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GOODS MOVEMENT STUDY IN ILLINOIS: APPLICATION TO FREIGHT TRANSPORTATION AND LOGISTICS

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| 16. Abstract This report details the results generated by a recently completed nationwide online freight establishment study. The survey was assembled with the intention of allowing the formulation or enhancement of new or existing freight-demand microsimulation models. Within this report is an overview of the steps taken in designing and implementing the establishment and shipment questionnaires of the freight survey. Following that is a descriptive analysis of the results of key questions posed in our survey. Over the course of the study, 966 usable establishment surveys and 1,844 shipment forms were collected and assembled in a database, an adequate number for modeling purposes. | | | | | |
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EXECUTIVE SUMMARY

This report describes the methodology and results of an online freight establishment survey. The survey was designed to shed light on freight shipping practices and to further develop an associated freight-demand microsimulation model. The model can be then used to better inform investment decisions and ease policy assessment. In dealing with the well-known difficulties in securing survey responses, a variety of approaches were implemented. The individual success rates and financial costs of such contact methods as personal telephone calls, web crawling, and mass e-mailing are detailed in this report. On the basis of the response rate, the mass e-mailing approach was selected as the most cost-efficient method of contacting companies.

A preliminary version of the survey was designed and later refined according to the input obtained from knowledgeable informants in the field of freight transportation and online surveys. The survey had three major sections: relevant characteristics of the establishment, information on five recent shipments, and optional contact information. A marketing-data company was hired to send recruiting e-mails with an embedded link to the survey on behalf of the University of Illinois at Chicago (UIC) research team to randomly selected firms in the United States. The main survey was carried out in two waves from February to April 2011. Each wave was followed by two weekly e-mail reminders.

The e-mails were sent to firms in all 50 U.S. states, with a focus on the Midwest region, defined as Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. In total, more than 249,000 contacts were attempted in all 50 U.S. states, resulting in 1,003 surveys completed. After the cleaning of the collected data, 966 usable surveys, with 1,844 individual shipment forms, were obtained. This response rate indicates both the difficulties and the expense in collecting information considered sensitive by potential respondents, as well as the importance of maximizing one's response rate using proven methods.

Respondents from a diverse range of industry types participated in this survey. Thus, various commodity types are covered in the survey. Detailed information about establishments and logistics decisions was obtained from the completed surveys. Extracted from the many questions posed in the survey, general trends among participants can be assembled. The survey revealed these establishments to overwhelmingly be manufacturing based with a focus on machinery or production of metal products. Light trucks are more likely to be used than heavy trucks, and fewer owned is more common than more owned. Shipment loads are most commonly under 10,000 lb, and trucking is always used as the mode of transportation 62.9% of the time. More detailed information and a complete descriptive statistic analysis are presented in this report.

In the end, the level and quality of data collection were found to be sufficient for our purposes. The data presented here represent the wide range of current circumstances that existing freight establishments operate and develop under. Its collection contributes greatly to freight modeling in its detailed and contemporary information, and its broad, nationwide scope.

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CHAPTER 1 INTRODUCTION

The volume of freight flows within the United States has almost doubled the rate of the population increase over the past three decades (TRB 2008). According to the most recent nationwide Commodity Flow Survey (CFS), more than 13 billion tons of goods, valued at nearly \$12 trillion, were moved throughout the United States in the year 2007 (BTS 2008b). Between 2002 and 2007, the United States incurred a 6.9% increase in ton-miles shipped by private and for-hire trucks, from approximately 1.26 to 1.34 trillion. Over the same period, the average distance traveled per trip by trucks increased from 168 miles/trip to 203 miles/trip, a 20.7% increase in just five years (BTS 2008a). Combined with this increasing trend of freight flows, freight-shipping behaviors are becoming more complex. The growing trend toward new delivery methods, such as just-in-time or outsourcing to a third-party logistics company (3PL), rapid changes in supply chain structure, and technological advancements have made freight decision-making procedures more sophisticated. On the other hand, recent advances in modeling techniques, specifically microsimulation models, have revolutionized the modeling practice. These robust tools can be used to account for complex interactions between freight decision makers and markets in the freight system. The tools offer a better understanding of national or regional freight activities and thus provide effective demand forecasting and policy-assessment instruments.

Knowledge of the current patterns of freight activities and decision-making processes are important aspects in the development of these modern models. Thus, a fundamental part of each freight study is conducting surveys and obtaining required data. However, it is not an easy task to obtain through surveys comprehensive and reliable data on behaviors associated with freight transportation. Many decision makers are unwilling to participate in surveys that inquire about their shipping decisions because the information is an important part of their business strategy; understandably, they fear jeopardizing their competitive edge by participating. This results in generally poor participation rates for freight surveys and makes them very expensive, even if successful, in many cases.

There are three main types of freight surveys: business establishment surveys, roadside surveys, and vehicle owner surveys (McCabe 2007). Each of these methods has its pros and cons. For example, an establishment survey, which is the most common type of freight survey, can provide valuable and detailed information on shipments and an establishment's specifications. However, this method is more costly than others in terms of dollar per response (Chow 2004); and often, only limited information can be collected about the shipping process, such as delivery route and delivery time, because respondents may not be involved in the actual shipment activities. Roadside surveys are less common and more difficult to conduct because they require close collaboration with police or other law enforcement agencies to intercept vehicle drivers for interviews (Allen and Browne 2008). Moreover, with this method, only information that drivers actually know can be gathered, such as origin, destination, and vehicle type. Finally, vehicle owner surveys attempt to obtain information from truck drivers or owners; and, like the roadside method, they provide information only on topics that drivers or owners might be aware of.

In this study, the research team at the University of Illinois, Chicago (UIC), conducted an online freight establishment survey. The survey covered all 50 states in the United States and provides detailed and valuable information about shippers, receivers, and shipping processes in a wide range of industry classes and for different commodity types. This report describes the methodology and results of the completed online freight establishment survey.

The survey was designed to shed light on freight shipping practices and to further develop an associated freight-demand microsimulation model. The demand model can be

used by elected officials and transportation planners to make better investment decisions and policy assessments. In dealing with the well-known difficulties in securing survey responses, a variety of approaches were implemented. The individual success rates and financial costs of such contact methods as personal telephone calls, web crawling, and mass e-mailing are detailed in this report. On the basis of response rate, total cost, and convenience, the mass e-mailing approach was selected as the most cost-efficient method for contacting companies. The survey was conducted in two waves between February and April 2011, polling freight shippers across the United States.

As noted, business establishment surveys often result in low response rates because freight decision makers are unwilling to give information about their logistics strategies. Thus, considerable attention should be paid to designing and developing survey questions that fit the study's purposes and that are asked in an effective form and format. Also, to obtain reliable results, a careful examination of the response patterns is required and, if necessary, special treatment of the data should be conducted before analysis. If a survey is designed in a way that a group of recipients with specific characteristics are more likely to participate, collected data will be biased, and all the modeling results will be questionable (Heckman 1990).

This report incorporates the methodology, design, and results of the UIC establishment survey. Chapter 2 presents a brief overview of freight data-collection efforts in the past, which were used as guidance in this study. The methodology, design of the survey, and challenges in obtaining the data are discussed in Chapter 3. The results of the survey and descriptive statistical analysis performed on the collected data are presented in Chapter 4. Finally, Chapter 5 provides a summary and conclusion of what has been done in this study.

CHAPTER 2 BACKGROUND

An accurate, comprehensive, and reliable dataset is a very fundamental part of developing a freight-modeling framework that could be obtained from survey. The literature review presented in this section focuses on presenting a background of efforts on freight establishment surveys and discusses different contact methods used in those surveys, such as mail-in/mail-out, online, and telephone methods.

The establishment survey is the primary method used in freight studies and may target the shipper, carrier, or receiver of shipments (Allen and Browne 2008). This method can provide more valuable information about shipments than other methods such as a roadside survey or vehicle owner survey. However, the establishment survey is the most expensive method in terms of dollars per response (Chow 2004). The Commodity Flow Survey (CFS) is the main data source for freight shipment activities of domestic establishments in a diverse range of industry types (BTS 2008b). However, information is not released at the disaggregate level because of the sensitivity of the data collected. Therefore, currently, CFS can be used only as a baseline for a large-scale freight movement study in the United States, with a supplementary survey being conducted in the studies that require more detailed analysis.

Establishment freight surveys vary in both geographical and business coverage. For instance, Holguin-Veras et al. (2006) looked into the shipping behavior of the restaurant sector in Manhattan with respect to four policies that were designed to encourage off-peak deliveries. The survey questionnaire was designed based on 17 interviews with business executives and was distributed to 600 restaurant owners, from which 68 completed questionnaires were obtained. Another establishment survey was conducted in the New Orleans metropolitan area in 2005, providing information from 170 establishments (Parsons and Cleckley 2005). Although they focused on a wide range of businesses, most of the recipients (around 75%) were from the service sector. A fairly large freight survey in the Netherlands also targeted more than 10,000 establishments, from which 1,529 completed questionnaires were obtained (Iding et al. 2002). The primary goal of this survey was to make a freight trip-generation model that takes into account the industry types. This survey was large in scale, reaching 5,000 firms in Randstad, the densely populated western part of the Netherlands, and an additional 5,000 in other parts of the country. Although this was a large survey in terms of the geographical coverage and industry types, only general questions about the establishments were asked.

The University of California, Irvine, carried out a freight operator survey at the state level (Golob and Regan 2002) in 1998. The survey was conducted using computer-aided telephone interviews to obtain survey answers. They randomly contacted 5,258 firms and collected 1,177 surveys from participants. The results showed a response rate of 35% from firms with large numbers of trucks that could be included in the survey.

The Oregon Department of Transportation (ODOT) conducted nine pilot studies and one statewide survey in 2002 (Lawson and Strathman 2002). The objective of the pilot studies was to investigate the efficiency and usefulness of different types of survey deployment. These included various mail and telephone methods, such as call-back and mail-back reminders, and in certain cases included paper copies of the Oregon highway map as a gift. The results of pilot studies revealed the need for person-to-person interaction, multiple contact attempts, and an up-to-date database of potential contacts. After feasibility evaluation, a telephone survey method was selected as the preferred method because it obtained a higher response rate. The selected method was used in two surveys, one on large trucking firms and another on smaller firms, with response rates of 61.1% and 56%,

respectively. The official nature of the study and the official truck-registration database used as the contact list for the survey might be the main reasons for the extremely high response rates.

In 2005, Cambridge Systematic conducted two surveys for the improvements of the travel-forecasting model of the Maricopa Association of Governments (MAG), one an operator survey conducted by telephone interview and one involving truck trip travel diaries completed by drivers. After a pretest, the study was executed for 3,276 companies in the Phoenix Metropolitan Area. The operator survey concluded with 562 completed surveys. The usable responses for the trip diaries were limited to 236 trip diaries received from 46 companies (5 per company). The study recommends using at least two pretests to experiment with multiple contact approaches (Kupman et al. 2008).

Large-scale freight surveys have also been conducted in Canada. Around 7,300 business establishments in Calgary and Edmonton regions in Canada were interviewed about their commercial movements on an assigned day (Hunt et al. 2006). This survey provided information of roughly 37,000 tours and 185,000 trips within the Calgary region. In another effort, some valuable information about truck tour formation was obtained and adopted in Ohio for developing urban freight models (Hunt and Stefan 2007). Patterson et al. (2007) also performed a stated-preference survey in the Quebec City–Windsor corridor to test the difference between 3PLs and other shippers in mode choice behaviors. This survey is the only recent one in Canada that did not focus on urban freight and that also considered truck–rail competition and its effect on an intercity corridor. Nearly 400 shippers participated in this study. Roorda et al. (2007) conducted the Region of Peel Commercial Travel Survey, focusing on urban goods and services. The survey had two major parts, namely a shipper survey and a driver survey, as well as some information about the establishments' shipping behavior and truck tour formation (McCabe 2007; Kwan 2007). Trucks were also equipped with a GPS unit in the driver survey component, which was novel in freight surveys. The GPS data provided unique and valuable information about truck routing, which could be used with the establishment information to make behavioral urban freight models. Although this survey has the information for 597 establishments, only 86 drivers provided input to the GPS survey.

There have been freight data-collection efforts elsewhere, some of which are briefly discussed here. Wisetjindawat and Sano (2003) carried out a freight survey in the Tokyo Metropolitan Area to develop a truck logistics model. They did not take into account other modes of transportation and focused only on urban freight. In 2009, the Department of Infrastructure, Energy and Resources (DIER) of Australia conducted three surveys on freight movement in the island state of Tasmania (Tasmania DIER Freight Survey Data Summary, no date; Tasmania DIER Freight Survey Discussion Paper, no date). The surveys inquired about shipping information such as origin and destination, shipment weight and value, mode, vehicle type, and port of entry. The results are used to estimate freight flows on major highways and railways and to evaluate the stress placed on the most congested ports.

Norojono and Young (2003) also performed a stated-preference survey in Java, Indonesia, to explore truck and rail competition in goods movement. This shipper's survey was later used in other studies (Arunotayanun and Polak 2007). In India, Shinghal and Fowkes (2002) carried out a similar study on a limited scale and asked 32 firms in six industry sectors to fill out an adaptive stated-preference survey about their freight modal selection behaviors. The very small sample size, however, could make any similar survey open to serious questions. Catalani (2001) also discussed freight data limitations in Italy and performed a similar survey to shed light on freight-mode choice behaviors.

CHAPTER 3 UIC ESTABLISHMENT SURVEY

3.1 METHODOLOGY

The main objective of this study was to conduct a detailed freight establishment survey at the national scale. The geographic bounds of the study encompassed all 50 U.S. states, with specific focus on Illinois, and can facilitate analysis of the freight activities in Illinois and the Midwest region and their interactions with the rest of the country. The primary goal was to acquire detailed information about individual shipments and logistics decisions to obtain a better understanding of supply chain formation and complex interactions among decision-making units in the freight system. The survey was designed to gather comprehensive information on the logistics choices about shipping chain formation and to track the commodities from origin to destination through all intermediate stops. Therefore, the study findings could help modify ideas about freight modeling, which basically have been exported from passenger transportation models that have been seriously questioned.

The research team chose an online method to conduct the survey for several reasons. First, the resources required to conduct the survey method with the highest response rate, the roadside interview, were unavailable to the team; and furthermore, that method would have limited the type and length of questions one could ask. The participants in the roadside interview survey are truck drivers, who are not involved in decision-making process of logistics choices; and it is highly unlikely to obtain supply chain data from this type of survey. Because we had experience with online surveys, the data are collected automatically in a digitized format, and the data are easy to clean up and analyze, we decided to conduct an online survey.

We constructed the survey and chose an online data-collection medium. The basic schedule for survey delivery was set up, whereby one introductory e-mail was delivered initially and two weekly reminders followed. We selected Tuesday as the day to contact the participant in the business establishments because it is in the middle of the week and yet early enough that potential participants would have consecutive weekdays to read the e-mail and participate. The intended result of the establishment and shipment survey was sufficient responses by 1,000 shippers of freight.

A variety of techniques was employed to establish contact with potential freight survey participants and to encourage them to complete an online survey record. These include telephone introductions, e-mail blast campaigns, and web crawling. A more detailed description and a cost–benefit analysis of the different approaches used to establish contact with members of the freight shipping community and to collect survey responses are presented below.

Initially, believing that using undergraduate student callers would be more memorable, persuasive, and likely to instill a more pleasant attitude in potential participants toward the survey, approximately 27,600 telephone records were purchased from a data-marketing company. Up to ten students at a time were employed in making contact with the survey prospects via Voice over Internet Protocol (VoIP) tools. These calls were made between 10 a.m. and 4 p.m., Monday through Thursday, to maximize the chances for contact. The callers introduced themselves and the project and then attempted to procure e-mail addresses by which to deliver the survey. Contacts at participating freight companies were sent links to the survey through the online medium via e-mail. This method was used for 7 months from June 22 to December 2010 before being discarded as not fast or cheap enough for our needs. This method incurred expenses for a graduate student and an average of \$10 an hour for up to ten undergraduate students. Other costs included

maintaining the license with the online data-collection medium and the marketing-data company, which were both significantly discounted for a university research project. However, returns on the first wave of the survey were poorer than anticipated. After 4 months of work, merely 86 complete responses had been obtained, out of a desired 1,000 for the entire project. The result was a steep expense of \$310 per survey response, which might be acceptable for an industry-run survey of this caliber but was much higher than had been anticipated for a university research project. The response rate for the survey was 0.006143 records per contact attempt, based on 14,000 sought respondents.

The second approach, applied simultaneously, was a trial attempt at combing the Internet for potential survey contacts to speed the rate at which responses trickled in. The list procured for the telephone-call approach of the survey was used to provide an undergraduate worker with companies to research. After searching a firm's website, the student recorded the most relevant e-mail address, if possible, for the logistics manager. The desired order for contacts is presented in Figure 1.

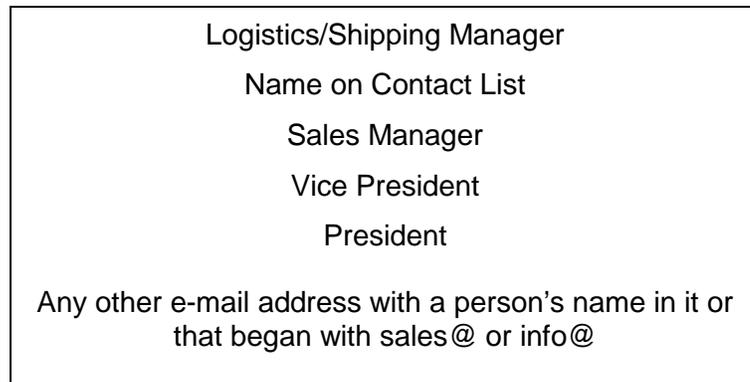


Figure 1. The desired order of contacting participants.

The designated person was then sent an introductory e-mail through the online data-collection medium. From 578 contacts, 326 e-mail addresses were gleaned. But only one company representative participated in the survey. In light of the extremely weak response, this technique was promptly abandoned. It may be the case that the lack of human interaction involved in this practice doomed the trial. Without anything more than an e-mail contact, the importance of the first few words becomes paramount; and the survey recipient has little to encourage his or her completion of the survey.

In another effort, a new approach—one that had proven successful in a previous UIC study (Wave 1)—was applied. This approach was also expected to save money over the unexpectedly expensive phone method of contact. An e-mail blast campaign was set up with the same data-marketing company, targeting over 100,000 potential participants nationwide. In the campaign, much as before, e-mails were sent to the representatives of freight-handling companies, with one introductory e-mail and two reminders. Unlike before, the e-mail addresses were simply rented from the data-marketing company and were sent by them without us being allowed to view the names and contact information of the recipients. In terms of final outcomes, this procedure was much more successful, both fiscally and quantitatively. The approach brought us much nearer to our goals but still required the rental of an additional 100,000 e-mail addresses before we were able to bring the survey to a close. The two e-mail blast campaigns were conducted between February and May 2011.

This wave (Wave 2) resulted in response rate of 0.003883 responses per e-mail contact made. The resultant cost per response in this method was \$52.15, significantly cheaper than the telephone method.

As noted before, to achieve the survey goals (1,000 completed surveys), another 100,000 firms had been targeted (Wave 3) to send the e-mail blast for an even more discounted price. However, owing to insufficient records to stratify the sample, the response rate was significantly less favorable, with a response rate of 0.001695 per e-mail sent and a cost of \$73.82 for each completed record. Some of the reasons for the lower response rate can be attributed to the geographic distribution of the wave, which did not include Illinois e-mail addresses and relied less on other Midwestern states, as all Illinois records and many from other Midwestern states were exhausted in the previous waves. Another possible explanation is that a sizable subset of the third wave may have been duplicative, either by contacting different employees with the same company or simply through error by the marketing-data company; these possibilities were not controllable by us because of the proprietary nature of the e-mail addresses (which were not available to us). However, the likelihood of this explanation is supported by the number of participants who complained of having received more e-mails than are sent in one wave. Table 1 summarizes the results of the survey and provides a comparison of the cost and response rates of each approach. The results show that although a group of well-trained telephone interviewers could obtain a higher response rate, the mass e-mailing method generally could be performed in a more cost-effective manner.

Table 1. Results of Each Survey Method

| | Successful Contacts | Attempted Contacts | Cost / Response | Response Rate |
|--------------------------|----------------------------|---------------------------|------------------------|----------------------|
| Telephone, Wave 1 | 86 | 14,000 (approx.) | \$310.02 | 0.61% |
| E-Mail, Wave 2 | 396 | 101,981 | \$52.15 | 0.39% |
| E-Mail, Wave 3 | 174 | 102,670 | \$73.82 | 0.17% |
| Internet Search | 1 | 578 | - | - |

In the end, it was seen that each reminder of the e-mail blast-driven waves of the survey served as a significant improvement in the total response count. The first 2 days after an e-mail blast was released featured sizable increases in the cumulative total, until the daily increase began to approach zero. Previous experience with e-mail blasts tells us that a fourth reminder has limited response potential and is especially bothersome to those who have already decided not to participate and have received three reminders already. The cumulative result counts are detailed in Figure 2. It should be noted that Wave 3 was delayed by 2 days by problems with the e-mail blast production. That survey was released on a Thursday instead of a Tuesday as normally done; therefore, it is represented on the graph as having begun on day 3 (i.e., Thursday).

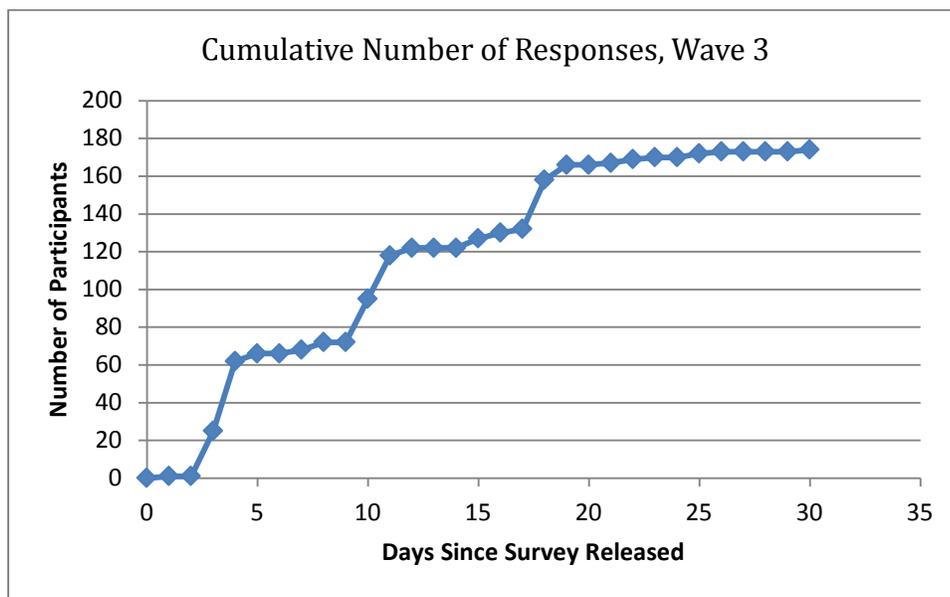
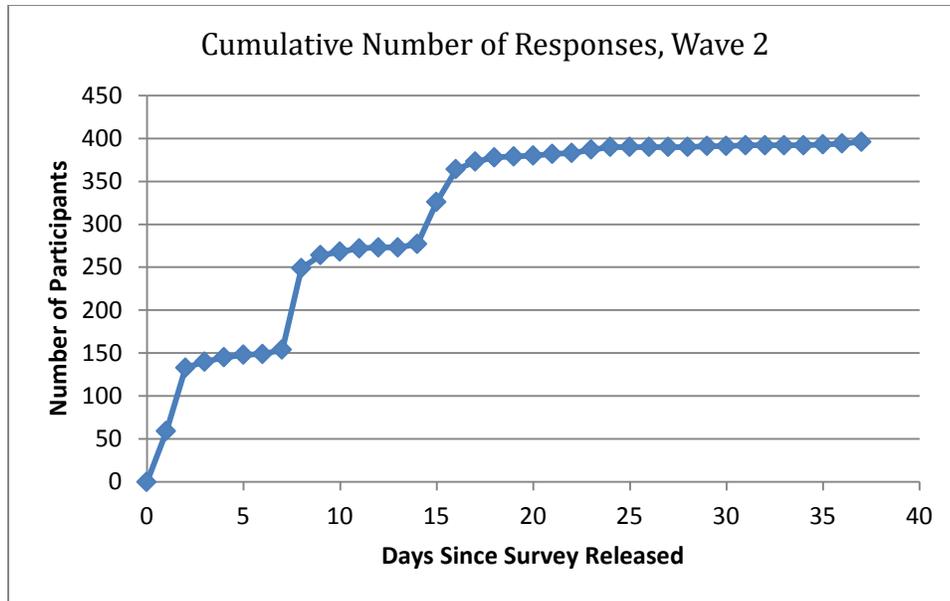


Figure 2. Cumulative number of responses.

The data collected ultimately featured a broad range of shippers from 48 of the 50 U.S. states, as well as the District of Columbia. Data recorded indicate a variety of numbers of employees, facility sizes, number of major suppliers, and a plethora of sample information regarding individual shipments. The data represent the collective behavior of the industry. The descriptive analysis of the dataset, cross-validation against other larger sources of data, and a non-bias analysis all prove its validity. Details and descriptive analysis of this information can be found in the next sections.

3.2 SURVEY DESIGN

The intended result of the establishment survey is sufficient responses by 1,000 shippers of freight, which will be later used to facilitate the development of a behavioral microsimulation of freight flow. Specifically, information on the logistics decisions and shipping chain had to be collected because such detailed information is not available publicly. An initial review of the freight-demand modeling studies, in addition to interviews with experts in the academic and industrial sectors, was undertaken before and during the questionnaire design phase to help the design and revision of the survey. A preliminary version of the survey was designed and later refined according to the information obtained from the knowledgeable informants in the field of freight transportation and online surveys.

The survey was divided into three basic parts: establishment information, shipment information, and survey evaluation/contact information. The entire survey was labeled as requiring about 15 minutes to complete, though providing detailed answers and completing all pages may have required more time.

The first section, concerning details of the company itself, attempts to reveal the decision-making process that underlies the establishment. In addition to simple questions such as the location and square footage of the facility, this section inquired about the existing conditions and relationships, such as the number of daily inbound and outbound freight shipments and the distances to the firm's primary suppliers.

Shipment information was handled somewhat differently. Instead of asking about the general decision making, this section sought information on a specific recent delivery. It gleaned information on what the shipment was made up of, what path it took, when it traveled, and when shipment decisions were made. Blank shipment forms were available for participants to record up to five shipments, depending on how willing they were to participate.

The final section of the survey collected nonessential but desired information. The first part gauged willingness to participate in further surveys of varying types, including an upcoming GPS study, which could use this survey's information as a supplement. It then included space for leaving optional contact information and an evaluation of the survey.

An informative and believable introductory page to the survey was desired to ensure that survey readers trust the survey creators enough to divulge personal information. The logos of the academic and state sponsors were proudly displayed at the top of the page. The rest of the introduction ensured the reader of confidentiality and of what the survey entails. Figure 3 shows the introductory page of the survey.

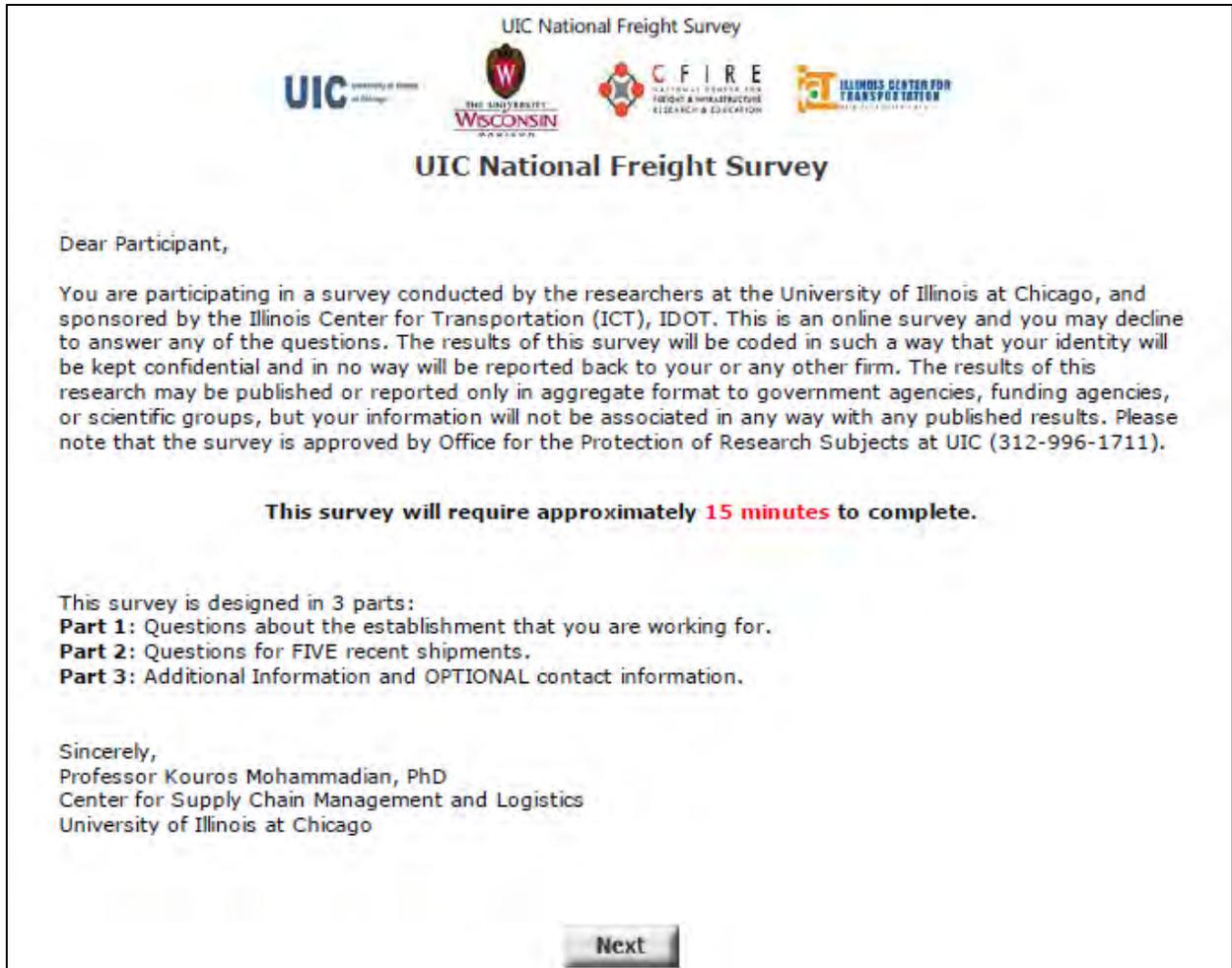


Figure 3. Survey introduction.

A diverse range of questions in the survey inquired about fundamental information on a firm's specifications, logistics choices, and shipping decisions. The data gathered in the survey give a better understanding of the freight decision-making process and could depict a picture of freight activities at the national level. Table 2 presents a summary of questions asked in each section of the survey. The complete survey can be found in the appendix to this report.

Table 2. An Overview of Survey Questions

| Section | Question |
|---------|--|
| I | <ul style="list-style-type: none"> • ZIP code of the establishment. • Total gross floor area occupied by the establishment and the number of employees. • Primary industry type of the establishment. • Potential use of each mode of freight transportation by the firm. • Access to intermediate handling and intermodal facilities. • Warehousing situation in the company (owned/rented/outsourced). • Preferred characteristics in choosing a supplier. • Number and type of commercial vehicles owned or rented by the company. • Average number of weekly inbound/outbound shipments. |
| II | <ul style="list-style-type: none"> • Origin and destination. • Mode(s) of transportation used for the shipment. • Type, value, weight, and volume of the commodity. • Whether the shipment was Inbound/Outbound/Import/Export/Containerized/Damaged/NOT delivered on time. • Expected delivery time window at the destination. • Shipping chain of commodity and detail characteristics of the shipping chain, including Transportation mode, Cost, Delivery time, Waiting time, etc. • Decision-making unit (sending firm/receiving firm/a 3PL). • Whether the shipment was Fragile/Perishable/Dangerous/Expedited/Time-sensitive/Dry bulk/Liquid bulk. |
| III | <ul style="list-style-type: none"> • Company name, address, phone, and e-mail. • Survey evaluation. • Willingness to participate in another online/telephonic/mail-in–mail-out/in-person survey. |

The first page of the survey dealt with details relating to the firm as a whole. It was noted that, although exact numbers were preferred, approximate figures were acceptable. Many questions required only brief, fill-in-the-blank responses. These included inquiries into such basic facts as the establishment's ZIP code, total gross floor area, number of suppliers,

number of paid employees, number of shipments inbound and outbound, value of these shipments, number of trucks operated, number of weekly vehicle arrivals and departures, and the extent to which containerization and backhauling are used.

Also of interest to the survey creators were the details of supplier relationships, which can be used as key inputs for state-of-the-art freight activity-based models. For the three most significant suppliers of the firm, participants were asked to evaluate the approximate distance to those firms, the average number of orders with them filled per year, and the average annual value of orders.

The survey also asked respondents to rank items on a subjective scale. The assigned values of supplier characteristics, for example, can be used to prioritize firm relations in our microsimulation model. For this issue, criteria such as cost, distance, loyalty, and delivery were rated on a five-level scale from low to high. Other such scales were applied to mode and handling facility usage.

The survey's shipment form documents the circumstances surrounding the dispatching of individual shipments entering or leaving the facility. Simple descriptors such as inbound/outbound, import/export, containerized, and damaged are included, as are the shipping origin, destination, time, and value.

To investigate the actual trip chain layout, a table of dropdown and fill-in-the-blank boxes was provided to indicate the actual path taken by the shipped goods from origin to destination. Facility types such as ports, consolidation centers, and intermodal transfer centers could be selected. Interdestination travel details are also included, such as mode used, haul time from previous location, wait time at location, and total shipping cost. Figure 4 shows the table that participants saw.

Other questions included inquiries into decision scheduling, shipment timing, categorical descriptors of the shipment, commodity type, and impact of the worldwide economic downturn.

| For this shipment, please complete the transport chain from the first origin to the last destination that you are aware of. Choose the intermediate locations from the list and fill in the information about these locations. The first entry should be the first stop AFTER THE ORIGIN. | | | | | | |
|---|----------------------|------------------------|----------------------------------|---|---|--|
| | Facility Type | ZIP Code OR City/State | Mode used to reach this location | Haul time from previous location (with units) | Wait time at this location (with units) | Total shipping cost to this location (USD) |
| Intermediate Facility #1 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Intermediate Facility #2 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Intermediate Facility #3 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Intermediate Facility #4 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Destination | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Figure 4. Blank template for the documentation of a freight shipment chain.

3.3 METHODOLOGY CONCERNS

Despite our desire for the freight survey to be minimally burdensome and simple both to understand and respond to, certain realities of the freight industry and necessities in collecting data to our specifications hampered our attempts. During the pilot survey and the first wave, numerous survey participants notified us of survey concerns or shortcomings as related to their own business tasks. These comments were categorized and helped to direct our question formulation in subsequent waves.

The survey was often criticized as being too long. Consequently, many users failed to complete it, often quitting after the first shipment. The issue with survey length was largely unavoidable because of the number of shipment responses desired. The pages were ordered specifically to maximize the number of completed pages in order of importance. Consequently, the establishment page was filled out first, followed by the five identical shipment forms, with the hope that at least one would be filled out. There was a high attrition rate once users moved from Shipment 1 to Shipment 2, as the questions were identical and participants likely viewed the information as being redundant or the process irksome.

The other major drawback inherent in a long survey is that busier employees might not have sufficient time to address all or any of the questions posed. This possibility may have negative effects on the bias of our response, as busier firms would be underrepresented. It also may result in hastier responses and estimates that are less reliable.

Another concern was that the requested information was not always readily available to survey participants. The questions gleaned information on topics that varied from logistics to finances but were directed to only one employee. Compounded with the aforementioned busy schedules and survey length, this aspect made it difficult for contributors to complete the survey in one session. Unfortunately, the way the survey was set up, there was no way to save results or to forward the participant's work in progress to another employee at the company. A password-based system might have been beneficial, given these conditions.

CHAPTER 4 RESULTS

Many decision makers are unwilling to participate in surveys that inquire about their shipping decisions because such information is an important part of their business strategies; and understandably, they fear jeopardizing their competitive edge by participating. This results in generally poor participation rates for freight surveys and makes them very expensive in many cases. In total, over 249,000 contacts were attempted in all 50 U.S. states, resulting in 1,003 surveys completed. After the collected data were cleaned, 966 usable surveys, with 1,844 individual shipment forms were obtained. This response rate indicates both the difficulties and the expense involved in collecting information considered sensitive by potential respondents, as well as the importance of maximizing one's response rate using proven methods.

Before inferences could be made from the results, the data had to be properly prepared for examination. Survey answer formats were made uniform and sometimes filtered into usable ranges of values. This section of the report presents a preliminary descriptive statistical analysis on the data gathered in the survey. The descriptive statistical analysis performed on the data can be divided into two parts. The first part is related to the first section of questions in the survey, establishment information, and considers a firm's characteristics such as industry type, number of employees, preferred mode of transport, etc. The second part is related to the second section of survey, which asks about shipping information. This part presents a statistical analysis on the detailed information about the shipping process of participants firms.

4.1 ESTABLISHMENT STATISTICS

The geographical bounds of the study encompass all 50 U.S. states with a focus on the Midwest region, defined as Illinois, Iowa, Indiana, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. In Wave 2 of e-mail blasts, a sample of 100,000 e-mail addresses was rented from the marketing-data firm. The selection was stratified to national averages by industry and based on geographic location. All Illinois contacts were used. Up to half of the total contacts were selected from the Midwest. The remainder of e-mails was dispatched to companies in the other 42 states. In Wave 3, another 100,000 batch of e-mails was sent out to supplement the earlier wave to meet our target numbers. These two waves together provided an inclusive geographic coverage. Figure 5 presents the geographic distribution of surveys gathered from participants.

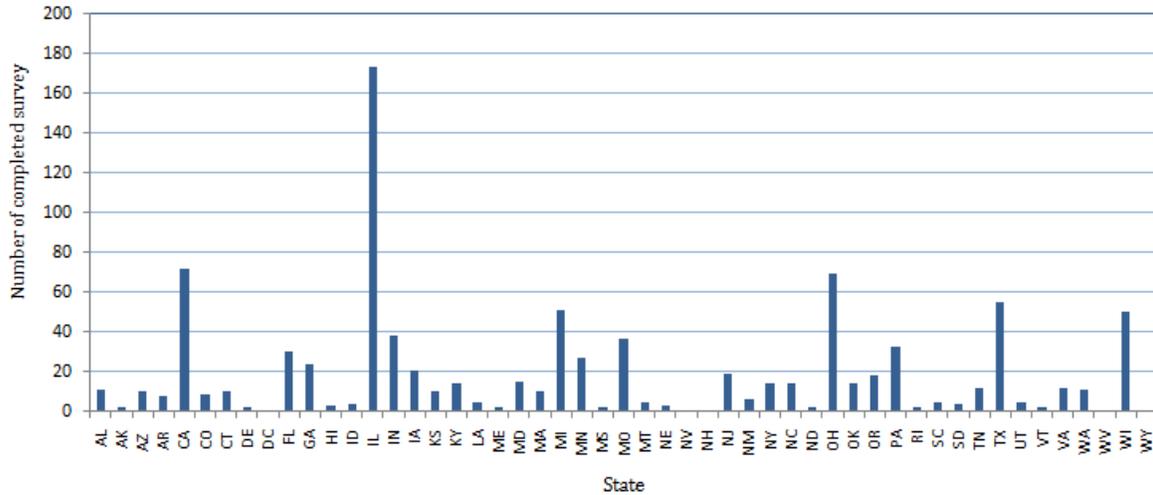


Figure 5. Geographic distribution of collected surveys

As the figure shows, results were obtained from participants in 49 states and the District of Columbia. Wyoming was the only unrepresented state, though potential respondents in the state were targeted in the survey. Illinois was by far the most represented state, with a participation rate of 18.2% from the various methods of contact. It was followed by California and Ohio with 7.6% and 7.3%, respectively. Analysis of the geographic spread on a results-per-contact-attempt basis was made on all three waves of the survey. Using this criterion, Missouri showed the highest response rate, at 5.02 records per thousand attempts. Illinois placed second with 4.63 and Indiana third with 4.11. The strength of the response in Illinois and neighboring states is likely due to participants' recognition of the university as being local and the survey therefore more relatable. In total, more than 49% of the participants were from the Midwest.

Respondents from a diverse range of industries participated in this survey. As Figure 6 shows, more than 50% of participants indicated "Manufacturing" [U.S. Census Bureau's North American Industry Classification System (NAICS) codes 31–33] as their industry type. After that, "Transportation and Warehousing" (NAICS 48 and 49) and "Wholesale Trade" (NAICS 42) industries have the highest shares, respectively. The "Mining, Querying, and Oil and Gas Extraction" (NAICS 21) was the least represented value, with ten responses, only 1.1% of the total respondents. The large gap between types is not especially strange, as the survey specifically targeted the manufacturing industry above all others.

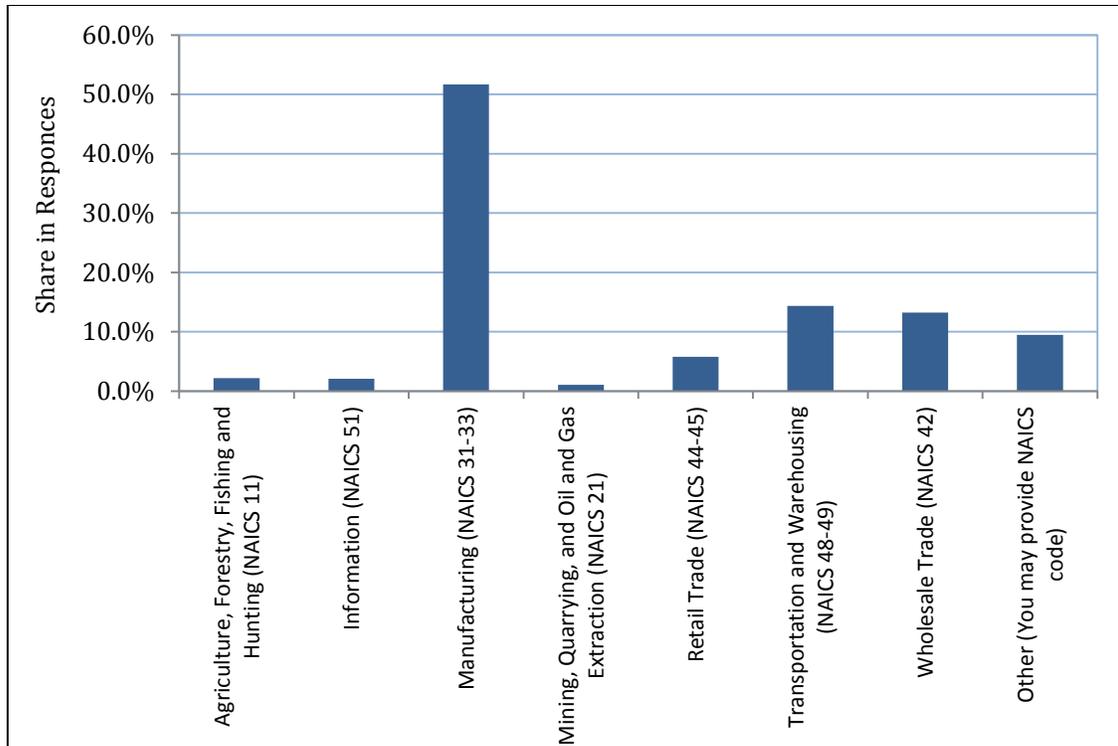


Figure 6. Share of industry types in the survey [types as indicated in the U.S. Census Bureau’s North American Industry Classification System (NAICS)].

Also, the dataset covers a wide spectrum of shippers in terms of number of employees, though the companies polled lean toward smaller establishments. Half of the participants were from a company with fewer than 50 employees, while 42% reported between 50 and 1,000 employees, and the rest were large firms with more than 1,000 employees. Figure 7 presents the distribution of participants according to company size in terms of number of employees.

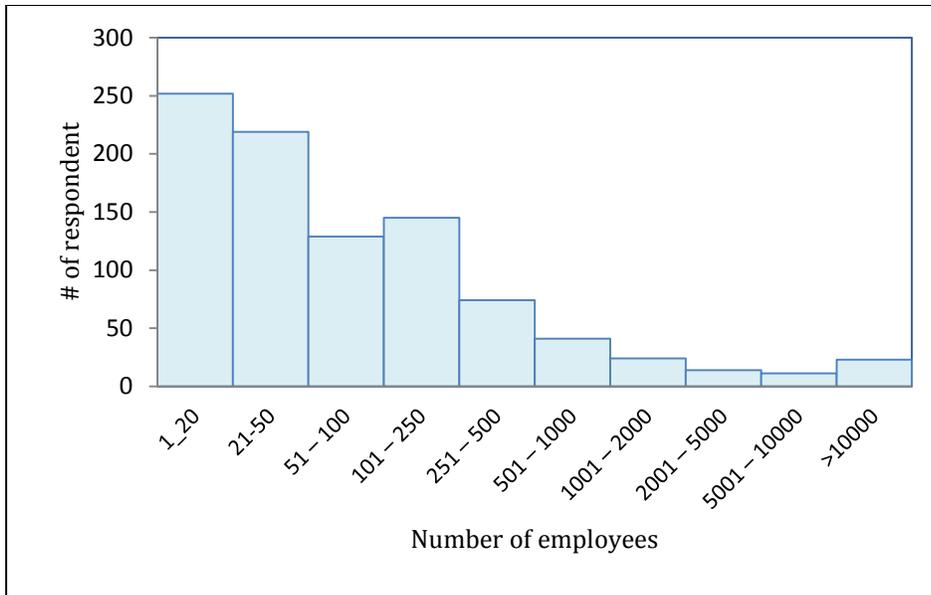


Figure 7. Distribution of respondents in terms of the number of employees in the company.

Another question asked in the survey refers to the floor area occupied by the company. As for inquiries into the physical size of these companies, small- to medium-sized companies were the most prevalent contributors to the survey. As Figure 8 shows, over half of the responses indicated between 1,001 ft² and 40,000 ft². Local maxima were found between 1,001 and 5,000 ft² and between 20,001 and 40,000 ft². Despite these peaks in surface area, a significant variety of firm sizes exists in our data.

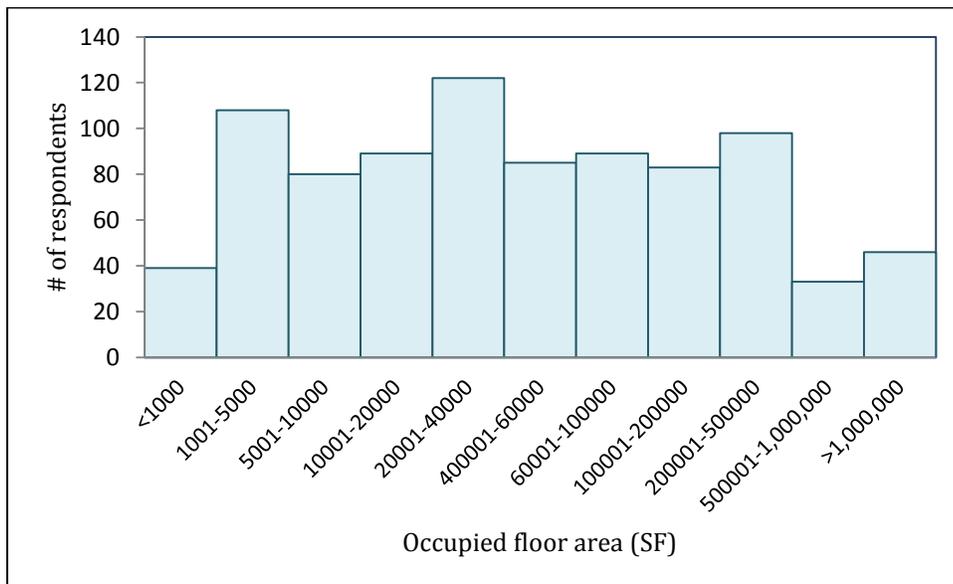


Figure 8. Distribution of occupied floor area for companies in the survey.

One of the important logistics decisions is supplier selection. We asked some questions in this survey to clarify participants' views on the effective criteria for selecting a supplier. In the survey, we asked the number of major suppliers that each firm has and the most significant criteria for choosing those suppliers. Figure 9 presents the distribution of the number of major suppliers in the survey.

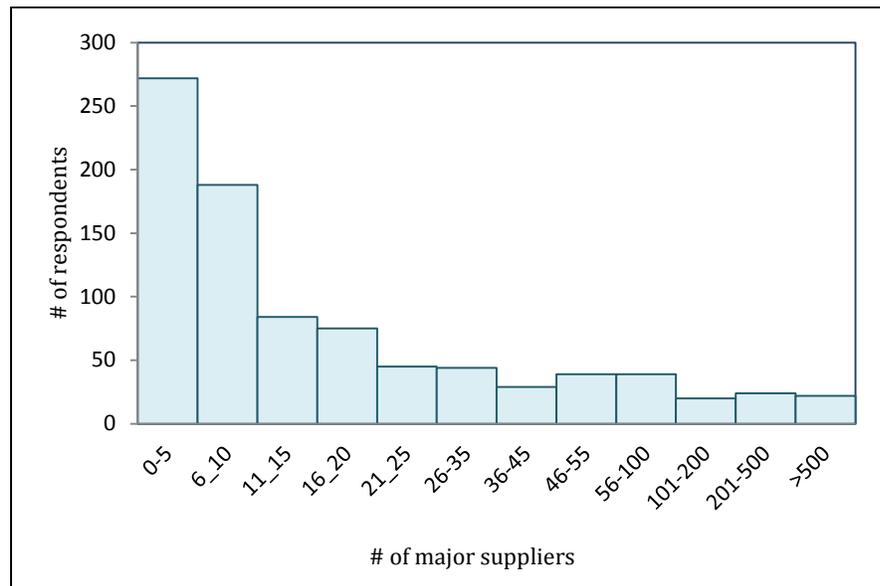


Figure 9. Distribution of number of major suppliers for companies in the survey.

On the basis of the literature review carried out before the survey was conducted, we chose eight characteristics to investigate their importance in selecting a supplier: cost, credit and finance, delivery, distance and convenience, loyalty, management and service, manufacturing capacity and reliability, and quality and technology. As we were unsure what variety of question would most revealingly display the characteristics of supplier selection, two questions were asked. In the interest of minimizing the burden for a respondent, some were asked the first version of the question and some the second. The first version asked participants to select the three most important criteria and to rank them from one to three. As seen in Figure 10, cost is the most represented factor when considering all three top spots together; but when considering only the top rank, then cost, manufacturing capacity and reliability, and quality and technology are roughly at the same level. The lowest ranked criterion is credit/financial status, with only one vote.

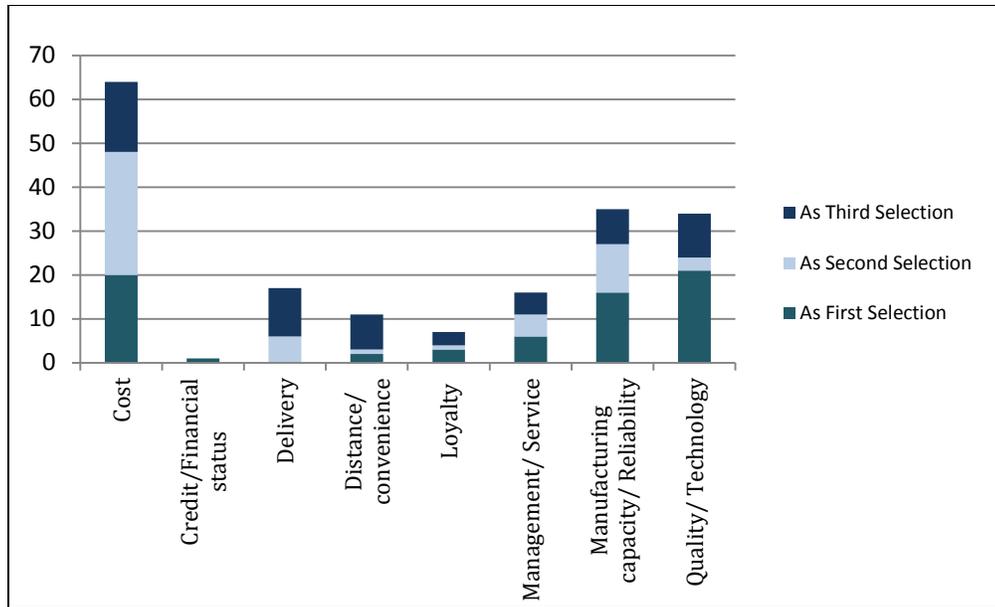


Figure 10. Ranked supplier selection criteria.

The second form of the question had participants rank every criterion on a scale from one to five, with one indicating low importance; three, medium; and five, high. Instead of simply asserting which characteristic was more valued, respondents could demonstrate how much more he or she valued a characteristic. Figure 11 shows of the average scores of supplier selection criteria in the second form of the question.

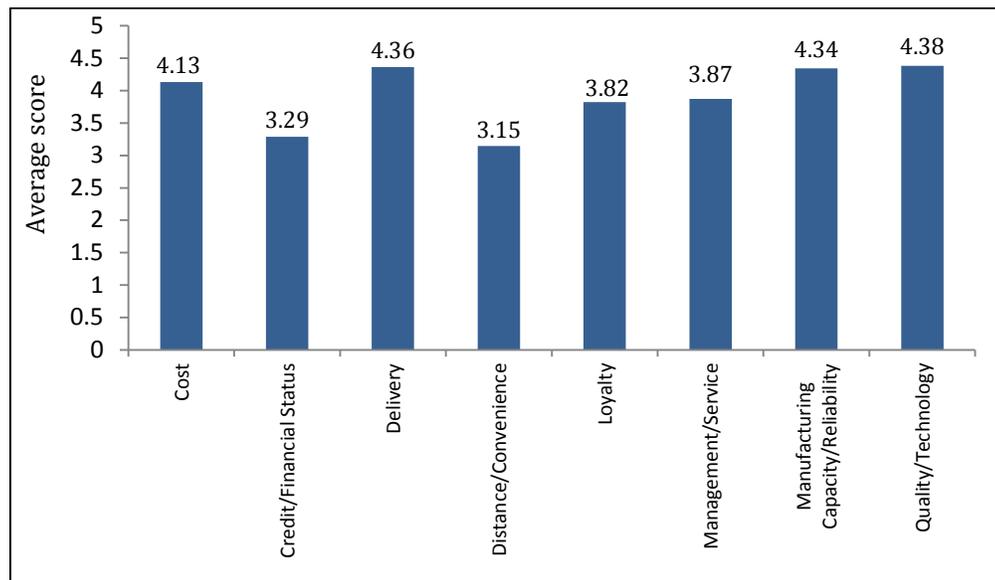


Figure 11. Average scores of supplier selection criteria.

As shown in Figure 11, these results paint a significantly different picture of how suppliers are chosen. All eight characteristics have been assigned values that average above the middle value of “medium,” indicating that none is generally considered to be of low importance. Cost, manufacturing capacity, and quality and technology are again given high values, though cost is ranked as lower than the other two factors. Surprisingly, the delivery criterion, which previously had been ranked as of lesser importance, with no first selections, now holds the second-highest overall ranking.

Figure 12 illustrates a more detailed demonstration of the ranking in the second form of the question. For each criterion, it shows the percentage of respondents who chose what rank (number) and how the average ranks are obtained.

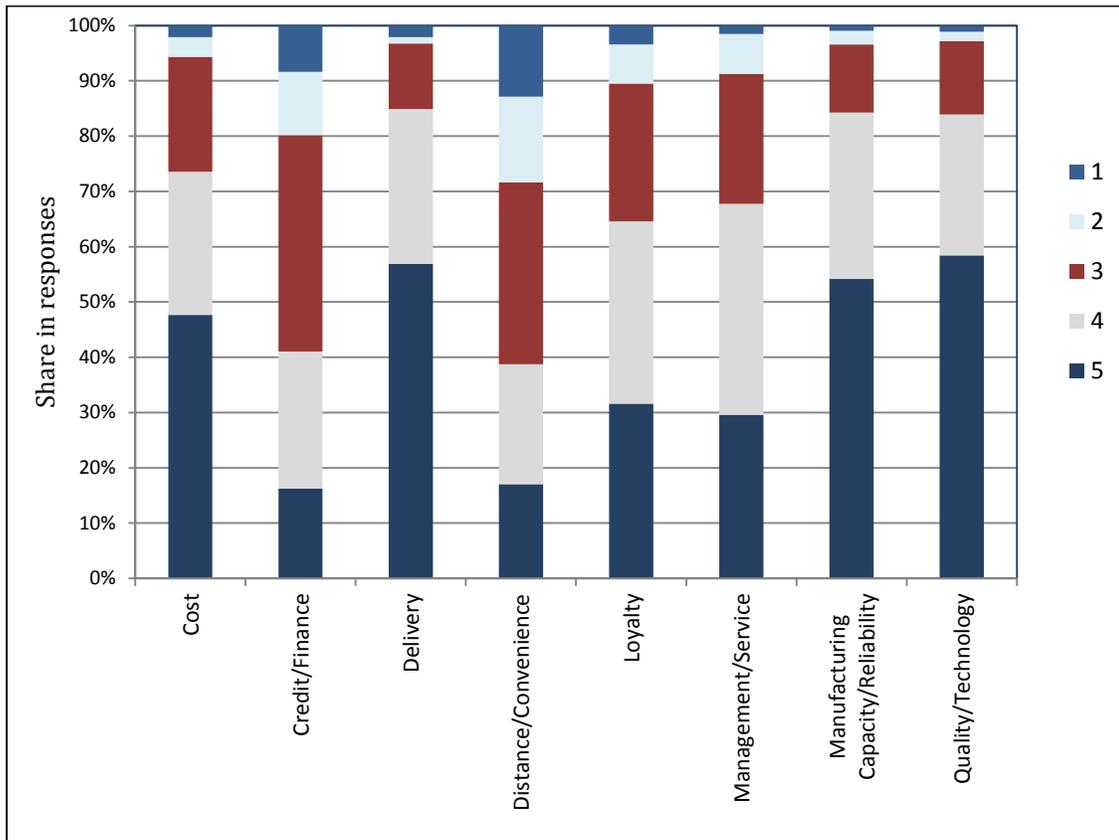


Figure 12. Detail scoring of supplier selection criteria.

To classify the firms by level of freight transport, we inquired about the number of private commercial trucks owned. The values input here may be significant in the development of the mode choice model. Vehicles were loosely categorized as light trucks or heavy trucks, and the values for each range were tabulated. The results leaned toward fewer trucks than more, with 138 firms having only one truck that fits the light-truck category and 47 having only one truck that fits the heavy-truck category. These values dropped off immediately, with there being 65 firms with two light trucks and 29 firms with two heavy trucks. The values can be seen graphically in Figure 13. Whereas light trucks generally

outnumbered heavy trucks if a company had fewer than ten trucks, for companies having more than 30 vehicles, it became more common to have heavy rather than light trucks.

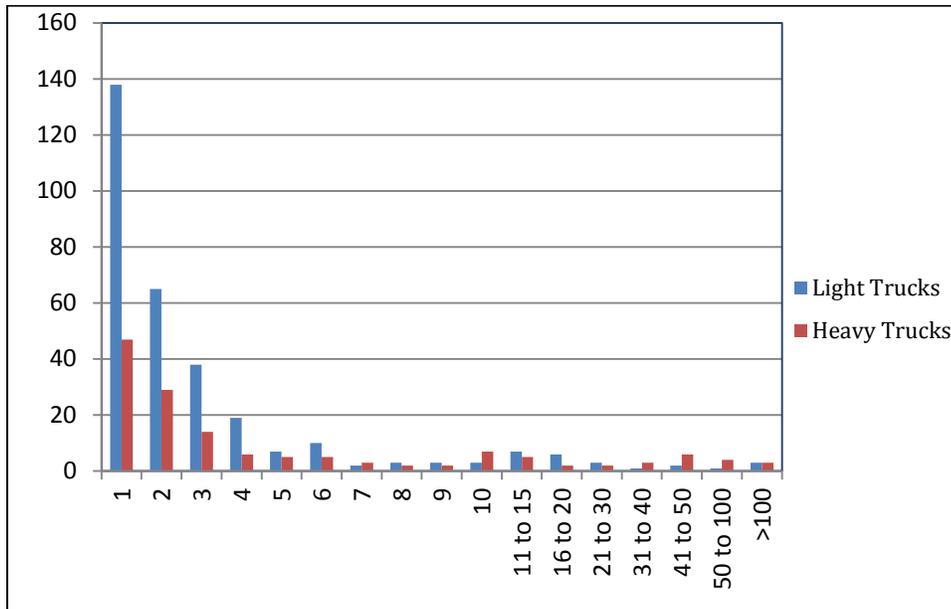


Figure 13. Commercial vehicles owned, by classification.

Respondents were also polled on their use of backhauling, the act of picking up goods when out on deliveries. Among the 346 respondents with at least one truck, 179, or 58.7%, denied partaking in the activity, while 126, or 41.3% did. On a per outing basis, 43.06% of trips engaged in backhauling. This indicator, with the related count performed of empty vehicles entering and leaving the firm, are key measures that will be used to perform network assignment in freight transportation models.

To better understand the transportation logistics decisions made by firms, it was decided to inquire about the level of convenience of various shipping facilities. The facilities chosen were Consolidation Center, Truck–Rail Terminal Facility, Distribution Center, Port, Airport, Warehouse, and Other Intermodal Terminal Facility. Participants could rank the facilities as low convenience, medium convenience, high convenience, or never used. In all cases, the never-used category was the dominant choice. Disregarding that choice, low and high were always the two with the highest representation, never medium, which was always second. Distribution Centers and Warehouses were the two categories in which high representation was predominant, indicating that they are more ubiquitous stops on shipping channels. All others had low levels of convenience as the general choice, signifying that those types of stops are much rarer. Figure 14 illustrates the results.

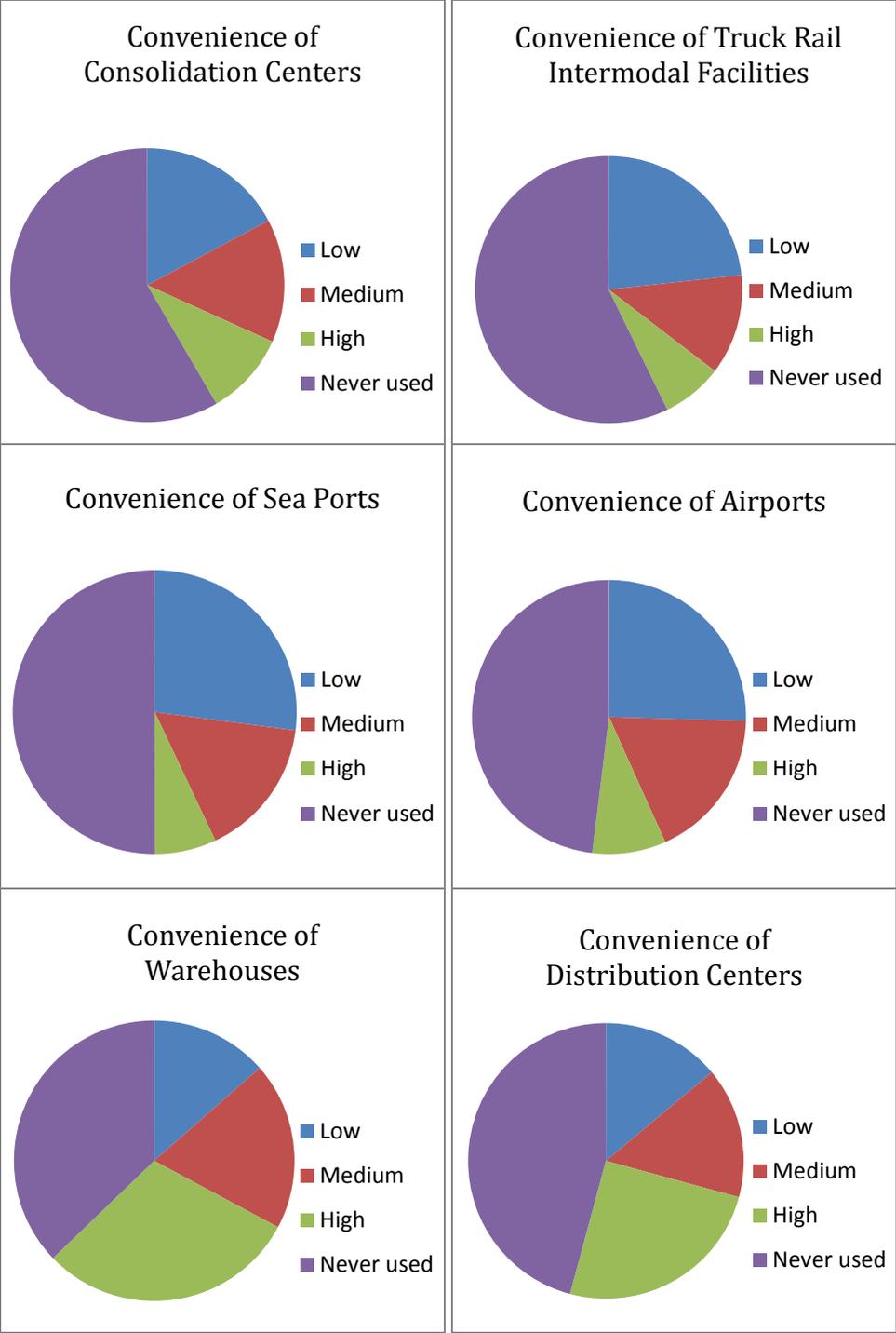


Figure 14. Convenience of intermediate handling facility.

Warehousing strategy is a major decision in freight policy making. In the survey, each participant was asked to explain his or her establishment's policy toward warehousing. Figure 15 shows the shares of respondents that do not use a warehouse; outsource to a 3PL; have their own warehouse; rent a public/private warehouse; or other.

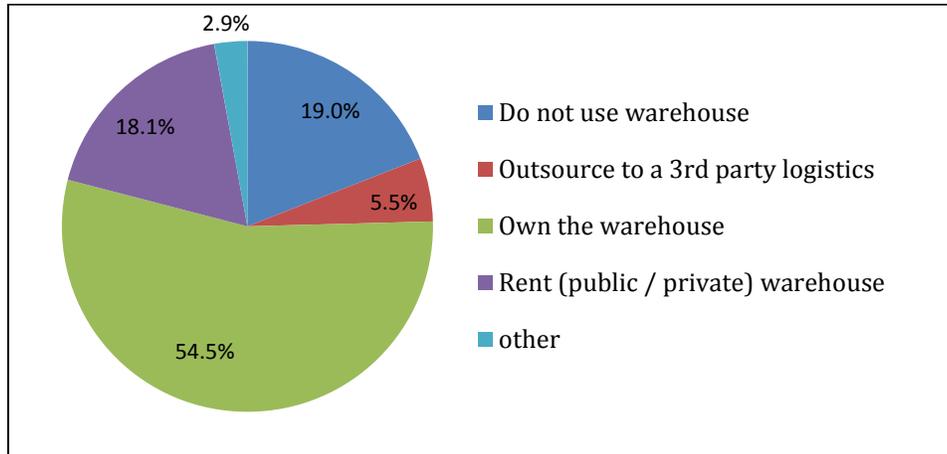


Figure 15. Warehousing.

In another question in this part of survey, participants were asked to state how different modes of transportation are considered as the potential mode for transporting their goods. Figure 16 illustrates how participants consider six modes of transportation (Truck, Rail, Truck–Rail Intermodal, Air, Marine, and Mail/Courier) as their potential mode of transportation. As Figure 16 shows, 'Truck' is considered the most desired mode of transportation, with a significant difference from responses favoring other modes of transportation.

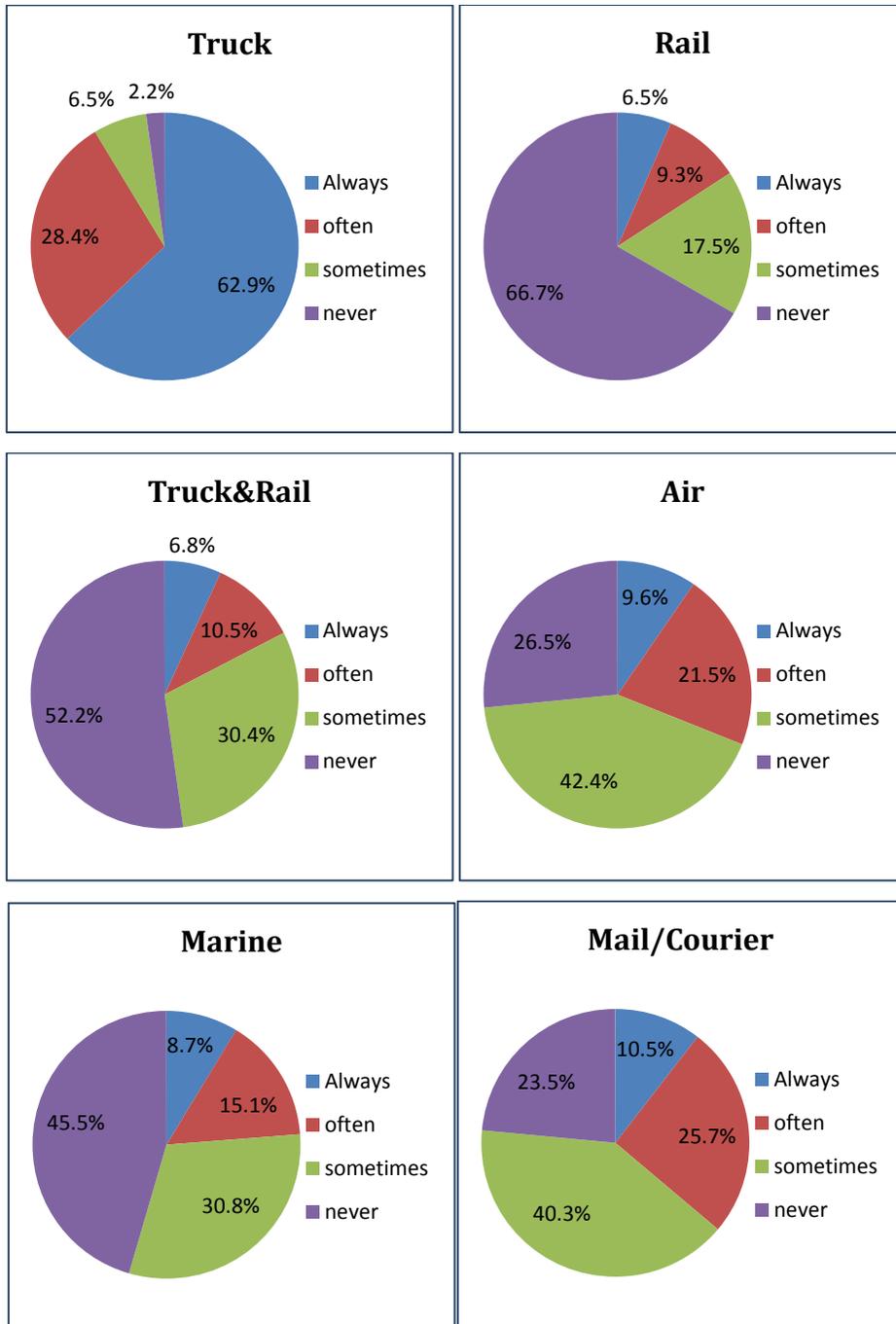


Figure 16. Potential modes of transportation.

4.1 SHIPMENT STATISTICS

As noted, 1,844 shipment forms were gathered from the survey. Because different industry groups were invited to participate in the survey, information on a diverse range of commodities was obtained. As illustrated in Figure 17, “Machinery and Metal products” has the highest share (25), while “Coal and minerals” has a share of only 1.4%. A considerable share of shipments is aggregated in the “Other” group of commodities by the participants, including commodities such as plastics, rubbers glass, and concrete products. With the data coverage over a wide variety of commodity types, the demand model will be able to account for commodity heterogeneity, which is an essential issue especially for a behavioral model.

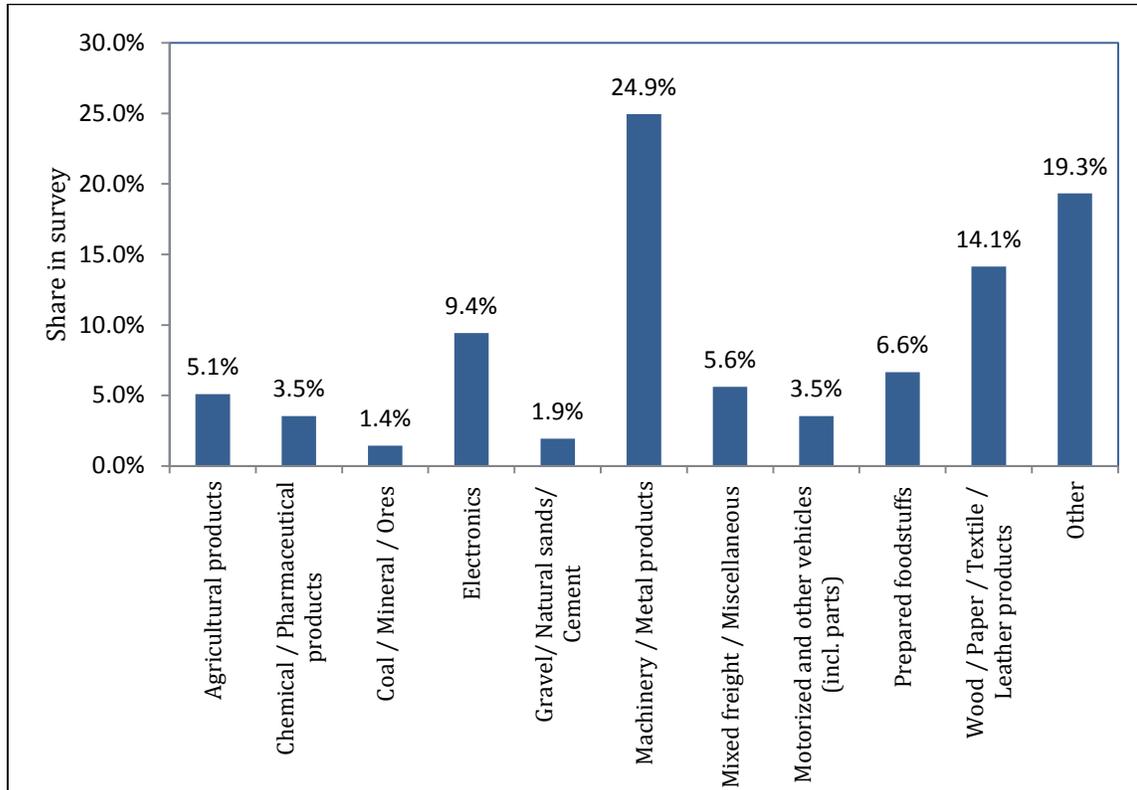


Figure 17. Commodity types in the survey.

The survey also asked about other characteristics of shipments. For example, the survey categorizes shipments into two main groups, called inbound and outbound shipments. Inbound shipments are deliveries to the establishment being surveyed, while outbound shipments are shipments sent out from the establishment. Of the shipments, 44.4% were inbound and 55.6% were outbound. Furthermore, respondents were asked about other shipment characteristics (such as being imported or exported, being containerized, being damaged in transit, and delayed delivery) to give a better understanding of a shipment’s condition and characteristics. Figures 18 and 19 present more detailed information about the shipments.

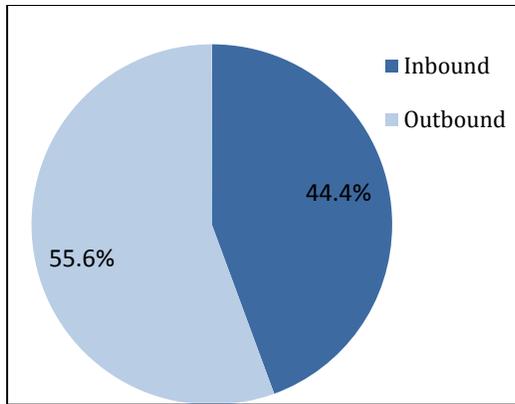


Figure 18. Inbound and outbound shipments.

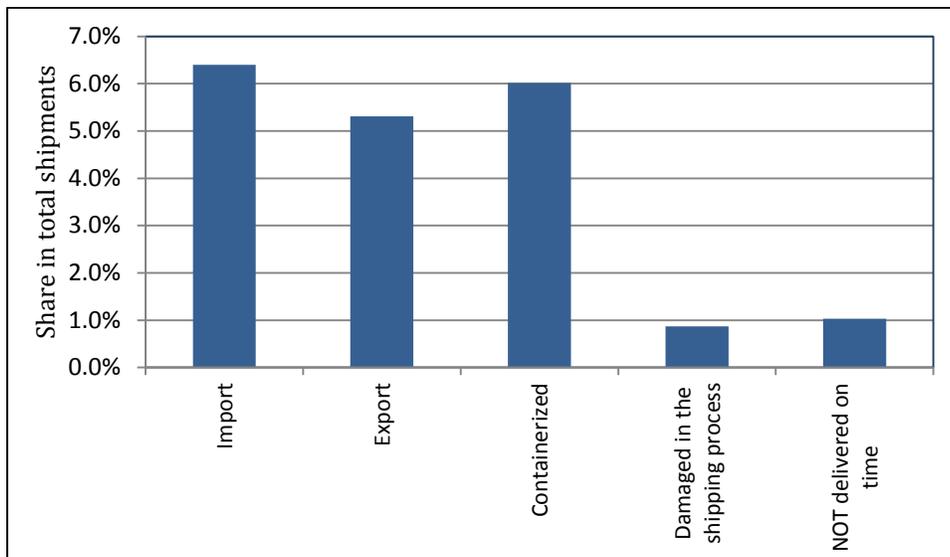


Figure 19. Shipments characteristics.

Also polled was whether the cargo being shipped fell under certain categories, which may allow for the better understanding and modeling of routes and time frames. These include fragility, perishability, time-sensitivity, whether or not expedited, hazardousness, and liquid or dry bulk goods. The last three of these variables are newly implemented, compared to our previous freight establishment survey. Many respondents answered for some but not all of these categories, so the number of responses ranges from 677 to 1,628, based on the categorical identifier. The most represented groupings were fragile (25.2%), expedited (16.8%), dry bulk (16.1%), and time-sensitive (14.7%). The others were significant but considerably lesser in number. Figure 20 present the results for this question about transported commodities.

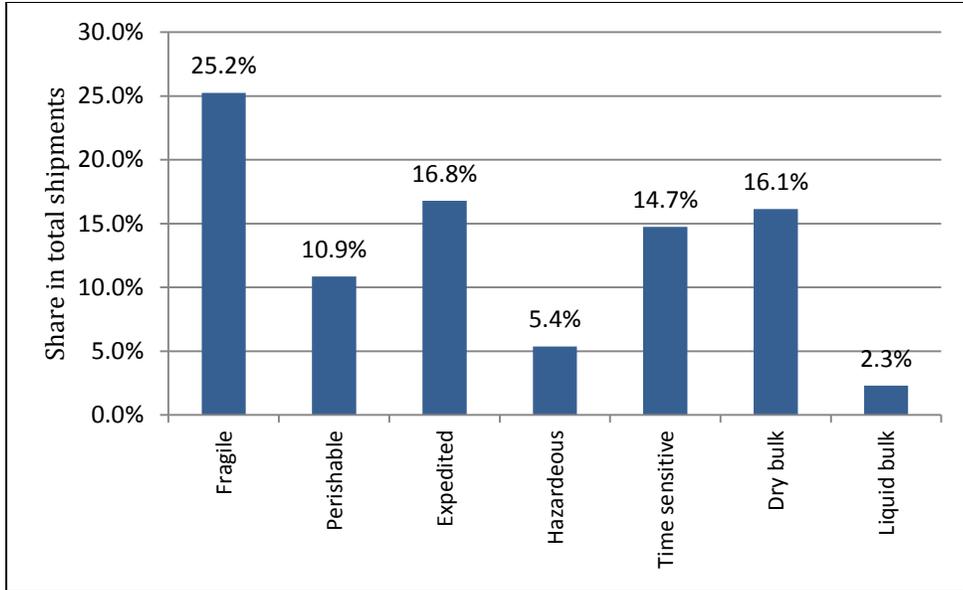


Figure 20. Commodity characteristics.

Figures 21 and 22 show the weight and value distribution of commodities shipped. By weight, shipments overwhelmingly consisted of goods falling in the ‘under 10,000 lb’ category. Sizable numbers of shipments were made in the ranges between 10,000 and 50,000 lb, but very few shipments were made that were heavier than that.

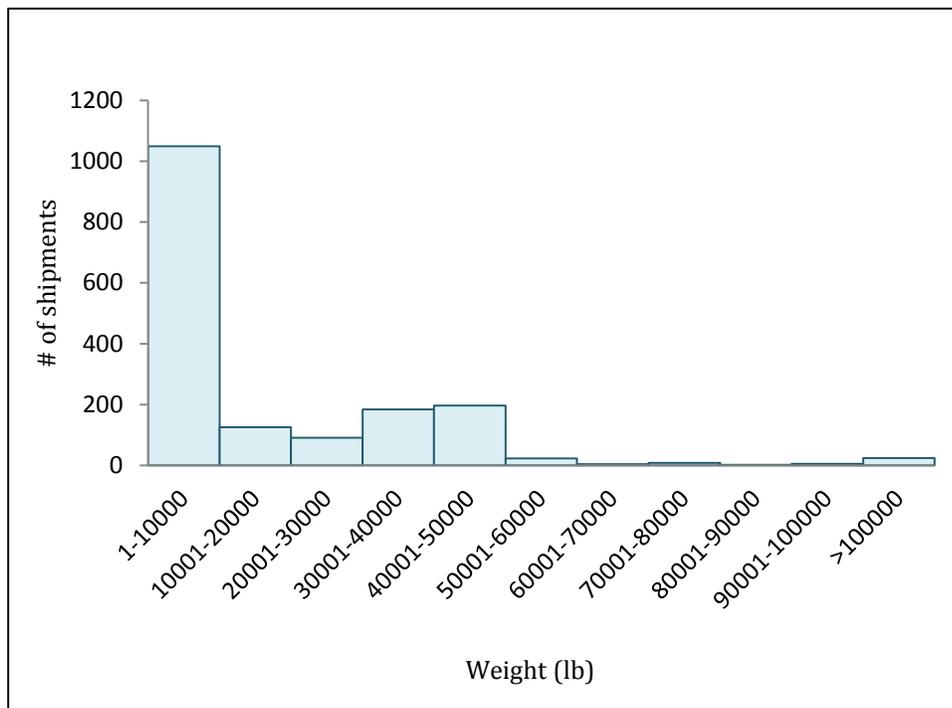


Figure 21. Weight distribution of shipments.

Categorized by value, the shipments observed congregate at the lower cost end of the scale. Value ranges have been further subdivided in that range to depict the distribution within the crowded \$1-\$5,000 range. Despite this tendency, multiple instances exist of shipment values falling in all categorical bins up to and exceeding \$1,000,000 in value.

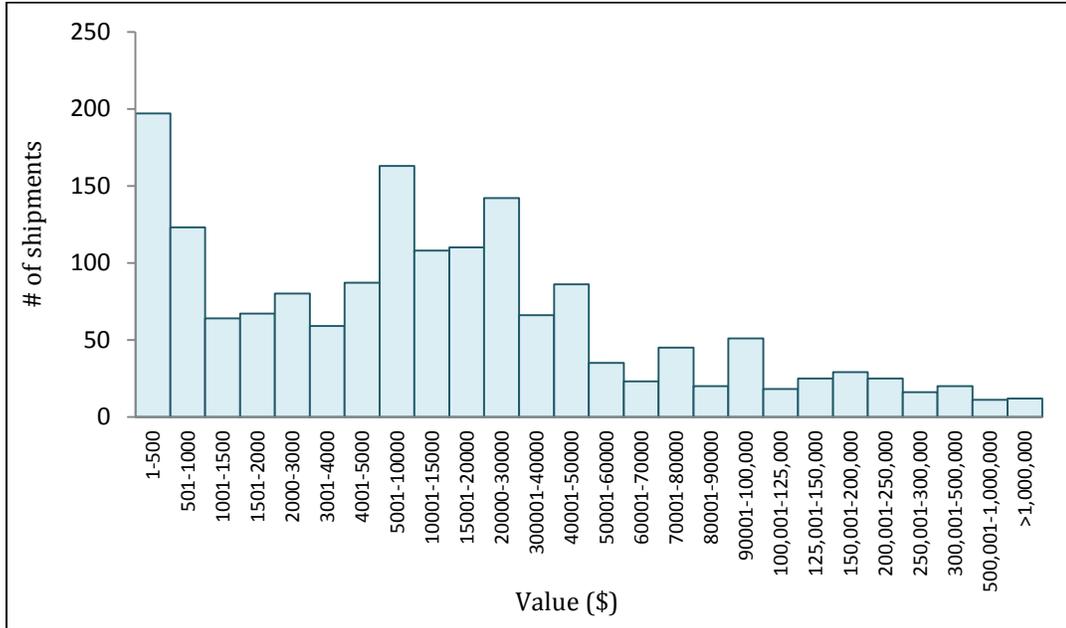


Figure 22. Value distribution of shipments.

CHAPTER 5 SUMMARY

Freight data are so valuable that some firms are in the business of collecting and analyzing it. A freight survey is always challenging because the target population is reluctant to participate, and the information to be collected often includes complex logistics decisions that may be hierarchical and/or interdependent. In addition, each contact is made under a severe time constraint because the respondents are typically surveyed while they are on the job. Thus, the survey structure and methodology are particularly crucial in carrying out successful freight surveys.

In this study, the development and implementation of an online national freight survey were discussed. This study detailed the outcome of the establishment and shipment survey conducted in 2010 and 2011 at UIC. This information was introduced as an affordable supplement to public freight data sources in the United States, to pave the way for future freight-demand analysis.

Despite its many complications and difficulties, the survey was successful in obtaining an adequate number of participant responses for our research needs. The experience gained in this endeavor will allow the survey administrators to better prepare for the data and participant needs of future studies. These needs include the evaluation of online survey software, participant feedback, experience with survey methods, and the fiscal viability of each method.

In total, 966 establishments participated in the survey, providing information on 1,844 shipments across the United States. Although online surveys are less costly than the other methods, their relative low response rate has to be carefully addressed. The data gathered can be used to formulate new or to enhance existing pieces of the freight model, such as the shipping chain and supplier selection process.

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APPENDIX SURVEY QUESTIONNAIRE

6/1/2011



Dear Participant,

You are participating in a survey conducted by the researchers at the University of Illinois at Chicago, and sponsored by the Illinois Center for Transportation (ICT), IDOT. This is an online survey and you may decline to answer any of the questions. The results of this survey will be coded in such a way that your identity will be kept confidential and in no way will be reported back to your or any other firm. The results of this research may be published or reported only in aggregate format to government agencies, funding agencies, or scientific groups, but your information will not be associated in any way with any published results. Please note that the survey is approved by Office for the Protection of Research Subjects at UIC (312-996-1711).

This survey will require approximately 15 minutes to complete.

This survey is designed in 3 parts:

Part 1: Questions about the establishment that you are working for.

Part 2: Questions for FIVE recent shipments.

Part 3: Additional Information and OPTIONAL contact information.

Sincerely,
Professor Kouros Mohammadian, PhD
Center for Supply Chain Management and Logistics
University of Illinois at Chicago

Next

Completed: 0%



UIC National Freight Survey

Part1: Information about Your Establishment

If you do not know the exact number for some of the questions, please provide approximate figures.

| For your establishment, what is the | |
|---|----------------------|
| ZIP code of your establishment? | <input type="text"/> |
| Total gross floor area occupied by your establishment (sq-ft)? | <input type="text"/> |
| Average number of weekly INBOUND shipments of any mode? | <input type="text"/> |
| Average number of weekly OUTBOUND shipments of any mode? | <input type="text"/> |
| Estimated total value of INBOUND shipments at this establishment in the past year? (USD) | <input type="text"/> |
| Estimated total value of OUTBOUND shipments from this establishment in the past year? (USD) | <input type="text"/> |
| How many MAJOR suppliers do you have? | <input type="text"/> |

| Please fill out the following regarding the major suppliers of your establishment. | | | |
|--|------------------------------|-------------------------------|--------------------------------------|
| | Approximate Distance (Miles) | Average Number of Orders/Year | Average Annual Value of Orders (USD) |
| FIRST major supplier | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| SECOND major supplier | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| THIRD major supplier | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| Please rank the following characteristics by how important they are in selecting a supplier. | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Low | | Medium | | High |
| Cost | <input type="radio"/> |
| Credit/Financial Status | <input type="radio"/> |
| Delivery | <input type="radio"/> |
| Distance/Convenience | <input type="radio"/> |
| Loyalty | <input type="radio"/> |
| Management/Service | <input type="radio"/> |
| Manufacturing Capacity/Reliability | <input type="radio"/> |
| Quality/Technology | <input type="radio"/> |

| Which category best describes number of paid employees at your company? |
|---|
| Please select one ... <input type="text"/> |

| Which of the following best describes your company's primary business? |
|--|
| <input type="radio"/> Agriculture, Forestry, Fishing and Hunting (NAICS 11) |
| <input type="radio"/> Mining, Quarrying, and Oil and Gas Extraction (NAICS 21) |
| <input type="radio"/> Manufacturing (NAICS 31-33) |

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- Wholesale Trade (NAICS 42)
- Retail Trade (NAICS 44-45)
- Transportation and Warehousing (NAICS 48-49)
- Information (NAICS 51)
- Other (You may provide NAICS code)

How are the following modes considered as a potential mode of freight transportation by your firm?

| | Always | Often | Sometimes | Never |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Truck | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Rail | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Truck-Rail Intermodal | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Marine | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Air | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mail/Courier | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

How many commercial vehicles are currently owned or leased by your business?

Light Trucks / Vans

Heavy Trucks / Trailers

What is the average number of weekly commercial vehicles arriving and departing your establishment?

| | Arriving | Departing |
|-------------------------|--|--|
| Light Trucks / Vans | <input style="width: 150px;" type="text"/> | <input style="width: 150px;" type="text"/> |
| Heavy Trucks / Trailers | <input style="width: 150px;" type="text"/> | <input style="width: 150px;" type="text"/> |

What is the average percentage of empty vehicles arriving and departing your establishment per week?

| | Arriving | Departing |
|-------------------------|--|--|
| Light Trucks / Vans | <input style="width: 150px;" type="text"/> | <input style="width: 150px;" type="text"/> |
| Heavy Trucks / Trailers | <input style="width: 150px;" type="text"/> | <input style="width: 150px;" type="text"/> |

Do your trucks engage in backhauling? (When out on deliveries, do they also pick up goods?)

Yes
 No
 If yes, what is the percentage of vehicle trips that engage in backhauling?

Please choose the level of convenience of each intermediate handling facility in terms of availability, cost and time.

| | Low | Medium | High | Never Used/Does not Exist |
|------------------------------|-----------------------|-----------------------|-----------------------|---------------------------|
| Consolidation Center | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Distribution Center | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Warehouse | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Truck-Rail Terminal Facility | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Port | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Airport | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



Which of the following best describes the warehousing situation in your company?

- Own the warehouse
- Rent (public / private) warehouse
- Outsource to a 3rd party logistics
- Do not use warehouse
- Other

What percentage of your shipments in the past year have used shipping containers (of any type).

Answer:

OPTIONAL: please provide your preferred contact information.

Email
Phone

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Completed: 1%

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Part2: Recent Shipments Information Shipment Number 1

Please answer the following questions about one of your most recent shipments.

This shipment was (please check ALL that apply)

- Inbound
- Outbound
- Import
- Export
- Containerized
- Damaged in the shipping process
- NOT delivered on time

What was the approximate ...

| | |
|--|----------------------|
| Dollar value of the goods being shipped? (USD) | <input type="text"/> |
| Weight of the goods being shipped? (lbs) | <input type="text"/> |
| Volume of the goods being shipped? (cubic-ft) | <input type="text"/> |
| Total shipping cost? (USD) | <input type="text"/> |
| Total shipping time? (days) | <input type="text"/> |

What were the origin and destination of this shipment?

| | |
|---|----------------------|
| Origin (ZIP code OR city and state OR SPLC code) | <input type="text"/> |
| Destination (ZIP code OR city and state OR SPLC code) | <input type="text"/> |

For this shipment, please complete the transport chain from the first origin to the last destination that you are aware of. Choose the intermediate locations from the list and fill in the information about these locations. The first entry should be the first stop AFTER THE ORIGIN.

| | Facility Type | ZIP Code OR City/State | Mode used to reach this location | Haul time from previous location (with units) | Wait time at this location (with units) | Total shipping cost to this location (USD) |
|--------------------------|----------------------|------------------------|----------------------------------|---|---|--|
| Intermediate Facility #1 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Intermediate Facility #2 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Intermediate Facility #3 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Intermediate Facility #4 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Destination | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

If your cargo was consolidated, what percentage of shipping cost was saved by using this process?

Answer: Not Consolidated 0-10% 11-20% 21-30% 31-40% 40+%

Which of the following best describes the type of commodity? (please check ALL that apply)

- Agricultural products
- Chemical / Pharmaceutical products
- Coal / Mineral / Ores
- Electronics
- Gravel/ Natural sands/ Cement Machinery / Metal products
- Machinery / Metal products
- Mixed freight / Miscellaneous
- Motorized and other vehicles (incl. parts)
- Prepared foodstuffs
- Wood / Paper / Textile / Leather products
- Other

Please choose appropriate characteristics of the shipment:

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Part3: Additional Information and Contact Info

Are you willing to participate in a broader similar survey?

| | Yes | No | Not Sure |
|-------------------------|-----------------------|-----------------------|----------------------|
| Online survey | <input type="radio"/> | <input type="radio"/> | <input type="text"/> |
| Telephone interview | <input type="radio"/> | <input type="radio"/> | <input type="text"/> |
| In-person interview | <input type="radio"/> | <input type="radio"/> | <input type="text"/> |
| Mail-in Mail-out survey | <input type="radio"/> | <input type="radio"/> | <input type="text"/> |

Is your firm willing to participate in a follow up study to install GPS on your trucks to collect routing behavior data?

| | Yes | No | Not Sure |
|------------------------|-----------------------|-----------------------|----------------------|
| Willing to participate | <input type="radio"/> | <input type="radio"/> | <input type="text"/> |

Optional Contact Information

If you have provided complete answer to all the questions, and want to be considered for the related benefits, please fill out your contact information:

| | |
|-----------------|----------------------|
| Email | <input type="text"/> |
| Phone | <input type="text"/> |
| Company name | <input type="text"/> |
| Mailing Address | <input type="text"/> |

What is your responsibility within your company?

How do you evaluate this survey?

| | Good | Neutral | Poor |
|------------------------|-----------------------|-----------------------|-----------------------|
| Easy to understand | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Relevant to your field | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Timeliness | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Overall | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Please provide any additional comments you may have.

