

Methodology

Target Population:

The target sample for the M3 survey includes all companies with at least \$500 million in annual manufacturing shipments and a supplemental panel of all other manufacturing companies.

Panel Design:

The universe for the M3 survey includes all manufacturing companies in the most recent Economic Census. There were approximately 250,000 companies in the 2022 Economic Census - Manufacturing, representing about 299,000 establishments. There were approximately 1,700 manufacturing companies exceeding \$500 million of manufacturing shipments in the 2022 Economic Census. For firms that operate in a single M3 industry category, the reporting unit typically comprises all operations of the company. Most large, diversified companies, however, file separate reports for divisions with significant activity in different industrial areas. The actual panel consists of approximately 3,000 companies.

The composition of each company or reporting unit of a company in the survey usually includes more than one plant or establishment and frequently includes industry activities outside the M3 category in which it is classified. The survey methodology assumes that the month-to-month changes of the total operations of the reporting units classified in each industry category effectively represent the month-to-month movements of all establishments that make up the category.

Sample Maintenance:

The panel is continually updated with company merger and acquisition activity, as well as company births and deaths.

Data Collection

Data Items Requested and Reference Period Covered:

Shipments, new and unfilled orders, and inventories data for the preceding month

The survey questionnaire can be found at [m3surveyform.pdf](#)

Type of Request:

Voluntary

Frequency and Mode of Contact:

The Census Bureau sends an initial email which includes instructions for online reporting when the collection period opens. An email reminder is sent out to those businesses that have not responded by the due date. Additionally telephone follow-up of nonrespondents with a valid phone number is conducted.

Data Collection Unit:

Companies, with separate reports for each natural business unit with significant manufacturing activity.

Compilation of Data Editing:

Standard edits, micro and macro industry review

Edit tests are run throughout each reporting period to determine outliers and reporting errors. These edit failures are reviewed and resolved by survey analysts.

Nonresponse:

Nonresponse is defined as the inability to obtain requested data from an eligible survey unit. Two types of nonresponse are often distinguished. Unit nonresponse is the inability to obtain any of the substantive measurements about a unit. In most cases of unit nonresponse, the Census Bureau was unable to obtain any information from the survey unit after several attempts to elicit a response. Item nonresponse occurs either when a question is unanswered or the response is unusable.

Imputation:

Imputation is based on company or industry historical trends.

Tabulation Unit:

Company

Estimation:

A link relative procedure derives the monthly universe estimates of shipments, unfilled orders, and total inventories for each industry category. The universe estimate for the previous month is multiplied by the monthly ratio of change to arrive at a universe estimate for current month. The company must be present in both the prior and current month to be included in the ratio of change calculation. When an individual company reports unusually large changes from the previous month, or when a particular company has unique data patterns differing substantially from the movement shown by the rest of the reporting panel in a particular industry category, the company is excluded from the ratio of change calculation but included in the universe estimate of level. The effect of this procedure is to

restrict the estimation for nonrespondents and firms not in the survey panel to the general trend of the industry.

The universe estimate of new orders is derived from the monthly estimate of shipments plus the change in unfilled orders between the current and prior period. The estimate includes orders that are received and filled in the same month as well as orders that have not yet been filled. It also includes the effects of cancellations and modifications of previously reported orders. The standard ratio estimate procedure is not followed for new orders because not all companies report new orders, and some that do report this item limit their reporting to specific products for which long lead times are required in the production cycle. These companies, in effect, exclude new orders received for products that are shipped from inventory.

A modified procedure also is used to estimate the stage of fabrication inventory data. In this procedure, the total inventory data estimated for each tabulated industry category are retabulated to the appropriate three-digit NAICS subsector levels and serve as control totals for the stage of fabrication data. Initial estimates are made for each of the stages of fabrication at the three-digit NAICS level using the ratio estimation procedure. The differences between the sum of the stage of fabrication detail and total inventories at the three-digit NAICS level are then allocated proportionally to the stage of fabrication figures to form the estimates. The reason behind this procedure is that a significant number of companies report total inventories but cannot report inventories by stage of fabrication.

Benchmarking:

The M3 survey data are benchmarked to reduce both sampling and nonsampling errors. The relatively small monthly sample size as well as the differences that result from collecting the monthly data on a divisional basis as compared to the benchmark data on an establishment basis account for most of the revision. Also, some monthly reports received too late to be included in the monthly publications are added to improve the revised estimates of change of the historical monthly data.

Seasonal Adjustment Methodology:

Seasonal modeling for the M3 survey uses the Census Bureau's X-13ARIMA-SEATS program to remove predictable calendar-related patterns and highlight underlying economic trends. Monthly data for shipments, unfilled orders, and total inventories are seasonally adjusted at the most detailed industry level by dividing unadjusted values by factors computed through X-13ARIMA-SEATS. Seasonally adjusted new orders are then derived by combining seasonally adjusted shipments with the period-to-period change in seasonally adjusted unfilled orders.

Inventory by stage of fabrication is adjusted at the three-digit NAICS subsector level. When the sum of stage-level adjustments does not align with the seasonally adjusted major-group totals, the discrepancy is proportionally distributed across the stage-of-fabrication categories to maintain consistency. Seasonal factors are calculated concurrently, meaning each month's factor incorporates the current observation.

Trading day adjustments are also applied to account for irregular month-to-month fluctuations caused by differing numbers of working days and varying month lengths. These calendar effects can obscure underlying manufacturing activity, particularly in shipments series. Except for Tobacco Manufacturing and Turbine and Generator Manufacturing, all M3 shipment series are adjusted for both month length and trading day variation.

X-13ARIMA-SEATS regression and spectral diagnostics guide the selection of daily weights, aiming to reduce peaks at calendar frequencies and decrease the magnitude of residual irregular movements.

Stock variables such as inventories and unfilled orders may also exhibit trading day effects because they represent accumulations of monthly flows. Diagnostics like those used for shipments determine when trading day adjustments are appropriate for total inventories, stage-of-fabrication inventories, and unfilled orders. New orders are implicitly trading-day-adjusted since they are derived using trading-day-adjusted shipments, although changes in unfilled orders are typically not adjusted for trading day effects.

Reliability of the Data

The monthly data presented in this publication are subject to both sampling and nonsampling errors. Sampling errors occur because reports are received from a sample rather than the complete universe of manufacturing companies. Because the present composition of the panel is not based on a probability sample, the amount of sampling error cannot be quantified. Nonsampling errors, on the other hand, are attributable to many sources. The use of company or divisional reports to estimate the monthly change for establishments is one source of nonsampling error. The use primarily of large companies to represent the month-to-month movement of all companies is another potential source. In addition, response and processing errors may be present, although computer edits and analytical reviews of the data detect the most significant errors of this kind prior to tabulation.

Disclosure Avoidance:

Disclosure is the release of data that reveals information or permits deduction of information about a particular survey unit through the release of either tables or microdata. Disclosure avoidance is the process used to protect each survey unit's identity and data from disclosure. Using disclosure avoidance procedures, the Census Bureau modifies or removes the characteristics that put information at risk of disclosure. Although it may appear that a table shows information about a specific survey unit, the Census Bureau has taken steps to disguise or suppress a unit's data that may be "at risk" of disclosure while making sure the results are still useful.

Disclosure avoidance is done for the M3 survey using cell suppression. Cell suppression is a disclosure avoidance technique that protects the confidentiality of individual survey units by withholding cell values from release and replacing the cell value with a symbol, usually a "D". If the suppressed cell value were known, it would allow one to estimate an individual survey unit's value too closely.

The cells that must be protected are called *primary suppressions*.

To make sure the cell values of the primary suppressions cannot be closely estimated by using other published cell values, additional cells may also be suppressed. These additional suppressed cells are called *complementary suppressions*.

The process of suppression does not usually change the higher-level totals. Values for cells that are not suppressed remain unchanged. Before the Census Bureau releases data, computer programs and analysts ensure primary and complementary suppressions have been correctly applied.

The Census Bureau has reviewed the data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied. (Approval ID: CBDRB-FY26-0151).

For more information on disclosure avoidance practices, see FCSM Statistical Policy Working Paper 22.

History of Survey Program

1962

The survey's initial sample design included all companies with more than 1,000 employees. Smaller firms were selected using probabilities proportional to employment size within each industry.

1975

In January 1975, approximately 1,000 additional companies with 100–1,000 employees were added to address declining response rates in this size class.

1978

Beginning in January 1978, data from the 1975 supplemental sample—despite a response rate of about 60 percent—were incorporated into the survey panel and used in monthly estimate calculations. Due to poor response rates among companies with fewer than 100 employees, this group was dropped from direct collection; instead, estimates were produced using industry-level movements reported by larger firms.

Subsequent Years

Over time, the selection criteria shifted from employment size to value of shipments to improve response rates. Staff intensified outreach to large nonreporting companies and requested additional industry categories from large, diversified firms. Ongoing letter campaigns targeted industries with low response levels.

1990

A probability sample of roughly 400 midsize plastics companies was drawn to assess the feasibility of probability sampling in industries dominated by smaller, less diversified firms. These efforts resulted in adding 45 to 55 percent of firms contacted to the panel, although respondent attrition continued to offset gains. At this point, the panel represented approximately 60 percent of total manufacturing shipments estimates.

2007

In January 2007, approximately 380 nonreporting companies were added to improve coverage in low-response industries. The “M3 Augmentation Project” achieved a response rate of roughly 69 percent; however, due to dropouts, overall panel coverage remained at about 60 percent of total manufacturing shipments estimates.