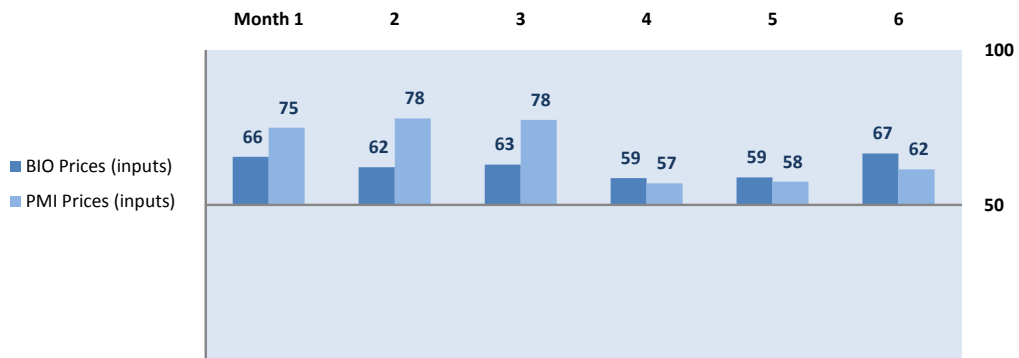
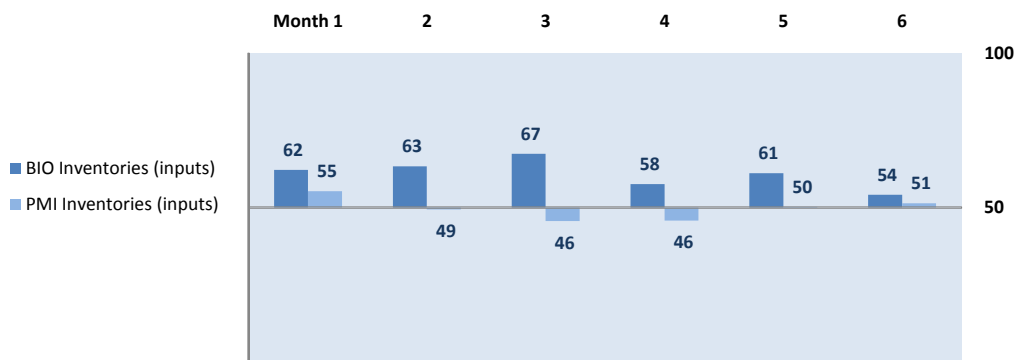
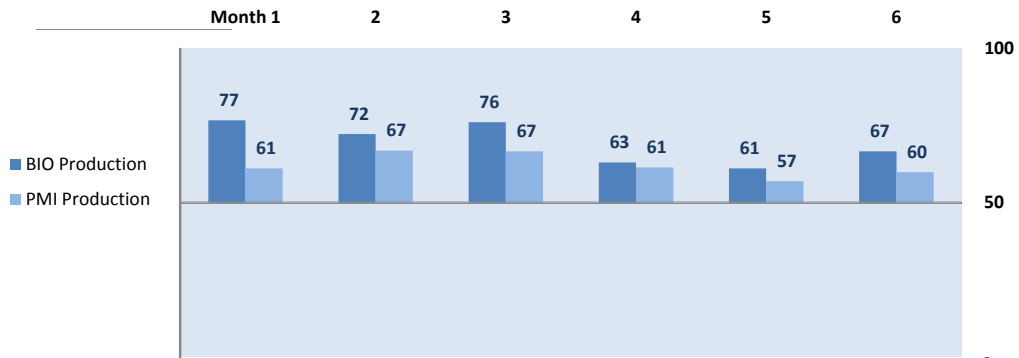
There are two over-riding patterns. In general, among the manufacturing responses, the contraction and expansion patterns are similar. Overall scores, however, differ markedly by category and in composite. Production values were generally similar, but inventory values differed. The sample manufacturers indicated strong patterns of expansion throughout the measurement period though national PMI manufacturers indicated only minor gains or declines. Alternatively, the fraction of firms reporting input price increases was less than the national comparison early in the survey, though both aligned closely in the last three months. Increasing delivery lead times were more likely to be reported in the national measure than for the pilot group. In this case, too, the trend over the six month period was similar.

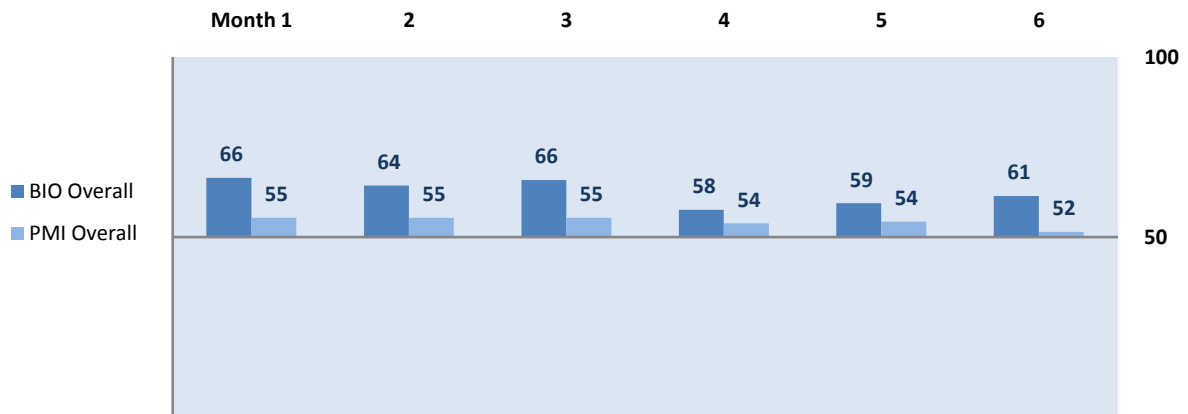
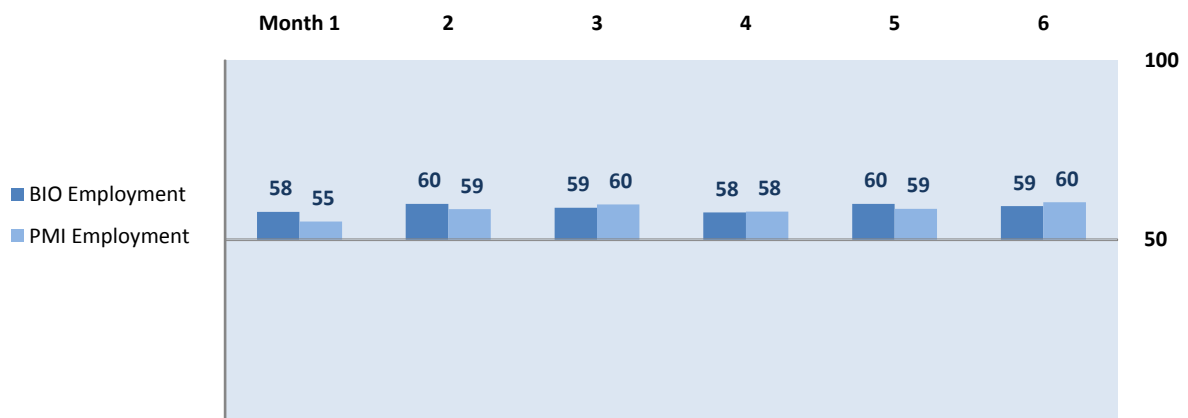
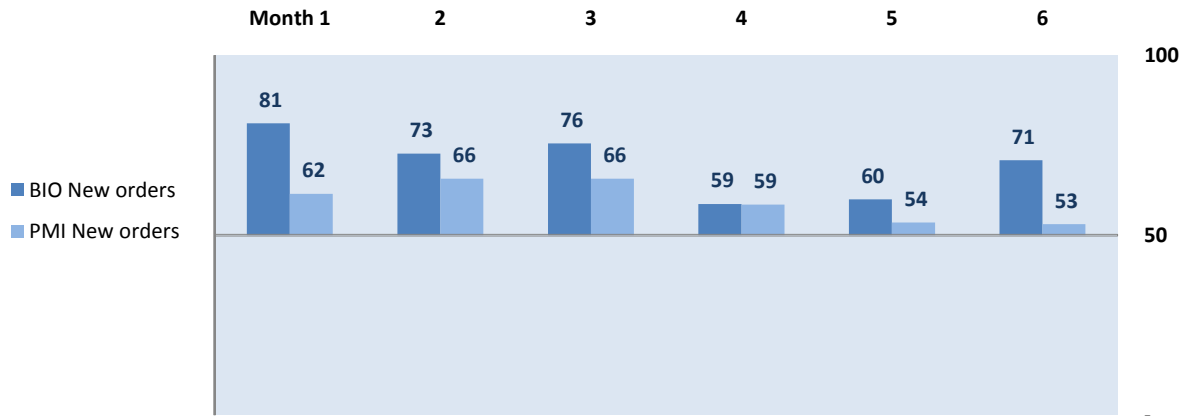
The national group indicated gains in new orders, but the pilot survey group's new orders were more widespread among manufacturers. Total employment among the national measure and the pilot survey indicated more firms were hiring than declining, and the patterns of employment growth among the two was similar through the survey period.

The composite for the two indicated greater positive overall economic performance among the pilot survey manufacturing respondents than among the national group. Both measures were trending downward, but towards the end of the period, the national manufacturing composite was approaching neutral with a score of 52 while the pilot survey group posted a much stronger composite value of 61.

In all, the pilot study manufacturing measure was significantly influenced by higher reported scores for inventories and new orders. **These offset better performance in input prices and slower delivery lead times among the national PMI group.**

Figure 12





The individual component measures for the non-manufacturing PMI group and the pilot group produced slightly more variance than the manufacturing measures (see Figure 13). Growth in business activity in the pilot group was substantially more widespread in the early period of the survey before aligning with the national group. There was a sharp contraction in the fourth month among the survey respondents that is perplexing as it does not align closely with movements in national economic indicators, though national stock markets and consumer confidence scores were lower during that period.

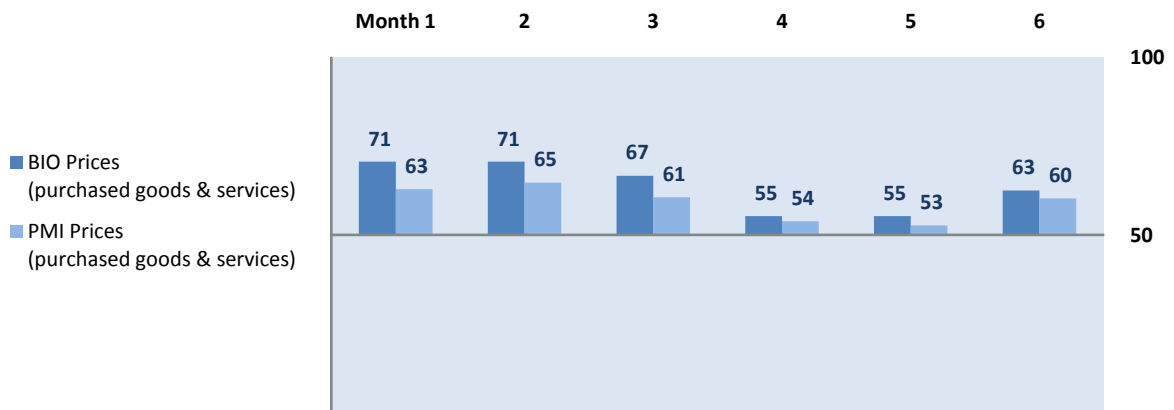
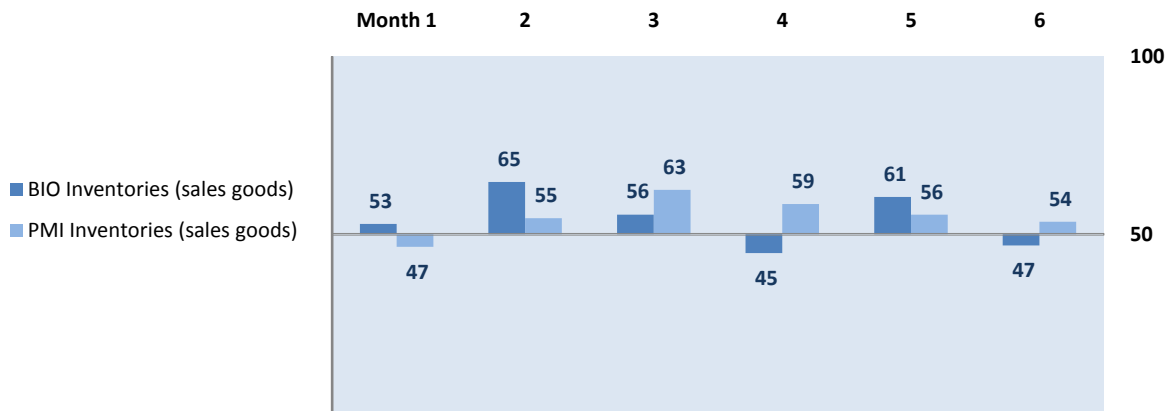
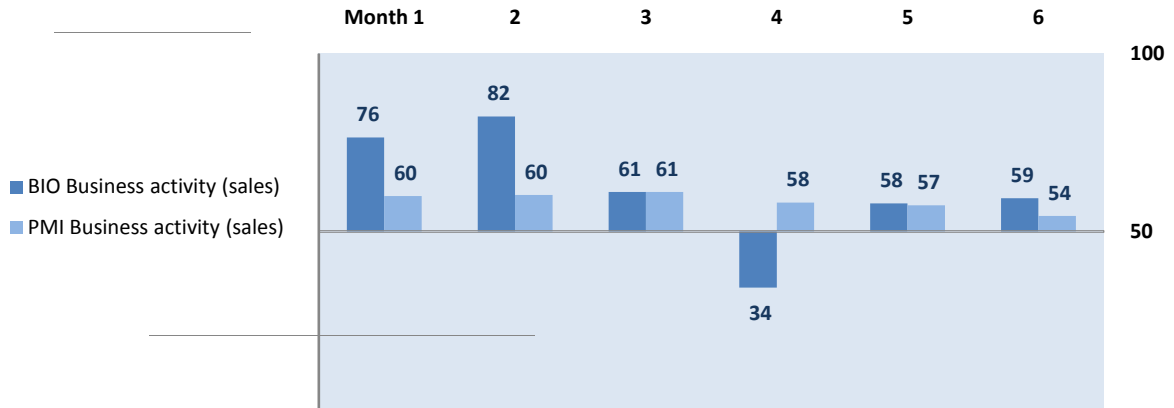
Inventories showed volatility over the comparison period for both groups. The pilot survey group posted gains in four months and contractions in two. The national measure was more consistently demonstrating gains. Both groups were reporting increases in prices paid for inputs of similar magnitudes early in the reporting period, and both groups' trends followed the same pattern throughout.

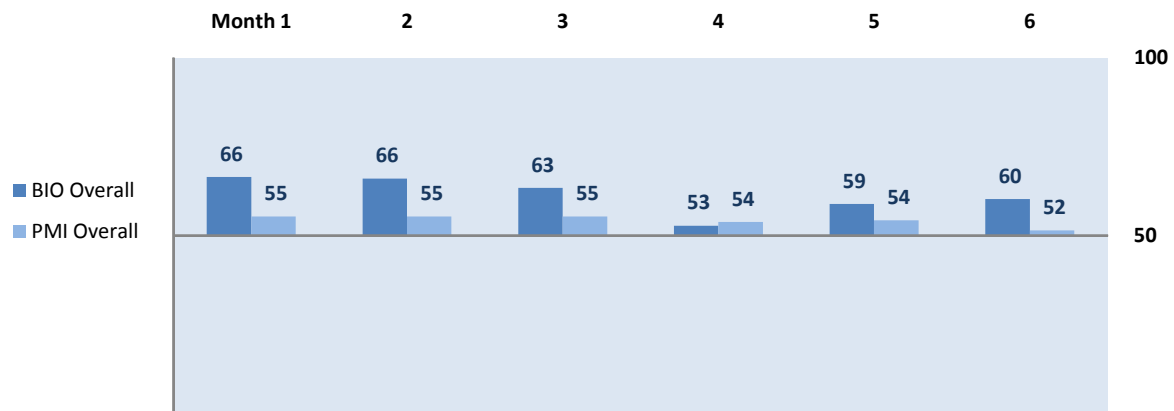
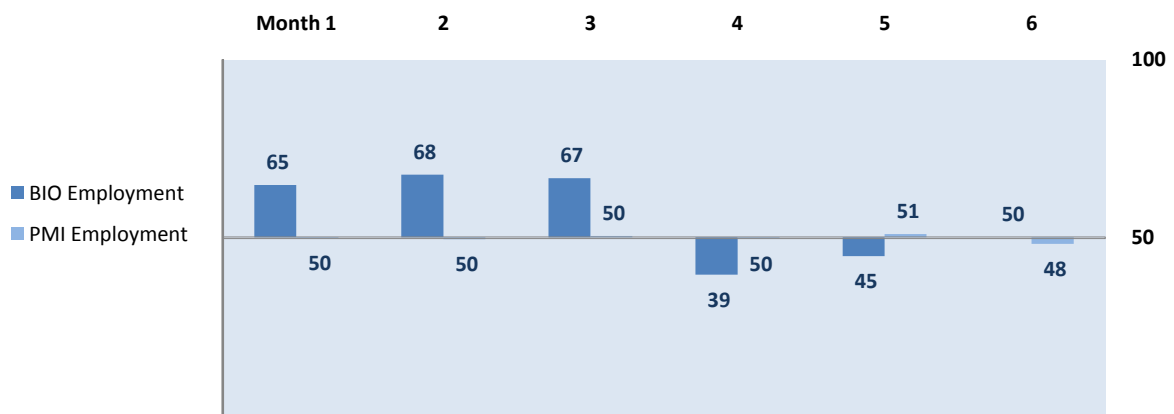
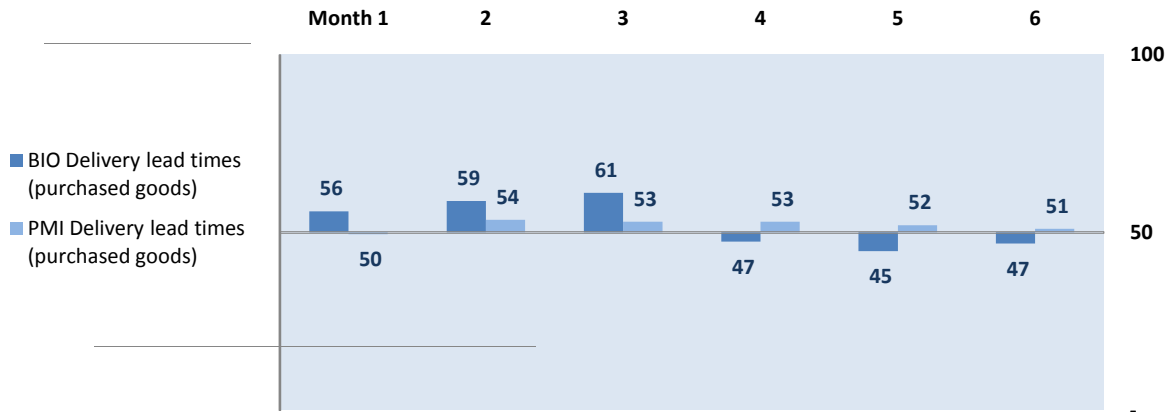
Longer delivery lead times were more widely reported among the pilot survey group early in the survey, though those times appeared to ease in the later period. The national values were slightly better than neutral for the period.

The employment measure produced stark differences. Early in the reporting period, there was very widespread reporting of employment gains among the pilot survey firms whereas, in contrast, their national non-manufacturing counterparts were mostly neutral. In the fourth and fifth months the pilot group shifts sharply to contraction before recovering to a neutral position.

In all, the pilot survey group composites are much more growth indicating in the early period of the survey as compared to the nation, and except for the fourth month's values, maintained stronger values throughout the measurement. Those early values among the pilot survey group were weighted strongly by business activity reports, employment gains, and to a smaller extent, higher delivery lead time scores.

Figure 13





Part 4. Recommendations

This project explored the feasibility of developing a purchasing managers' index to monitor various conditions affecting biobased products firms. The pilot survey did not randomly sample firms from the universe of all U.S. biobased products firms; consequently, the results of the study cannot be generalized beyond the participating firms. Were a similar project to be implemented on a permanent basis, there are several design, administrative, and other issues to consider. Following is a discussion of some of the methodological and procedural issues and obstacles to developing an ongoing purchasing managers' index for the biobased products sector.

Survey Design Issues

Sampling Methodology and Size

If the project were replicated on a larger scale, alternative sampling methodologies should be considered. Rotation surveys and supplemented-panel surveys are good choices for monitoring changes in a particular measure over time. In a rotation survey, a sample unit is observed for a partial set of time points and is not observed for the remaining set of time points in the study. There are many ways in which the observation pattern can be specified. The Canadian Labour Force Survey and the U.S. Current Population Survey are examples of surveys designed to run continuously in which units rotate into the sample for a fixed period and then permanently rotate out of the observation set. Given the relatively small number of biobased products firms, however, this type of survey could quickly exhaust the pool of potential participants.

Supplemental panels are surveys in which a panel of individuals (firms) is observed at every time point and additional individuals (firms) are observed at just some of the time points. The simplest such design is a two-phase sample in which the observations at the second of two time points is a subsample of those observed at time one. Other designs employ both a fixed sample for the duration of the study and a supplementary sample of the same size but comprising different individuals at each time point of the study. Examples of this type of study include the Survey of Income and Program Participation conducted by the U.S. Census Bureau and the National Resources Inventory conducted by the Natural Resources Conservation Service of the USDA, with collaboration by the Iowa State University Center for Survey Statistics and Methodology.

The size of the sample is another important consideration. The national PMI survey by the Institute for Supply Management has approximately 400 respondents.⁴ Most of the regional surveys are likely smaller, although they don't generally publish their sample sizes with their results.

The distribution of firms in the sample, whether in terms of size, business and product type, or other characteristics, would ideally reflect their actual distribution in the U.S. economy; however, it is not often feasible to achieve or maintain such a balance within a sample of firms. Sampling weights calculated on the basis of each respondent's characteristics could be used to adjust the survey results

⁴ Koenig, Evan F. (2002), "Using the Purchasing Managers' Index to Assess the Economy's Strength and the Likely Direction of Monetary Policy," Federal Reserve Bank of Dallas Economic and Financial Policy Review, Vol. 1, No. 6, http://dallasfedreview.org/pdfs/v01_n06_a01.pdf.

for differential probabilities of selection and attrition. Unfortunately, because such characteristics of the population of biobased firms is not knowable from available data sources, we currently have no basis for determining the ideal number of firms of each type to include in the sample, nor can we confidently calculate sampling weights to correct for variations in response rates from month to month.

Recalling that overall sample design and implementation, participation rate patterns, over-sampling for under-represented entities, and the degrees to which the findings are subdivided for reporting purposes all influence the statistical confidence that can be attributed to monthly results or the overall patterns of change that are occurring over time. It is therefore important to note that the Institute for Supply Management or the several regional surveys do not report measures of confidence in their findings.

Recruiting Participants

Given the possibility of some participating firms going out of business and others dropping out of the survey, continuous recruitment of new participants would be required. If the rotation and supplemental panel survey methods described in the previous section were utilized, this need would increase. Key issues related to firm recruitment include challenges associated with identifying the appropriate contact person within a firm and overcoming participants' concerns about the confidentiality of their responses.

The respondent's position within the firm is important. In very large firms, it is likely that only the purchasing manager would know answers to some of the more detailed questions pertaining to input purchases. Other questions relating to production levels and employment might require input from other firm officers such as a CEO or a CFO. For smaller firms, the CEO would probably be the best contact person.

Confidentiality concerns may also complicate efforts to recruit participants, especially for individuals below the CEO level. Lower-level employees may be reluctant to or forbidden from expressing opinions relating to the firm's performance, and participants at all levels may not wish to divulge personal information. It is a long standing practice in state and federal government business surveys to give business firms the benefit of the doubt as to protecting their responses from scrutiny by competitors. Consequently, analysts often find that federal data are suppressed so as to not reveal firm characteristics from the county level to even the state level. Assurances that findings cannot be attributed to single firms can be met with skepticism, and many firms opt to not give the surveyors the benefit of the doubt and refuse participation.

Finally, turnover of individual employees within a firm can result in the loss of key contact persons and would require new in-firm recruiting efforts. State chapters of organizations such as the Institute for Supply Management or the National Association of Purchasing Management may be helpful for identifying knowledgeable individuals within candidate firms.

The Survey Instrument

General recommendations for the survey instrument include keeping the instrument short, avoiding complicated questions, and using very specific wording for the questions. For example, on a question about change in inventories, specify whether we mean inventories of raw materials or finished goods, and whether we mean biobased products or all products.

Supplemental questions may be included to provide additional information. For example, open-ended or non-quantitative questions can be helpful for interpretation of the responses to the core questions. Special questions can be included to address topics of interest on an *ad hoc* basis. Such questions can be hard to code, so where possible, they should be designed so that respondents can choose from defined ranges of values to simplify interpretation.

Otherwise, for this effort, the survey instrument is comparatively simple and easy to administer. These attributes enhance participation rates and, over time, the overall quality of the data. The addition of questions or enhanced complexity to the instrument may interfere with survey results and their reliability.

Survey Administration Issues

Administration

As discussed above, firms are often reticent about participating. While they are required by law to complete federal and state surveys, non-participation for non-mandatory surveys is high. Survey administrators will need to have realistic response rate expectations. In general, patient persistence can pay-off when re-contacting non-respondents and increase the chance of establishing a dialogue that may lead to a positive participation outcome.

Demonstrating survey administration competence has an impact on response rates. This means that survey designers and managers must be mindful of the most effective mechanisms for collecting data, care when reminding respondents who fail to respond, and following up in instances where a participant drops out in order to maintain the overall integrity of the process.

Modern survey techniques simplify administration and response through the use of very efficient on-line surveys. Those gains, however, can be offset by individual firm electronic information management procedures that filter out non-approved email traffic. Administrators will need to keep on top of survey administration issues and solutions to maximize returns and minimize biases or disruptions caused by technical issues. Ease of responding is an important issue, and administrators should deploy instruments that are easy to fill-out and return. For example, the FED's monthly banking survey fills in basic firm information automatically for respondents that it recognizes so they don't have to fill in their personal information each time. Again, administrative competence and efforts taken to simplify the reporting process will pay-off on the response rate side.

Finally, consideration should be given to the use of incentives to improve participation by firms. Because such a survey would involve a commitment lasting several months or more, attrition rates will likely be high. One possible incentive would involve agreements to share data among the participants.

Analysis & Interpretation

Responses to the questions may be highly variable depending on personal characteristics of the respondents. For example, even within the same firm, an optimist might respond to the same set of external cues more favorably than a pessimist. There is no way to statistically evaluate such variances.

Accordingly, it is important to have the same person or persons fill out the survey portions that are appropriate to their expertise and knowledge in order to minimize respondent biases.

Regional or sub-sector diffusion surveys can behave erratically at times, and the results may be disproportionately weighted by characteristics of the responses month in and month out. Interpretive caution should always be maintained, most especially if regional or sub-sector results are strongly divergent from national patterns.

The division of responsibility in the management of diffusion surveys and the reporting of results must be very narrow. Ideally, surveyors administer the data collection process, and the chief analyst handles all other aspects of evaluation, interpretation, and reporting. Survey administrators must also be mindful of the time-value of the information they are producing. Consequently, a short turn-around from data collection to reporting the results is the norm.

Furthermore, analysis and interpretation require an economist or a skilled and respected regional scientist who is widely perceived to be policy neutral. Diffusion measures are indications of firm movement. The economist should be capable of interpreting the results within the context of the broader economy, and not focus strictly on, say, the agricultural economy or some other regional specialization. A regional economic generalist who can respond to a broad range of questions about the economy may be best suited to this task.

Considerations for the Longer-Term

If this project moves beyond the pilot stage, administration of the effort should be treated as a primary job responsibility where product timeliness is an over-riding consideration. The survey process requires consistent engagement with respondents, must be done consistently at the same time each month, and responses (and non-responses) will fall within a very narrow reporting window. These types of surveys can have a high failure rate because it can be difficult for administrators to maintain administrative consistency.

Handing the project off to the USDA or some other agent, were a regular survey to eventuate, may involve a period of transition and engagement involving the pilot researchers and the survey administrators. The transmission of knowledge and experience cannot be handled completely through a written report.

The sponsoring agency and the survey administrator will get information (survey responses) in proportion to the perceived clout and legitimacy of the organization. The USDA might have advantages in the Midwest or the Plains that might not be demonstrated in other regions of the U.S. It could be the case that inter-agency cooperation may improve the performance of this effort and the perceived value of the findings.

As timeliness of the findings is important to the industry at large and to policy development, questions might arise as to how the sponsoring agency handles the release of findings. The standards of reporting care for federal agencies are significantly different than those employed by private associations like the Institute for Supply Management or the various regional efforts. The federal government maintains very

high standards in releasing labor statistics, other monthly indicators of economic performance, and does so in a manner that maximizes timeliness and prevents interference with results for partisan purposes. For this type of data to have value, similar standards will be expected.

Survey administrators and sponsors must be mindful of the intended audience for the data, and the findings must be tailored so that it has value to that audience. The current Administration has initiated a wide range of environment friendly policies and proposals that have been met with resistance from many states and national business organizations. Remaining policy neutral, or being perceived as policy neutral, given the current economic development and environmental policy initiatives may be a challenge for the sponsoring agency and the survey results reporters.

If the overall objectives are policy development, a quarterly survey might suffice. If nearer-term economic performance is the over-riding justification, then a monthly measure would be optimal. Nonetheless, not having a significant series of data will make it hard to interpret results. In addition, given the nature of the inputs, researchers may discover significant seasonal components to the data. Seasonal adjustments to the index would be a consideration; however, comments provided by respondents in the pilot survey revealed differences in their peak business months, suggesting that seasonal variations might be masked by firm-to-firm or industry-to-industry differences. Overall, it may take several years before the series has significant interpretive value. Project funders need to be mindful of the short-term interpretive limitations to the data.

Publication of Results

Because this was a pilot study, the researchers on this project collected monthly responses for a six month period and did not make the results available to either the participants or the public. If a full-scale survey were conducted, mechanisms would be required for the timely release of the monthly results. There would be two primary release dynamics. First, findings would be made available at fixed web-address that provided both the values, a short description of the research process, and the current interpretation of the values. There would also be a concomitant press-release to assist media in the interpretation and reporting of the results.

Feedback Loop

All publicly funded projects should be evaluated. A bio-products survey, were one to become routine, would require feedback mechanisms. In moving from pilot to an actual on-going survey, the new survey administrators would de-brief all pilot project participants. In addition, a small subset of respondents chosen randomly might be contacted to ask a few select questions about their experience, their willingness to continue, and any survey administration issues that they encounter.

Over a longer period, if a more formalized and random recruitment process were deployed, researchers have an obligation to continually monitor performance to assure that sample or participation related biases are not skewing results. The use of a rotation survey or a panel subset can allow for periodic evaluation of both the survey process. Researchers can use feedback address issues that do not bias measurement, collection, or reporting during the current cycle as they would compare with previous cycles.

Ongoing feedback can be obtained by allowing for comments on the survey instrument. To be useful, however, those comments must be interpreted carefully. Ideally, qualitative data help to provide context, and all qualitative information can be categorized and scored. Survey administrators would be expected to monitor industry-substantive and survey-performance comments on an ongoing basis.

Appendix A. Survey Methodology Report

CIRAS Biobased Product Index Surveys:

Pilot Project Methodology Report

Jan Larson

Iowa State University

Center for Survey Statistics & Methodology

October 1, 2010

In 2009-2010, the Center for Survey Statistics and Methodology (CSSM) was contracted to provide data collection services for a pilot project being conducted for Iowa State University's Center for Industrial Research and Service (CIRAS). This project consisted of conducting a series of six online surveys with manufacturers and distributors of biobased products for the purpose of testing the development of an index that would provide benchmark data on the biobased industry. The primary researcher for this project is Liesl Eathington, Assistant Scientist in the Department of Economics. This report describes the survey and sample design, the data collection procedures used, and survey response.

Survey and Sample Design

CSSM collaborated with the primary researcher to finalize the project and sample design. In 2008 CSSM had conducted a telephone survey with biobased manufacturers and distributors for CIRAS, and an update of that project began in January of 2010. The sample for both of those projects was compiled by CIRAS staff and it included information that was verified or corrected during the 2008 survey, such as primary product, company size, and location for each firm. The primary researcher divided the U.S. companies in that sample into 20 groups based on manufacturer/distributor status, primary product group, size group, and region. Companies with missing information were excluded. CSSM staff then selected roughly equivalent numbers of companies from each group to use as a sample for recruiting project participants. The selection of companies to contact was basically random, however only companies that were cooperative in 2008 (and to-date in 2010) were chosen for this pilot project. A total of 153 companies were selected for this purpose.

Table 1 shows the number of companies by group in the 2008 survey and in the sample for the Index pilot project.

Table 1. Number of companies by group.

Group #	Business Type	Product type	Firm Size	Region	Number in Frame	Number Selected	Number Agreed
1	Manufacturing	Biofuels	All Sizes	Midwest	67	9	5
2	Manufacturing	Biofuels	All Sizes	Non-Midwest	22	7	3
3	Manufacturing	Soaps, etc.	Small	All	121	8	5
4	Manufacturing	Soaps, etc.	Large	All	53	8	6
5	Manufacturing	Other Chemicals	Small	Midwest	24	8	6
6	Manufacturing	Other Chemicals	Small	East	20	7	5
7	Manufacturing	Other Chemicals	Small	West	30	8	5
8	Manufacturing	Other Chemicals	Large	Midwest	61	8	4
9	Manufacturing	Other Chemicals	Large	East	53	8	5
10	Manufacturing	Other Chemicals	Large	West	45	8	4
11	Manufacturing	Other Products	Small	Midwest	28	7	5
12	Manufacturing	Other Products	Small	Non-Midwest	26	5	4
13	Manufacturing	Other Products	Large	Midwest	41	8	3
14	Manufacturing	Other Products	Large	East	37	8	4
15	Manufacturing	Other Products	Large	West	27	7	4
16	Distribution/Other	Biofuels	All Sizes	All	29	8	3
17	Distribution/Other	Other Chemicals	Small	All	82	8	5
18	Distribution/Other	Other Chemicals	Large	All	49	8	4
19	Distribution/Other	Other Products	Small	All	46	7	5
20	Distribution/Other	Other Products	Large	All	37	8	4
TOTAL					898	153	89

The questions for the online survey were developed by the primary researcher in consultation with CSSM professional staff. Each question asked participants to compare their expectations for the next month to the current month. All questions were closed-ended, with six questions for manufacturers and five for distributors. Participants would be asked to complete an identical online survey each month for six months. The goal for this pilot project was to obtain 50-75 completed surveys each month and to identify operational issues that would need to be addressed if a future index were to be implemented.

Data Collection Procedures

CSSM staff finalized the survey questions, incorporating additional items to confirm who the respondent was and to verify who should receive the survey notification the following month. The survey was programmed for online administration using Snap software and tested for accuracy by CSSM staff. To ensure the integrity of the survey and its results, unique usernames and passwords would be required to access the surveys. The survey and the data were set up to be stored on separate secure servers.

Appropriate recruitment scripts, email notices, and other project materials were developed. CSSM staff also verified with the university Institutional Review Board that this was an establishment survey, not research involving human subjects, and that no IRB approval was required.

Recruitment of Index survey participants was conducted by telephone on March 16-26, 2010. Because most of the participants had very recently been interviewed for the 2010 CIRAS Biobased Product Survey, no advance letters were sent prior to the recruitment calls. Of the 153 selected companies, 83 were reached and agreed to participate in the six-month Biobased Index pilot project. Of the remaining 70 companies, 24 refused and 46 could not be reached during the recruitment period. Recruitment outcome by group is shown in Table 2.

After recruitment was finished, email verifications were sent to each of the individuals who agreed to participate to ensure that their email addresses were functioning and that there were no filters or blocks in place. The few resulting problems were clarified and resolved by telephone.

The Biobased Index monthly surveys were administered from March through August of 2010. Each monthly survey was available for about one week. Approximately five days before the end of each month, participants were sent an email notification containing a customized URL link for the survey with an embedded username and password. Two work days later, a reminder email was sent to non-respondents. One or two days later, telephone calls were made to remind those who still had not responded. The online survey was closed about 2 or 3 days after the first of the subsequent month.

Participants were encouraged to contact CSSM staff by email or telephone via a toll-free telephone number if they had any questions or concerns or if they wished to withdraw from the project. The online survey also provided opportunity each month for comments or notification of changes in contact information.

The first monthly survey, conducted in late March, was completed by 66 of the 83 companies who agreed to participate. As a result, additional recruitment calls were made in April to some of the 46 who could not be reached during the original recruitment period, and six more companies were added to the participant sample for future surveys bringing the total to 89.

Table 2. Recruitment outcome by group.

Group #	Number Selected	Agreed	Refused	Not Reached
1	9	5	1	3
2	7	3	2	2
3	8	5	1	2
4	8	6	1	1
5	8	6	1	1
6	7	5	0	2
7	8	5	1	2
8	8	4	2	2
9	8	5	0	3
10	8	4	2	2
11	7	5	0	2
12	5	4	0	1
13	8	3	3	2
14	8	4	3	1
15	7	4	0	3
16	8	3	3	2
17	8	5	1	2
18	8	4	1	3
19	7	5	1	1
20	8	4	1	3
TOTAL	153	89	24	40

Each month the survey responses were downloaded and reviewed. Changes in contact information were recorded for future use. Refusals were recorded so they would not be contacted again. Four of the 89 people who originally agreed to participate in the pilot project later refused to continue. One of them never completed a survey, two completed the first survey and then refused, and one respondent completed the first two surveys before refusing to continue.

An interim data file containing data from the first three monthly surveys was prepared and sent to the primary researcher on June 9, 2010, along with a receipt file and the final questionnaire. The final data file was delivered on September 3, 2010, with the final receipt file and questionnaire with codes.

Results

Survey response by month appears in Table 3. A total of 394 surveys were completed over the six month period, ranging from 63 to 70 completed per month. The corresponding monthly response rate varied from 70.8% to 78.7%.

Table 3. Number of completed surveys by month and group.

Group #	Number Agreed	March Surveys	April Surveys	May Surveys	June Surveys	July Surveys	August Surveys	Total Surveys
1	5	2	3	3	4	5	3	20
2	3	2	3	2	2	2	2	13
3	5	5	4	5	4	4	4	26
4	6	3	4	4	4	4	3	22
5	6	6	5	5	5	5	5	31
6	5	3	2	3	3	3	2	16
7	5	4	3	4	4	3	4	22
8	4	3	3	1	2	2	3	14
9	5	5	4	5	3	4	5	26
10	4	2	3	3	3	2	3	16
11	5	4	4	5	1	2	4	20
12	4	3	3	3	3	3	2	17
13	3	3	3	3	3	3	3	18
14	4	2	3	3	3	3	4	18
15	4	2	3	3	3	2	3	16
16	3	2	2	2	2	3	2	13
17	5	5	4	5	5	5	5	29
18	4	3	4	4	4	4	3	22
19	5	4	4	4	4	4	3	23
20	4	3	3	3	1	1	1	12
TOTAL	89	66	67	70	63	64	64	394

Table 4 shows overall participation by group. Of the 89 companies that agreed to participate, 82 (92%) completed at least one of the six surveys. There were 44 companies (49%) that completed all six surveys and 13 (15%) completed five of the six. Seven of the 89 companies (8%) did not complete any surveys; one agreed but subsequently refused and the other six simply never responded.

Table 4. Overall participation by group.

Group #	Number Agreed	0 Surveys	1 Survey	2 Surveys	3 Surveys	4 Surveys	5 Surveys	6 Surveys
1	5			1	2			2
2	3			1			1	1
3	5			1				4
4	6	1	1		1			3
5	6		1					5
6	5	1		2				2
7	5	1				1		3
8	4		1		1		2	
9	5					1	2	2
10	4	1					2	1
11	5			1	1	1	1	1
12	4			1		1	1	1
13	3							3
14	4		1				1	2
15	4	1				1		2
16	3			1			1	1
17	5						1	4
18	4					1		3
19	5	1					1	3
20	4	1			2			1
TOTAL	89	7	4	8	7	6	13	44

The following Appendices are included at the end of this report:

- A-1. CIRAS Biobased Index Survey Questions
- A-2. Recruitment Script
- A-3. Email Verification Notice
- A-4. Survey Email Invitation – Month 1
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Appendix A-1. Online Survey Questions

CIRAS Biobased Index

Online Survey Questions FINAL

[Survey link sent in email notification, with username embedded.]

Thank you for participating in the Bio-Based Product Index this month.

- Please answer ALL of the questions that follow.
- Your answers should reflect the responsibility level of the purchasing organization that you represent (plant, division, company).
- You are encouraged to consult with others in your purchasing organization to provide current and accurate answers to all of the questions.
- Please arrange for an alternate representative of your purchasing organization to complete this survey if you are unable to complete it.

[GO TO QUESTION SERIES, BASED ON WHETHER MANUFACTURER or DISTRIBUTOR.]

Manufacturing or Manufacturing/Wholesale Firm Questions

Your answers to the following questions should compare the EXPECTED performance of your company next month to THIS (current) month.

1. **Production.** How do you expect your overall production next month will compare to this month?
 - a. Will be **higher** than this month
 - b. Will be the **same** as this month
 - c. Will be **lower** than this month

2. **Inventories of Purchased Materials.** How do you expect your raw materials inventory levels next month will compare to this month?
 - a. Will be **higher** than this month
 - b. Will be the **same** as this month
 - c. Will be **lower** than this month

3. **Prices.** How do you expect the per-unit prices of the goods and services that you will buy next month will compare to this month?
 - a. Will be **higher** than this month
 - b. Will be the **same** as this month
 - c. Will be **lower** than this month

4. **Delivery Lead Times.** How do you expect the lead time for your suppliers' deliveries next month will compare to this month?
 - a. Will be **shorter** than this month
 - b. Will be the **same** as this month
 - c. Will be **longer** than this month

5. **New Orders.** How do you expect the total volume of new orders from your customers next month will compare to this month?
 - a. Will be **higher** than this month
 - b. Will be the **same** as this month
 - c. Will be **lower** than this month

6. **Employment.** How do you expect the overall level of employment in your firm next month will compare to this month?
 - a. Will be **higher** than this month
 - b. Will be the **same** as this month
 - c. Will be **lower** than this month

Wholesale or Wholesale/Retail Firm Questions

Your answers to the following questions should compare the EXPECTED performance of your company next month to THIS (current) month.

7. **Business Activity.** How do you expect your overall level of sales next month will compare to this month?
 - a. Higher than this month
 - b. Same as this month
 - c. Lower than this month

8. **Inventories.** How do you expect your product inventory levels for next month will compare to this month?
 - a. Higher than this month
 - b. Same as this month
 - c. Lower than this month

9. **Prices.** How do you expect the per-unit prices of the goods and services that you will buy next month will compare to this month?
 - a. Higher than this month
 - b. Same as this month
 - c. Lower than this month

10. **Delivery Lead Times.** How do you expect the lead time for your suppliers' deliveries next month will compare to this month?
 - a. Shorter than this month
 - b. Same as this month
 - c. Longer than this month

11. **Employment.** How do you expect the overall level of employment in your firm next month will compare to this month?
 - a. Higher than this month
 - b. Same as this month
 - c. Lower than this month

The Biobased Index survey notification this month was sent to:

[NAME] reporting for [BUSINESS NAME].

12. Was this month's survey completed by [NAME]?

- Yes
- No [GO TO Q14]

13. Should next month's survey also be sent to you?

- Yes [GO TO Q21]
- No [GO TO Q17]

Please enter the following information.

14. Your Name:

15. Your Job Title:

16. Your Email Address:

17. Who should receive next month's Biobased Product Index survey?

- Send to [NAME]
- Send to [Your name]
- Send to someone else

[IF SEND TO NAME OR YOUR NAME, GO TO CLOSE. IF SOMEONE ELSE, GO TO SCREEN BELOW.]

Please record the following information for the person who should receive next month's Biobased Product Index survey.

18. Name:

19. Job Title:

20. Email Address:

21. Please record any comments or questions below.

[CLOSE.]

Thank you very much for your cooperation. We will contact your company again next month.

The final (6th month) survey is changed to the following:

The Biobased Index survey notification this month was sent to:

[NAME] reporting for [BUSINESS NAME].

12. Was this month's survey completed by [NAME]?

Yes [GO TO Q21]

No [GO TO Q14]

13. [SKIPPED BY EVERYONE]

Please enter the following information.

14. Your Name:

15. Your Job Title:

16. Your Email Address:

[GO TO Q21]

17. [SKIPPED BY EVERYONE]

[Q18-20 ARE SKIPPED BY EVERYONE]

Please record the following information for the person who should receive next month's Biobased Product Index survey.

18. Name:

19. Job Title:

20. Email Address:

21. The USDA has expressed interest in continuing the Biobased Product Index pilot project for another 6 months, however this possibility has not been finalized. If the pilot project is extended, would you be willing to complete the monthly surveys for 6 more months?

Yes

Maybe

No

22. Please record any comments or questions below.

[CLOSE.]

Thank you very much for your cooperation. We greatly appreciate your participation over the past 6 months, and your willingness to share your knowledge and experience with us.

Results from the Biobased Product Index pilot project will be posted online at the website of the Center for Industrial Research and Service at Iowa State University: We will notify you by email when the results are available, but you are welcome to check out the website at any time. There are numerous articles and links to information that might be of interest to you. The CIRAS website is

<http://www.ciras.iastate.edu/Bioindustry/biobasedproducts.asp> .

If you have any questions, please contact the Iowa State University research staff at 877-578-8848 (toll-free).

Appendix A-2. Recruitment Script

Case ID:

Contact Name:

Title:

Business:

Address:

Phone:

Day	Date	Time	Int ID	Number Dialed	Spoke To	Comments	Outcome

Hello, this is (interviewer name) calling for Iowa State University. May I please speak to [NAME]?

IF NOT AVAILABLE, SCHEDULE CALLBACK.

Recently we spoke to you about a Biobased Product Study being conducted here at Iowa State University by the Center for Industrial Research and Service. CIRAS is also in the process of developing and testing the feasibility of a Biobased Product Index based on a monthly purchasing managers' survey. This index is designed to evaluate trends among firms that produce or sell bio-based products. Results from similar surveys have been used to forecast future economic growth or contraction in certain sectors of the economy. It is hoped that the

Bio-based Index will be greatly beneficial for firms or individuals involved in production, purchasing, product distribution, or new development of bio-based products.

(The design of the survey is based on national and regional surveys that measure trends in the manufacturing sector, but it has no affiliation with any existing national or regional purchasing manager surveys.)

Your company is invited to participate in this pilot project. If you are interested, we would need to identify someone in your firm, perhaps yourself or perhaps someone else, who would complete a brief 6-question online survey, once a month for six months. We will send an email notification each month at the appropriate time. The email will include a link to the online survey, and answering the questions will probably take only 2 or 3 minutes. It's very important for these questions to be answered within a one-week period, so if they are not completed within a couple of days, we will send a reminder email as a prompt.

Would you or someone else in your firm be willing to participate in this project?

1 = Yes

2 = No → I understand. We appreciate your help in the past and thank you for your time today. [HANG UP]

IF YES:

Thank you very much. Who would be the best person at your company to complete the online survey each month?

1 = Me

2 = Someone else →

(Can I get the name, job title, and phone number of the person you recommend for this project?)

Name: _____

Job Title: _____

Phone: _____

E-mail: _____

Thank you very much. We'll contact him/her about the project.

I need to verify just a few pieces of information.

Your Name:

Company Name: «Company_Name»

Your Email address:

Your company is primarily involved in:«Type»

Your company's primary NAICS Code is:

[MAKE CORRECTIONS AS NEEDED.]

Thank you very much. We will send you an email within the next couple of days to thank you and to verify that we have the information correct. Please just reply "OK." Then we anticipate contacting you for the first online survey the last week of March.

Iowa State University thanks you for your help with this important pilot project.

Appendix A-3. Email Verification Notice

Dear [NAME],

Thank you for agreeing to take part in the Biobased Product Index that the Iowa State University Center for Industrial Research and Service (CIRAS) is testing for feasibility.

This email is being sent to confirm that we have the correct contact information for you. Please respond with "OK" to let us know you received this email and you are the person in your company who should be sent the survey notifications.

The first survey notification will be emailed to you on [DATE]. The email will include a link to the online survey, and answering the questions will probably take only 2 or 3 minutes. It's very important for these questions to be answered by the end of the month, so if they are not completed within a day or two, we will send a reminder email as a prompt.

This project is designed to determine whether an Index based on monthly surveys would be effective in evaluating trends and forecasting future economic growth or contraction in various bio-based sectors of the economy. It is hoped that the Biobased Index could be greatly beneficial for firms or individuals involved in production, purchasing, product distribution, or new development of bio-based products.

Thank you very much for your help in the past with other CIRAS related research.

Allison Tyler

Project Manager

Center for Survey Statistics and Methodology

Iowa State University

Ames, IA

Appendix A-4. Survey Email Invitation – Month 1

Dear [ContactName],

Thank you for your willingness to participate in the Biobased Product Index pilot project. We hope that you will find participating in this developmental project both interesting and ultimately helpful for you and your firm.

This is the first of six very brief web surveys that you will be asked to complete once a month. They are all identical. Because this is a pilot project, we will also verify who has answered the questions and who should receive the email notice next month.

The link that appears below is customized for your firm. Please click on the link to begin this month's survey.

[URL]

For the Index to be valid, surveys must be completed by the end of this month. Please do so today if possible; it should only take 2 or 3 minutes.

Thank you very much for your cooperation. If you have any questions, please contact the Iowa State University research staff at 877-578-8848 (toll-free) or reply to this email.

Allison Tyler

Project Manager

Center for Survey Statistics and Methodology

Iowa State University

Ames, IA

Appendix A-5. Survey Email Invitation – Months 2-5

Dear [ContactName],

Thank you for your willingness to participate in the Biobased Product Index pilot project.

The link for this month's survey appears below and is customized for your firm. Please click on the link to begin.

[URL]

For the Index to be valid, surveys must be completed by the end of this month. Please do so today if possible; it should only take 2 or 3 minutes.

Thank you very much for your cooperation. If you have any questions, please contact the Iowa State University research staff at 877-578-8848 (toll-free) or reply to this email.

Allison Tyler

Project Manager

Center for Survey Statistics and Methodology

Iowa State University

Ames, IA

Appendix A-6. Survey Email Invitation – Month 6

Dear [ContactName],

Thank you for your willingness to participate in the Biobased Product Index pilot project.

This is the last of the six web surveys included in this important developmental project. We greatly appreciate your willingness to participate and to share the benefit of your knowledge and experience.

The link for the final survey appears below and is customized for your firm. For the Index to be valid, surveys must be completed by the end of this month. Please do so today if possible; as before, it should only take 2 or 3 minutes.

Please click on the link below to begin.

[URL]

Results from the Biobased Product Index pilot project will be posted online at the website of the Center for Industrial Research and Service at Iowa State University: We will notify you by email when the results are available, but you are welcome to check out the website at any time. There are numerous articles and links to information that might be of interest to you. The CIRAS website is <http://www.ciras.iastate.edu/Bioindustry/biobasedproducts.asp>.

Thank you very much for your cooperation. If you have any questions, please contact the Iowa State University research staff at 877-578-8848 (toll-free) or reply to this email.

Allison Tyler

Project Manager

Center for Survey Statistics and Methodology

Iowa State University

Ames, IA

Appendix A-7. Survey Email Reminder – Months 1-5

Dear [ContactName],

Thank you for your willingness to participate in the Bio-Based Product Index pilot project.

According to our records, we have not yet received your completed survey for this month. Please take 2 or 3 minutes to complete the survey by clicking on the link below.

[URL]

Thank you very much for your cooperation. We hope that you will find participating in this developmental project both interesting and ultimately helpful for you and your firm.

If you have any questions, please contact the Iowa State University research staff at 877-578-8848 (toll-free) or reply to this email.

Allison Tyler

Project Manager

Center for Survey Statistics and Methodology

Iowa State University

Ames, IA

Appendix A-8. Survey Email Reminder – Month 6

Dear [ContactName],

Thank you for your willingness to participate in the Biobased Product Index pilot project.

According to our records, we have not yet received your completed survey for this final month. This is the last of the six web surveys included in this developmental project, and we would very much like to have your input included.

Please take 2 or 3 minutes to complete the survey by clicking on the link below.

[URL]

Results from the Biobased Product Index pilot project will be posted online at the website of the Center for Industrial Research and Service at Iowa State University: We will notify you by email when the results are available, but you are welcome to check out the website at any time. There are numerous articles and links to information that might be of interest to you. The CIRAS website is <http://www.ciras.iastate.edu/Bioindustry/biobasedproducts.asp>.

Thank you very much for your cooperation. We greatly appreciate your willingness to participate and to share the benefit of your knowledge and experience

If you have any questions, please contact the Iowa State University research staff at 877-578-8848 (toll-free) or reply to this email.

Allison Tyler

Project Manager

Center for Survey Statistics and Methodology

Iowa State University

Ames, IA

Appendix A-9. Reminder Telephone Script

Hello, this is (interviewer name) calling for Iowa State University.

May I please speak to [CONTACT NAME]?

I'm calling about the Biobased Product Index feasibility study we are conducting here at Iowa State University. We recently sent you an email with a link to the survey and as of today, we haven't received any information from you.

In order for your data to be incorporated into this month's Index, it is important for us to receive your responses no later than [DAY of WEEK] noon. (Preferably by close of business today.)

(If you have any questions, please call us toll free at 877-578-8848.)

Thank you.

(We expect that the survey should only take 2 or 3 minutes of your time to complete.)

(Did you receive the email invitation?)

(Do we have the correct email address?)

(Do you have any questions I could answer for you?)

Appendix B. Participation Summary

