NIST Economic Analysis Brief 11

NIST Customer Demographics: Calibrations

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Abstract
This economic analysis brief summarizes the efforts and results of the data collection and analysis of NIST's calibration customer information. Summary statistics for calibration customers are provided for fiscal years 2010 through 2015. Included in the analysis are demographically descriptive variables such as the age, location, North American Industry Classification System (NAICS) codes, number of employees and geographic distribution of NIST calibration customers. Overall, these features provide an understanding of the demographic characteristics of entities that purchase calibration services from NIST.

Key Findings
- NIST calibration customers are geographically well-dispersed across the United States and tend to be in urban/suburban areas.
- The majority of completed calibration services are for organizations that are at least 20 years old.
- The clear majority of NIST calibration customers have less than 500 employees at the site of the requested calibration.

Key Words
calibration; customer demographics; technology transfer.

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1 INTRODUCTION

Within the National Institute of Standards and Technology's (NIST's) Physical Measurement Laboratory (PML) is the Calibrations Group. "The calibration services of [NIST] are designed to help the makers and users of precision instruments achieve the highest possible levels of measurement quality and productivity". Currently, the group offers calibration services in the following metrology areas: biomedical, dimensional, electromagnetic, environmental, ionizing radiation, mechanical, optical radiation, thermodynamic and time and frequency. (NIST, 2018)

Assessing the demographics of NIST's calibration customers allows NIST to acknowledge the diverse types of businesses, academic institutions and other organizations that depend on NIST to calibrate devices to industry standards and requirements. This brief offers a formal, first-look into the geographic and demographic nature of NIST calibration customers.

2 HYPOTHESES

For NIST to better understand its customers, analysis was needed to answer questions about the composition and location of these entities. Where are NIST's calibration customers geographically located in the U.S.? Furthermore, can we classify the locations of these customers into categories that help us understand the likelihood of purchasing NIST calibration services? What are the ages of the customers that come to NIST for calibration services? Lastly, are NIST's calibrations customers primarily small or large based on the number of employees at the company?

To answer these questions through testing, the hypotheses and supporting reasons for them are offered below:

1. Customers are distributed throughout the United States due to the wide range of calibration services provided by NIST.
2. Calibration customers are mainly in urban areas due to the evidence that these are often areas where high-tech and innovative firms are located (Maggioni, 2002).
3. The majority of NIST's customers have established themselves many years before purchasing calibration services or are returning customers over extended periods of time. This is based on the notion that repeat customers are more likely to request NIST calibrations services due to the need for equipment recalibration.
4. Most calibration customers will be small in terms of employees at each specific location. This is most likely due to small organizations, or specific branches of organizations, that depend on calibrated equipment to perform their missions. Small businesses are those with 500 employees or fewer, as defined by the Small Business Administration (Small Business Administration, n.d.).

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Testing these hypotheses will aid NIST in understanding the characteristics of its calibrations customers.

3 METHODOLOGY

The Calibrations Group submitted a set of calibration transactions for analysis. Information for each calibration service included: Service ID number, start and end dates and company name and address.

With the assistance of Dunn and Bradstreet (D&B), a single DUNS number was selected for each company requesting a service. A DUNS number is a unique identifier that is used in creating a credit file and maintaining a record of information for many businesses and organizations (Dun & Bradstreet, n.d.). The process of obtaining data included reviewing each transaction individually, contacting companies directly to update their D&B profiles, and assigning the most appropriate DUNS for each customer.[1]

Dunn and Bradstreet returned a dataset for each calibrations customer that included information about the industry classification, geographic location, urban and rural classification, the year in which the company was founded and the number of employees for each company location. From the calibrations originally submitted, the sample size was refined to 711 calibration customers throughout FY 2010 through 2015 for which D&B returned available data.

4 DATA AND RESULTS

4.1 CUSTOMER BUSINESS CLASSIFICATION: THE NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS)

The Federal standard for classifying businesses is the North American Industry Classification System (NAICS). For each customer, the primary NAICS code was identified. Out of 711 customers, there were 157 unique NAICS codes. The most frequent NAICS code, accounting for 7% of customers, was "Testing Laboratories." The second most frequent NAICS was "Other Measuring and Controlling Device Manufacturing" (6%), and the third was "Instruments and Related Products Manufacturing for Measuring, Displaying and Controlling Industrial Process Variables" (5%).

[1] Interactions that were associated with internationally-based companies were removed from the dataset due to the unavailability of foreign DUNS numbers. The quantity and quality of the data retrieved from D&B were based upon D&B's respondents. Unfortunately, some DUNS numbers did not provide any information and others were incomplete. For DUNS numbers that were labeled as "out of business", every effort was taken to find the appropriate match.

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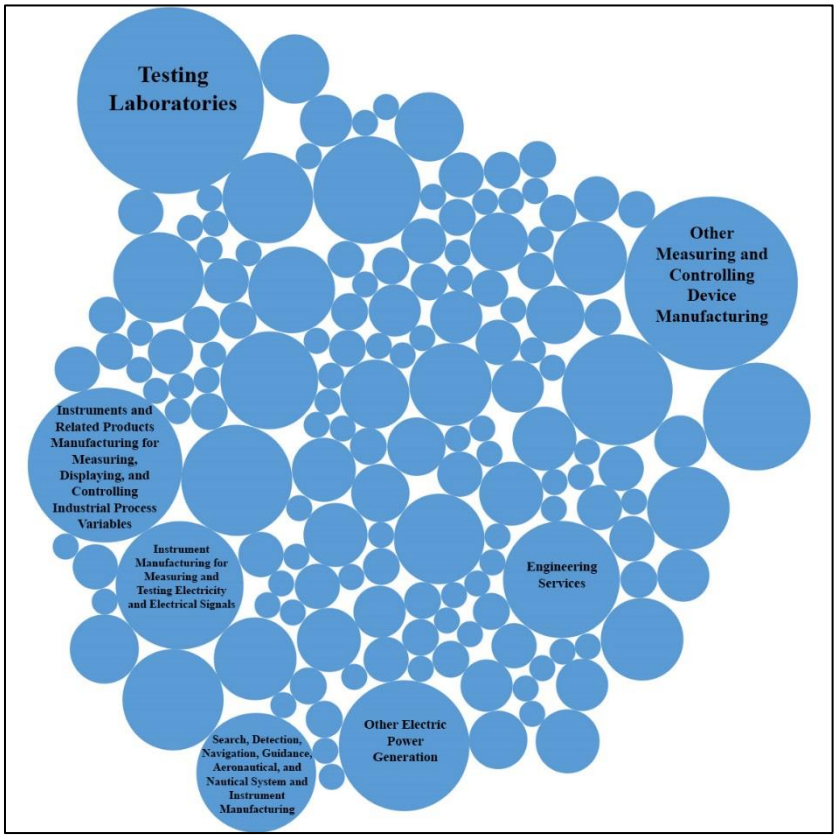
A packed bubble chart of calibration customer NAICS codes can be found in *Figure 1* below. The bubbles with a frequency greater than 15 are identified. It is clear from the bubble chart that calibration customers come from a wide range of industry classifications.

Figure 1 - Packed Bubble Chart of NIST Calibration Customer NAICS Codes



4.2 CUSTOMER LOCATION: GEOGRAPHIC LOCATION AND CLASSIFICATION

The 711 customers studied in this report were located in 44 states and the District of Columbia, as shown in *Figure 2* below. California had the largest number of calibrations customers (97), followed by Ohio (39) and Pennsylvania (38). These three states accounted for 24% of calibration services customers.

Geographic classifications were identified for 304 customers. Fifty-three percent were in urban or suburban environments (75 and 85, respectively). Seventeen customers were located in a rural environment. Three customers were located in a residential environment. One-hundred and eight customers were in industrial environments, and the remaining 16 identified themselves in undefined, or "other", locations.

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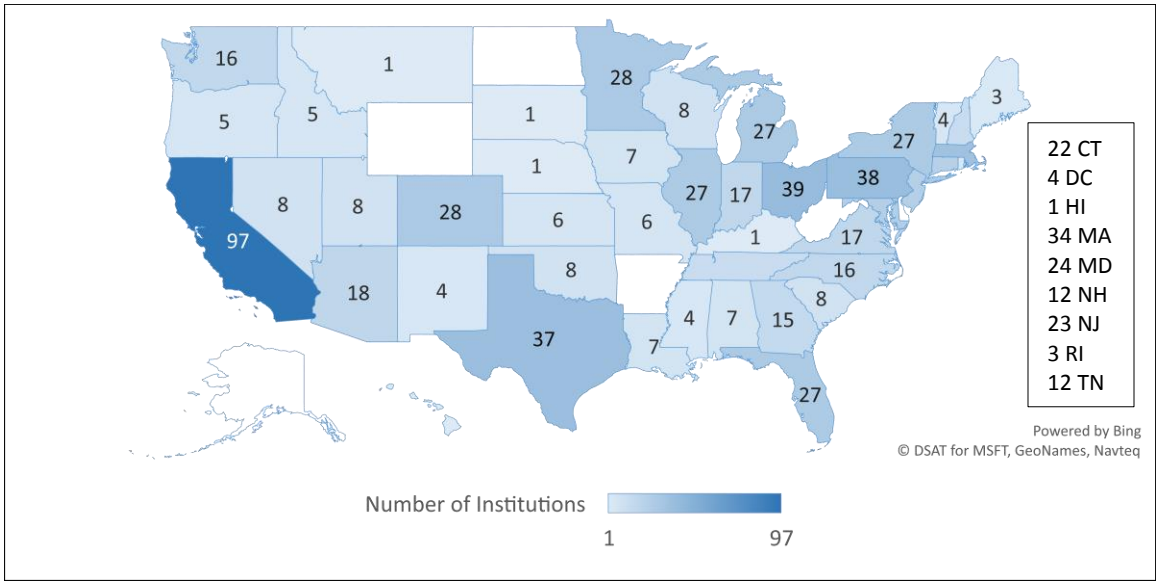
The expectations about the geographic locations of NIST's calibration customers were confirmed. While three states (California, Pennsylvania and Ohio) host almost a quarter of calibration customers, the customers are distributed across nearly every state in the country. This demonstrates that NIST calibrations services are widely used throughout the United States.

Figure 2 - Geographic Location of Calibrations Customers[2]



4.3 Customer Age: Age at Calibration Initiation

Four hundred and thirty-one customers reported the year their business started. Using data on both the date the customer was established and the date the calibration service was initiated, the age of the customer when the calibration was initiated was generated. As shown in *Figure* 3, 11% of customers were 5 years old or less at the time of calibration initiation. The definition used herein, as provided by the U.S. Department of Commerce Annual Report on Technology Transfer, identifies that these customers are considered start-ups or young companies (U.S. Department of Commerce, 2015). Customers aged 6 to 10 years comprise 8% of the subset of data, while those 11 to 20 years of age represent 19%. Customers that are 21 years old or older make up 62% of those represented in the data. This subset of data has a positive skewness of 2; therefore, is not normally distributed. The mean customer age of the data subset is 37 years old, the median is 28 and the standard deviation is 34[3]. The results for the distribution of ages of these customers are consistent with the hypothesis that most calibration customers would

[2]Certain commercial equipment, instruments, or materials are identified in this paper in order to specify the experimental procedure adequately. Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that the materials or equipment identified are necessarily the best available for the purpose.

[3] Evidence of a representative sample of NIST Calibration Customers could not be obtained due to the non-normal distribution of the subset of data on partner age and a lack of information about the ages of the larger dataset.

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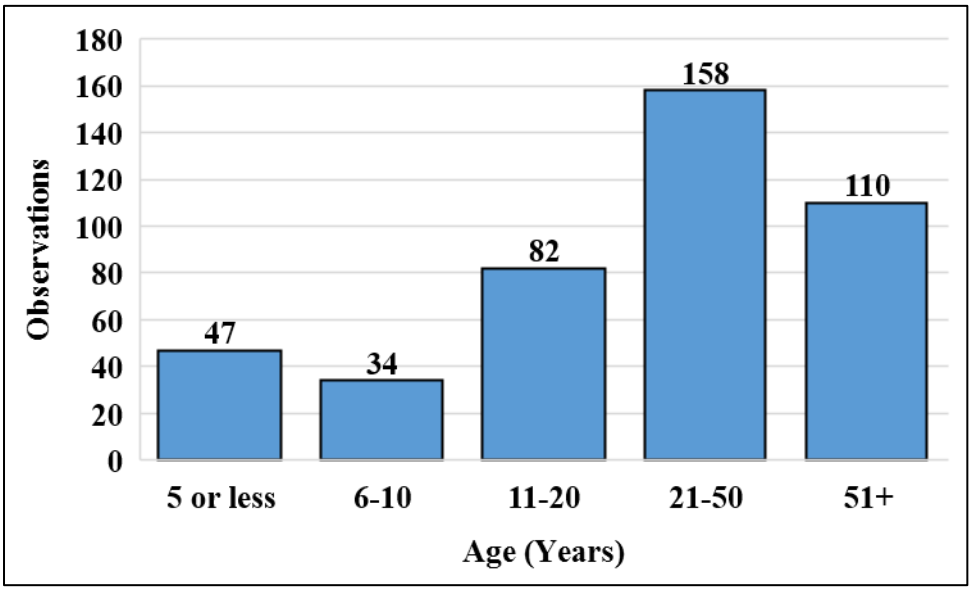
be among well-established companies due to the return of companies to purchase calibration services over time.

Figure 3 – Customer Age at Time of Calibration



4.4 CUSTOMER SIZE: NUMBER OF EMPLOYEES

Six-hundred customers identified the number of employees located at the specific location associated with the DUNS number.[4] Eighty-eight percent of the customers had less than 500 employees at the specific site, as shown in *Figure 4* below. Using the definition provided by the Small Business Administration, these customers are classified as small. These findings are consistent with the hypothesis that most customers that purchase NIST calibration services would have fewer than 500 employees at their locations.

[4] If a company has multiple locations, only the number of employees at a specific location associated with the DUNS number is reported.

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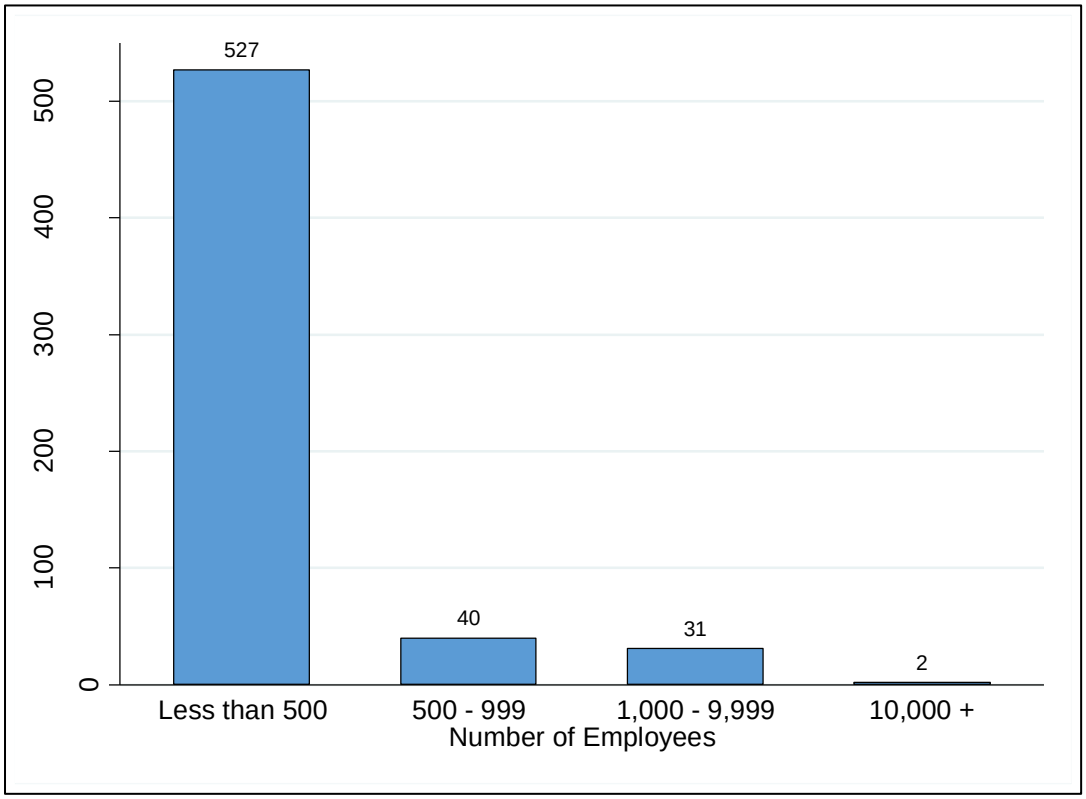
Figure 4 - Calibrations Customer Employment



5 CONCLUSION

This study highlighted characteristics of NIST calibration services customers. There are many industries that NIST supports by offering calibration services. The most calibration requests came from industry classifications such as “Testing Laboratories,” “Other Measuring and Controlling Device Manufacturing” and “Instruments and Related Products Manufacturing for Measuring, Displaying and Controlling Industrial Process Variables.” The analysis of geographic locations reveals that NIST’s calibration customers are geographically well-dispersed across the U.S., with the highest concentration of customers in California, Ohio and Pennsylvania. Furthermore, almost three-fourths of NIST calibration customers operate in urban or suburban areas. NIST’s calibration services are typically sold to older organizations that have been in business for at least a decade. Many of these customers are also considered small based on the number of employees reported at each location.

Future analyses can utilize these characteristics to produce case studies regarding the impact of calibration services on NIST customers over time. Each case study could focus on a specific company and look at different variables (sales, demographics, employees, finances, social media, etc) to examine calibration customer performance before and after

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calibration services were purchased from NIST. These variables may come from the D&B-provided data, as well as additional surveying.

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