

A National Survey of Organizations to Study Globalization, Innovation and Employment
A proposal submitted to the National Science Foundation on February 12, 2009
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Summary: Current data resources do not permit satisfactory measurement and analysis of three key processes in our economy — globalization, technological change, and innovation. Consequently the impact of these forces on important outcomes, such as changes in the quality and quantity of domestic jobs, is largely unknown. The lack of evidence to guide policymakers is particularly troubling during this time of sharp economic downturn. The project makes a contribution by collecting and analyzing new data on global engagement, use of technology, and innovation activity by United States organizations. To accomplish this we have developed a 2009 National Organization Survey (NOS) that uses a dual frame approach. The first frame consists of a nationally representative sample of public sector and other not-for-profit organizations as well as for-profit firms derived from and linked to a nationally representative survey of workers, the General Social Survey (GSS). The second frame consists of a representative sample of large for-profit firms, which are more likely to be globally engaged innovators, drawn from the 1,000 largest corporations in the United States. We will use the dual frame survey to study how an organization's domestic jobs relate to its actions regarding innovation, use of technology, outsourcing, and off-shoring. (A third frame of venture-backed start-ups is also under development, but this is funded separately and is not part of the project described here).

Intellectual merit: The study advances knowledge in several significant ways. It collects data on employment according to a set of exclusive and exhaustive *business functions*, i.e., specific activities which all firms undertake. This innovative approach to quantifying global engagement overcomes the increasingly false divide between manufacturing and services, and links geographic and organizational outcomes to the quantity and quality of domestic jobs in a representative sample of American organizations, both before and during the current deep recession. This is the first time that data on total employment by business function has been collected by any survey, and the first time that data on business function outsourcing and off-shoring has been collected from a representative sample of United States organizations. We collect data on a host of variables according to business function, including employment, location, use of technology, job characteristics, and earnings distribution, and collect data both at the time of the survey and in September 2008. These data provide a wealth of information about the relationships between outsourcing, off-shoring, use of technology, the nature of work, and the quality of jobs, and how these relationships have changed in response to the current economic crisis. They provide a benchmark for how business functions (including two closely associated with innovation) and related jobs are bundled within organizations. This benchmark will be invaluable when cross-sectional and longitudinal elements become available in future firm-based surveys using a business function approach. With the NOS data, the analysis can go beyond recent globalization studies that estimate the number of American jobs that are *potentially* off-shorable, and begin to systematically examine what firms and other organizations are *actually doing* in regard to both outsourcing and off-shoring.

Broader impact: The 2009 NOS data set, when completed, will be prepared and made available for broad dissemination to the research community. Because of this, the project will make an impact far beyond the analysis undertaken by the principal investigators. The GSS public use files are made available through the Interuniversity Consortium for Political and Social Research (ICPSR) at the University of Michigan, the Roper Center at the University of Connecticut, and at the University of California at Berkeley. The data from the national organizations survey (NOS), as well as the links to the GSS, will be placed in these public use data access repositories as well, and will also be made available to researchers through the National Opinion Research Center (NORC) data enclave at the University of Chicago, which specifically targets researchers interested in using business microdata, and which has a collaborative environment designed to develop the capacities of junior researchers as well as more senior scholars. Availability of NOS and GSS data on globalization, innovation, and jobs will stimulate research on these important topics, including how the observed relationships have changed during the recession, enabling significant improvement in the quality of these important scientific and policy debates.

Introduction

Current data resources do not permit satisfactory measurement and analysis of three key processes in our economy — globalization, technological change, and innovation. Consequently the impact of these forces on important outcomes, such as changes in the quality and quantity of domestic jobs, is largely unknown. The lack of evidence to guide policymakers is particularly troubling during this time of sharp economic downturn. The proposed project makes a contribution by collecting and analyzing new data on global engagement, use of technology, and innovation activity by United States organizations. To accomplish this we propose a 2009 National Organization Survey (NOS) that uses a dual frame approach. The first frame consists of a nationally representative sample of public sector and other not-for-profit organizations as well as for-profit firms derived from and linked to a nationally representative survey of workers, the General Social Survey (GSS). The second frame will consist of a representative sample of large for-profit firms that are more likely to be globally engaged innovators, drawn from list of the 1,000 largest corporations in the United States. We will use the dual frame survey to study how an organization's domestic jobs relate to its actions regarding innovation, use of technology, outsourcing, and off-shoring.

The study advances knowledge in three significant ways. First, it collects data on employment according to a set of exclusive and exhaustive business functions. This is the first time that data on total employment by business function has been collected by any survey, and the first time that data on business function outsourcing and off-shoring has been collected from a representative sample of United States organizations. With these data, the analysis can go beyond recent globalization studies that estimate the number of American jobs that are *potentially* off-shorable, and begin to systematically examine what firms and other organizations are *actually doing* in regard to both outsourcing and off-shoring. Second, the study examines the impact of the current recession on organizations' employment decisions. Finally, the data collection methodology allows the researchers to link the results from the organization-based survey, collected during a deep recession, to the results from a module of questions in a national survey of individuals collected prior to the economic crisis. This link enables an examination of the relationship between workers' perceptions of their job security and current and past organizational practices.

The data will be released as a public use data file through ICPSR and other public use access points, and provides a benchmark for other firm-based surveys, possibly an on-going NOS, that will collect data by business function to provide both cross-sectional and longitudinal elements. Availability of NOS and GSS data on globalization, innovation, and jobs will stimulate research on these important topics, including how the observed relationships have changed during the recession, and the results will help to improve the quality of the scientific and policy debates.

We should note that it is urgent that this project be funded now. The collection of the 2008 GSS data, to which the proposed NOS is linked and from which our first representative sample is drawn, was completed in the fall of 2008. With time, the workplace contact information supplied by GSS respondents will become outdated. In addition, the unique opportunity to examine the link between globalization, technological change and innovation on organizations and jobs in a time of economic crisis is time sensitive, and should not be missed.

Background

Here we briefly survey the research on globalization, its impact on domestic jobs, its potential impact on service employment, and document the data limitations for analyzing the effects of services trade. This review highlights how our project fills an important gap by collecting data on where organizations are locating specific business functions, including those related to innovation, and how their use of technology is rendering work more or less "portable", i.e., tradable or capable of being done remotely.

Throughout the 1970s, 1980s, and 1990s, there was a well-documented trend in United States manufacturing industries toward vertical fragmentation, relocation, and international sourcing of intermediate inputs (Feenstra 1998) and in some industries, such as apparel and consumer-oriented electronics, the final assembly of finished products (Fröbel et al 1980; Flamm 1985; Gereffi 1994, 1999;

Abernathy et al 1999; Sturgeon, 2002). The impact on the United States manufacturing sector has been profound, but on balance, the American firms that have been the most globally engaged have tended to prosper: hiring more workers, paying higher wages, and earning higher profits (McKendrick, Doner, and Haggard 2000; Bernard, Jensen, and Schott 2005a).

After twenty-five years of relative and absolute decline in United States manufacturing employment, the country had come to rely heavily on services for both employment and economic growth. A consensus view emerged that the United States could thrive in the “new economy” comprised of services and the highest value-added, most innovative business functions within globally-distributed manufacturing industries, such as product conception, R&D, and marketing (Bhagwati 2004). The fact that economists considered many services to be non-tradable because of their customized and personalized character was comforting. However, following the historic path of manufacturing, computerization has allowed a growing range of service tasks being standardized, codified, modularized, and more readily and cheaply done at remote locations (Dossani and Kenney 2007). By the fall of 2002 a debate over services off-shoring was raging in the press, in policy circles, and eventually, in academia (see Sturgeon et al 2006 for a summary).

The immediate question that arose was: how many service jobs have been lost through off-shoring? A series of consulting reports were released that contained estimates of the number of service jobs that had “moved” off-shore from 2000 to 2004. These estimates, based in large part on extrapolations from press reports, unscientific surveys, and case studies, ranged from 77,000 to 100,000 jobs per year (see GAO 2004; Sako 2005; NAPA 2006). Academic researchers, however, estimated the *net* job impact of services off-shoring, i.e., the number of jobs *created* as well as lost, and showed no significant impact over time. For example, in their estimate of the number of United States jobs that would be required to produce net imports domestically, Groshen et al (2005, p. 7) conclude that off-shoring “...has contributed only marginally to the labor market’s weak performance in recent years. Through year-end 2003, the number of jobs embodied in net imports did not exceed 2.4 percent of the country’s total employment.” Jensen and Kletzer (2008) examine net employment growth in industries and occupations they identify as tradable and find little difference in net employment growth between tradable and non-tradable services. Based on this research, academics, if not the general public, generally agreed that the scope of services off-shoring had been modest so far.

Researchers next asked: how many jobs are *potentially* at risk from services off-shoring? Building on earlier research that characterized work by the use of computers and by the routine/non-routine nature of tasks performed (Autor et al 2002, 2003), several studies (Bardhan and Kroll 2003; Blinder 2006, 2007; Jensen and Kletzer 2008) estimated the potential number of U.S. jobs, based upon their occupational attributes and specific job tasks, that could be done off-shore. Although the studies vary in their approach and exact definition of key job characteristics, they all find large potential for off-shoring of jobs: 11% of 2001 employment (Bardhan and Kroll 2003); 22% to 29% of 2004 employment (Blinder 2007); and 27% of 2005 employment (Jensen and Kletzer 2008). In a study across OECD countries, Van Welsum and Reif (2006) use four occupational job characteristics to compare the share of employment that is potentially off-shorable across OECD countries between 1996 and 2003. They estimate that the share of ICT-intensive occupations potentially affected by off-shoring in total U.S. employment during the period 1995-2003 to be about 18%.

Autor et al (2003) based their model of job skill demands on the observation that computer capital can replace workers whose manual or cognitive tasks follow explicit rules and that computers tend to complement workers in the performance of non-routine tasks, such as problem solving and complex communications. They distinguish work on the basis of how rule-based a task is, and divide work into simple routine tasks that can be computerized, and activities that involve complex thinking and judgment. Blinder (2007) applies O*Net data to a two-stage approach in which an occupational category is placed in a “highly non-offshorable” category if the worker needs to be “physically close to a specific U.S. work location.” He classified 71% of U.S. jobs in 2004 as being in occupations requiring a specific work location. The remaining occupations are placed in one of three categories (from non-off-shorable to highly off-shorable) based upon a subjective judgment of the job tasks and if the service must be

personally delivered. Jensen and Kletzer use the O*Net data to construct an off-shorability index across occupations based upon level and importance measures for eleven work activities. (In our conceptual framework, presented below, we draw upon Autor's production function approach with inputs of different types of job tasks.)

While the academic work cited above is of high quality, given the available data, each contains a large measure of subjective judgment. Researchers studying the economic and employment effects of services off-shoring agree that official economic statistics are inadequate. Perhaps the most glaring data gap is in services trade statistics. The BEA currently collects trade statistics on only 17 categories of traded services, in contrast to the 16,000 that Census provides for traded goods. BEA data showed very little change in services imports in the 2000-2004 period, while statistics from India showed a sharp spike in services exports to the United States, and this called the Agency's sampling techniques into question (U.S. GAO 2005). Furthermore, analysts found it impossible to discern the skill content of services imports from the coarse product classifications in the BEA data (NAPA 2006). Attempts to examine employment trends in service occupations thought to be vulnerable to off-shoring also led to a dead end because BLS data on occupational employment is collected in a way that precludes time series measurement.

Concerns about off-shoring extend beyond the narrow question of job loss from services off-shoring. In general, researchers find that innovation has a positive effect on employment (Van Reenan 1997; Harrison et al 2008). Anecdotal evidence and qualitative research suggest that off-shoring in both manufacturing and services is rapidly expanding into more complex activities related to innovation (Dossani and Kenney 2007). However, case study work (Brown and Linden 2008) suggests that off-shoring of engineering work by U.S. semiconductor companies, especially to India, appears to be more of a complement than a substitute to U.S.-based activities. Nevertheless, it is prudent to assume that the risks are real. In the short run, if an increasing amount of the work in industries where the United States has a comparative advantage is done outside the country from the very earliest stages of product and market development, the employment and wage benefits of innovation will be more weakly felt at home, and in the long run, the locus of competitive advantage in these industries could shift entirely (Samuelson 2004). If some of the activities being moved off-shore contain key elements of the innovation process itself, the center of gravity of innovation could eventually shift to locations outside the United States, and this could impact jobs at the high end of the wage distribution (Gomery and Baumol 2001; Blinder 2007). Currently, official statistics do not allow researchers to adequately explore these important questions. The link between globalization, technological change, jobs and the current economic crisis lies entirely in the realm of speculation (for example, see Norris 2009). Our proposed data set would allow social scientists to study these critical topics.

Contribution of the proposed National Organization Survey (NOS)

Our study seeks to understand, not what the *potential* job effects of globalization are, but what firms and other organizations are *actually doing* in regard to outsourcing and off-shoring. We also plan to examine the impact of the economic crisis on these decisions. To accomplish this, we use the concept of business functions to characterize the activities of firms and their jobs. Our study collects data on a set of exclusive, exhaustive, and generic functions that all organizations must either perform internally or purchase from outside vendors. Case study research on more than 600 firms (Berger et al 2005) has shown that decisions about how to bundle and unbundle, combine and recombine business functions have become a central strategic preoccupation for managers at globally-engaged firms. In contrast to the popular debates about services off-shoring, which casts the organizational and geographic fragmentation of the value added chain as unproblematic, our study will help to determine which functions tend to stay at home, which can be performed off-shore in different kinds of locations (e.g., high and low wage settings), and which tend to be co-located in one or another of these settings. This is a substantial advance on previous work, which has used industry codes or product lines as proxies for business functions. Although a single survey cannot provide information about the dynamic aspects of business function outsourcing and (re)location, it can provide a baseline on which future studies can build. Our goal is to

develop, test, and create benchmarks for employment, outsourcing, and offshoring by business function that will prove useful to other academic researchers. This survey will provide Federal statistical agencies with information on the value of collecting information by business function, including NSF's SciSIP program and Science Resources Statistics division, which is currently fielding the Business R&D and Innovation Survey (BRDIS).

The business function approach is not altogether new. Lewin et al (2008) studied 880 different off-shore implementations that respondents from 253 U.S. companies assigned to a set of eleven non-exhaustive business functions. They use these data to estimate, among other things, the probability that an off-shored function is in product development compared to non-product development activities. In 2007, the European Union (Eurostat) administered a business function-based survey of international sourcing practices in 14 out of 27 member states, collecting 60,000 responses (see Neilsen 2008). Respondents were offered seven specified business functions and an "other functions" category. The survey asked companies if business functions were obtained from domestic or international sources and if they were provided in-house, by affiliated companies, or independent companies. A similar survey was used in Statistics Canada's trial Survey of Changing Business Practices in the Global Economy. The inclusion of an "other" category in the business function frameworks used in these studies reveals the difficulty in creating a truly exclusive and exhaustive list of business functions.

Prior NOS have also collected data using variations of a business function framework. The 1991 NOS focused on training, compensation, and work organization (Kalleberg et al 1996; Marsden et al 2000). The survey asked if at least one person works in, and if there is a separate department for, eight functional areas of the organization (finance, accounting, health and safety, public relations, personnel or labor relations, R&D, long range planning, and marketing and sales). The 1996 and 2002 NOS focused on sourcing, work organization and practices, and training in eight functional areas (secretarial, clerical, and other office work; computer information systems; accounting or payroll; R&D for new products or services; marketing or sales; security services; janitorial services; repairs or service of machinery). Kalleberg and Marsden (2005) use these data to study organizations' externalization of work. The business function lists used in the 1996 and 2002 NOS were, in our view, non-exhaustive. In particular, the often-outsourced functions of logistics and distribution (outside of the sales function), and customer and after-sales service were missing, as well as a generic function to capture the main operations of the firm, though the "core" occupational title most directly linked to the organization's principal product/service was identified. Employment by business function was also not collected in prior NOS. While we cannot, therefore, use prior NOS to establish benchmarks for how organizations allocate jobs across business functions, we will be able to make comparisons across business functions that are common to the three NOS waves. Again, our goal is to establish benchmarks for employment, ownership, and location by business function that can be used as a baseline for time series data collected subsequently, either in future NOS or in other representative organization surveys.

The importance of developing an exhaustive list of business functions cannot be overstated. A comprehensive and consistent list of mutually exclusive functions, encompassing all of the activities that all organizations must accomplish, expressed generically, allows us to benchmark how organizations of all kinds (e.g., manufacturing, services) use different organizational structures to perform business functions internally or through external sourcing. This basic measurement can then be augmented by asking other question about the functions, such as location (domestic/off-shore) and range of pay. Other studies, including those mentioned above, have understandably focused on business functions that are of great interest, given the research questions being asked. For example, studies have focused on those functions widely believed to be susceptible to off-shoring (Lewin et al 2008), or on the ownership and location of the R&D function (Thursby and Thursby 2006). While these studies have generated important insights, the relative importance of any function can only be revealed when data are collected on an exhaustive list. In addition, instead of making *a priori* assumptions, data has to be collected on a full range of functions to identify which are being offshored. Finally, we are as interested in learning which functions are staying at home as we are in identifying those that may be migrating abroad.

We have an ongoing collaborative relationship with the main research organizations that are

developing and deploying business function lists in surveys, including the US BLS Mass Layoff Statistics Program, Statistics Denmark (a leader in the Eurostat effort), and Statistics Canada. In our view, the methodology used by the BLS has generated the most robust list of business functions to date. The BLS's MLS has included a business function question since 2007 to ask about jobs lost at sites that have at least 50 initial claims for unemployment insurance filed during a consecutive 5-week period. In the 2007 MLS survey of establishments, respondents were asked a question about the roles or functions of laid off workers. This resulted in a list of highly detailed business functions that were then aggregated into the nine higher-level business functions listed in Table 1.

Table 1. An Exclusive and Exhaustive List of Business Functions Developed by the Bureau of Labor Statistics' Mass Layoff Statistics Program

Function	Definition	Examples (not exhaustive)
1) Strategic management	Activities carried out at the highest managerial levels, including the formation, implementation, and evaluation of cross-functional decisions that enable the organization to achieve long-term objectives.	Coordinating activities; Identifying new investments, acquisitions, and divestments; Setting product strategy
2) Procurement, logistics, and distribution	Obtaining and storing inputs and with storing and transporting finished products to customers.	Buying; Shipping; Distributing; Receiving; Loading; Transporting; Packing; Warehousing
3) Operations	Transforming inputs into final outputs, either goods or services. Equates with industry code (NAICS) of the establishment.	Assembling products; Managing production; Producing goods; Fabricating components; Managing services; Providing services; Quality assurance or quality control.
4) Product or service development	Activities associated with bringing a new, improved, or redesigned product or service to market.	Developing business plans; Developing products or services; Analyzing markets; Researching products or services; Designing and engineering products or services; Product testing
5) Marketing, sales, and customer accounts	Informing existing or potential buyers	Advertising; Market research; Managing accounts; Billing; Merchandizing; Branding or managing products; Processing orders; Collecting payments; Selling; Marketing
6) Customer and after sales service	Providing support services to customers after purchase of the good or service	Call center services; Maintaining and repairing products; Technical support; Customer service; Warranty support; Installing products
7) General management and firm infrastructure	Corporate governance and administrative support activities	Accounting; Managing fraud; Administrative support; Government relations; Clerical support; Managing contracts; Investor relations; Managing documents; Legal; Finance
8) Human resources management	Activities associated with recruiting, hiring, training, compensating, and dismissing personnel	Providing employee assistance; Hiring and firing personnel; Human resources; Recruiting; Labor relations; Training; Payroll and compensation
9) Technology and process development	Maintenance, automation, design or redesign of equipment, hardware, software, procedures, and technical knowledge	Developing computer systems; Internet services; Maintaining or repairing computer systems; Designing processes; Managing data; Developing and testing software; Processing data; Software and IT services; Engineering

Source: Adapted from Brown, 2008, Exhibit 1, page 55.

According to Brown (2008 p. 56) “‘Do not know’ responses to the business function question remained low, indicating that the correct person is being reached for the interview and that most respondents in fact think in terms of business functions.” It is this bottom up methodology, collecting literal responses to generate a unique and detailed set of business functions that are fully captured by a parsimonious list, which gives us confidence that the list in Table 1 is the most exhaustive and exclusive available. Because the MLS did not collect information on the firm’s total employment, and surveyed establishments that experienced mass layoffs rather than a representative sample of organizations, the data cannot be used as a benchmark to quantify the organizational structure of U.S. organizations.

In terms of geographic information, we will ask for the city and country of the organization’s “most important” external source for each business function, rather than have respondents choose from a list of predetermined geographic regions (e.g., East Asia, Latin America, and so on), as similar off-shoring studies have done (Lewin, et al; Eurostat; Statistics Canada; BRDIS). Not only will this improve accuracy (aggregate regions are heterogeneous in terms of labor costs and capability), it will allow researchers to pinpoint sourcing locations for use in analysis by geographic information system (GIS) software. This approach can also reveal the location of externalized business function sources within the United States, which can help to identify regional shifts, emerging business function specializations within the United States, and identify those functions that require extreme proximity and are therefore likely to be the least tradable. This is important because distant domestic sourcing signifies that the function is vulnerable to international sourcing.

Finally, we will collect data on a host of other variables according to business function, including use of technology, job stickiness, recent job relocations, and earnings distribution. These data, when combined with data on internal employment and sourcing location by business function, will provide a wealth of information about the relationships between outsourcing, off-shoring, use of technology, the nature of work, and the quality of jobs, and how these relationships have changed in response to the economic downturn.

Outline of proposed research

Next we outline our core research questions and framework, and then describe the three main components of the proposed research: development and collection of an original representative organization-based survey, descriptive analyses of the data, and estimation of the framework.

Research questions and framework

Our survey and analysis address three key questions about globalization, technological change, and innovation and their relationship to domestic employment, and how the relationship has changed during the economic downturn:

1. Technology, Off-shoring, and Jobs: What is the relationship between an organization’s use of technology and job characteristics, and its ability to perform business functions remotely? Are the outsourcing and off-shoring of business functions related to the composition and pay level of an organization’s domestic jobs? How has this changed during the recession?
2. Innovation, Off-shoring and Jobs: Is innovation at the organization level related to its use of technology and off-shoring of business functions? Do organizations that innovate, deploy new technologies, and use off-shore resources provide higher paying jobs than organizations that do not? How have the jobs at innovative firms changed during the recession?
3. Employment Security in an Economic Downturn (GSS frame only): Are employers’ decisions to eliminate domestic jobs during an economic downturn related to the job characteristics and location of business functions? Are employees’ perceptions about their own job security reflected in what happens to jobs at their work sites during a downturn?

In addition to these research questions, a fourth area of inquiry is about the National Organization Survey (NOS) itself:

4. Value of NOS: What types of questions can researchers effectively address with the dual frame

NOS, especially compared to other firm-based data sets (e.g., those drawn on Dun and Bradstreet and the BRDIS)? How is the value of NOS enhanced if it is an on-going survey linked to GSS?

To address our three analytical questions we use a simple production function approach, based upon the production framework used by Autor et al (2003) and Harrison and McMillan (2006). The purpose of our analytic framework is to conceptualize the organization's decisions of where to locate business functions, and by extension, the jobs that carry out these functions. Our contribution is based on our extensive case study analysis of firms (dubbed "insider econometrics"; Ichniowski and Shaw 2007), which has revealed that decisions about where to locate functions and jobs are undergoing a major transformation, and that an important part of the process includes learning through experience (Lewin et al 2008; Brown and Linden 2008). As a result of these case studies, we use a short-run analytical framework that makes strong assumptions about use of labor, capital, and technology in the production process. Given the lack of longitudinal data, our approach captures this inherently dynamic process and maps its path in the short run. However we emphasize that this short-run path does not reveal the long-run relationship, which can only be derived with a series of NOS over time.

The appealing aspect of the Autor et al (2003) model is their use of a Cobb-Douglas production function with two types of labor inputs, routine and non-routine, and capital that is a perfect substitute for routine labor. They assume that workers are able to move between routine and non-routine occupations to clear the labor market, and that capital prices fall in a predictable fashion. This approach leads to a model with five endogenous variables: wages for routine and non-routine labor, computer capital inputs, relative efficiency in performing non-routine versus routine tasks, and ratio of routine to non-routine task input in production. The general equilibrium framework of Harrison and McMillan (2006) also provides a rigorous empirical approach. They estimate the impact of globalization on U.S. jobs and wages by assuming a global Cobb-Douglas production function with inputs (labor and capital) that are functions of inputs sourced at home and abroad. Profit maximization implies a domestic labor demand function that depends on domestic wages, foreign labor input, foreign and domestic capital inputs, product price, and Hicks neutral technological change. Empirically Harrison and McMillan estimate the firm's domestic labor demand as a function of labor, capital, other inputs, technological change, and final product price across three locations (U.S., low-cost trading partners, and high-cost partners).

In a similar spirit, we assume that firms are faced with a production relationship given by:

$$y_{jt} = F(Z_{jt}, L_{D1jt}, \dots, L_{DBjt}, L_{F1jt}, \dots, L_{FBjt})$$

where y_{jt} is output for firm j in period t , the vector Z_{jt} indexes the state of technology and L_{bjt} is the number of workers performing different business functions in different locations, where subscript Db indicates workers doing business function b in the domestic country and Fb workers doing business function b in foreign countries. In this framework, the demand for workers of type b by a particular firm depends upon the type of technology adopted (Z), the characteristics of the work required to use the technology (embedded in the capital), the scale of operations, and the relative shadow wages.

We assume that the firm maximizes global profits by locating business functions across different locations so that the marginal return is equalized across locations. However, the ability to move business functions among different locations is constrained by the characteristics of the business function and by the characteristics of the work needed to carry it out. Case study evidence, including our own fieldwork, makes it clear that this location decision takes time to implement because of the large fixed costs involved, uncertainty of the associated costs and productivity, incomplete information about managing abroad that reflects the importance of learning from experience in off-shoring (Brown and Linden 2006; Sturgeon and Lee 2005; Lewin and Peters 2006), and because of the constraints imposed by the characteristics of the business functions and jobs involved.

Our study focuses on these last constraints on the firm's location decisions: the characteristics of business functions and jobs. We take the firm's strategic decisions as given, and examine the underlying organization, technology, and work characteristics that structure the costs and benefits of the choices that the firm makes in a given time period. A firm's ability to outsource and off-shore specific business

functions is limited or enabled by the characteristics of the function and the work involved (Gereffi et al 2005).

In the spirit of Blinder (2007), we assume that a business function can be characterized by whether or not it requires a specific location (i.e., the service is delivered to customers *in situ*, as in medical care or food service). Following Blinder (2007) and Jensen and Kletzer (2008), who assign occupations an off-shorability index according to specific job characteristics, we assume that job content varies by its association with a specific business function and also by specific characteristics that reflect “job stickiness” (s). Stickiness, i.e., how easily a job can be done remotely, is determined by two attributes: 1) requirement for face-to-face interactions with colleagues or customers, and 2) the complexity of activities performed and how a computer is used. For given firm j in time t , its labor force is spread across locations by business functions, L_{Db} and L_{Fb} , and this location decision is constrained by the stickiness of the jobs involved in each function b . The firm’s demand for foreign and domestic labor, given their relative shadow wage and given the technology embedded in capital, depends on the firm’s location of business functions. This implies that the short-run empirical relationship between employment at home and employment abroad depends upon the business function and the job stickiness variable.

Next we discuss creation of the NOS to document and allow analyze of the organization’s global value chain and employment mix and the firm’s practices regarding outsourcing/offshoring of business functions innovation activities, and use of technology at a given point in time. We will also document and analyze how these relationships have changed as a result of the deep economic downturn. We recognise that our research can only examine firm variation in drivers and outcomes because of our sample size and the largely cross sectional nature of the study. We note, however, that our approach has the potential to yield richer results with repeated cross-sections and longitudinal information on firm behavior if the survey is repeated in the future.

The 2009 National Organization Survey

While we will build on what has been learned in the course of the BLS’s MLS data collection, our business function list will be finalized in the course of the project’s survey development process, which will include in-person testing by project researchers at a dozen or so organizations of different kinds. Once the refined list is complete and survey questions based on the list are drafted, cognitive testing will be done at 30 organizations by experts from Mathematica Policy Research Inc., the survey research firm that will carry out the data collection. Dr. Frank Potter will be in charge of the survey design, testing, collection and validation. He has designed and managed business surveys with response rates as high as 90% (Boyle et al 1995; Hartwell et al 1996), and has contributed to the literature on issues related to the design of surveys of businesses (Potter and Rush 1995; Zakin et al 1995).

The PIs have worked extensively with two nationally-recognized survey research companies to prepare bids based upon detailed description of the survey methodology and structure of questions. While both organizations provided a guarantee of meeting a 60% response rate, Mathematica's bid was significantly lower (by \$211,676) and provided a more efficient and effective method (more information about the survey’s method and expected response rate is provided in the budget justification).

An important component of the survey preparation process will be preliminary research to identify the appropriate respondent(s). Mathematica’s prior experience in contacting firms for data collection indicates that the presence of a contact name on advance materials makes cooperation more likely, and that even a contact name for someone who is not a proper informant provides an effective starting point. We assume that many of the firms will have information available on the firms’ public website about the organizational structure and leadership, and plan to make use of this information in compiling potential informants. Those firms that either do not have websites or do not list director-level contacts on their websites or in public records will be called in an attempt to obtain this information. A thorough effort to identify these individuals, combined with a monetary incentive, an attractive advance package, and the choice of completing the survey online or over the telephone increases the likelihood of participation.

As already mentioned, our research design uses a dual frame approach. The first frame will be a nationally representative sample of organizations, based on employment. As such it will contain a wide

range of organizational types. A nationally-representative employment-based sample is useful because it samples organizations with probability proportional to workforce size. This is important for two reasons. First, we expect that the frequency of actual off-shoring and innovative activity is greater in larger units. Second, almost all organizational phenomena vary more among large units than among smaller ones. When this is the case, probability-proportional-to-size (PPS) selection allocates the sample optimally, in the sense that it produces the most precise estimates available for a given budget. Because our sample is representative of jobs, we can interpret the results in terms of the jobs involved rather than in terms of the market size of firms. From a policy perspective, this is important because those who make policy are often concerned with jobs. However, since the sample includes firms with probabilities based on their employment of U.S. adults, the method will under-represent firms that have located business functions abroad that otherwise would have been retained in the U.S., or have created jobs outside the U.S. that otherwise would have been created domestically. Although we plan to develop weights that adjust for such underrepresentation, this requires assumptions about counterfactual conditions. Notwithstanding this limitation, the PPS sample will yield insight into the global engagement of a broad spectrum of U.S. organizations.

This caveat, however, has motivated us to draw a second frame from Fortune Magazine's list of 1,000 largest U.S. companies. This increases the number of data points and over-samples in the size range where we anticipate observing the greatest density of globally-engaged and innovating firms, which are of central interest in this research. Together, the two frames will allow us to establish a set of basic descriptive facts, such as the share of organizations – of all kinds – in the United States that are innovative, globally-engaged, or both; and also explore the deeper relationships between innovation, business function outsourcing and off-shoring, and technology deployment in a set of for-profit firms that are likely to be innovative and globally engaged.

The first frame: the workplaces of a nationally representative sample of individuals derived from the GSS

The National Organization Survey (NOS) has been conducted three times in the past (1991, 1996, and 2002). In 1991 and 2002, a representative sample frame of organizations based on employment was developed from workplace contact information collected from a representative sample of individuals in the General Social Survey (GSS). The 2009 NOS follows the same approach to generate its first sample frame. Deriving the organization sample from the sample of individuals provides several important benefits. First, the data on individuals will be directly linked to the data on organizations (with a one year lag), which opens up unique research possibilities, such as comparisons of work experiences and individual attitudes to organizational practices. Second, the GSS is heavily used by the research community, especially by sociologists,¹ which will draw attention to the 2009 NOS public use dataset and encourage new research on organizations on the topics of globalization, technological change, and innovation.

The GSS is conducted every two years. The 2008 GSS included a module we developed on globalization, use of technology, and employment security (funded by the Alfred P. Sloan Foundation). This module asked a nationally representative sample of 3,500 individuals questions about their employment and wage histories, their opinions about the impact of globalization on jobs (positive or negative), and the characteristics of their jobs, including use of computers and the need for face-to-face contact with customers, co-workers, and others in the course of their work. GSS respondents were also asked for the name, address, and phone number of their current or former workplace. The National Opinion Research Center (NORC) at the University of Chicago, the survey research organization that collected the GSS data, estimates that 1,265 respondents provided this contact information. This contact list will serve as the first sample frame for our project. By assuming a 60% response rate, and eliminating

¹ The use of the GSS by sociologists is second only to the Decennial Census. Through 2005, analysis based on GSS data has appeared in more than 14,000 articles, textbooks, monographs, and dissertations. In 2006, 4,500 interviews were completed; the interview target in 2008 is 3,500. See <http://gss.norc.org/>.

approximately 120 self employed and 37 small organizations where the respondent name can easily be associated with the organization name, we estimate that the 2009 NOS will consist of approximately 705 cases. Furthermore, applying the ratios of for-profit and not-for-profit organizations obtained in the 2002 NOS to our projected sample, suggests that approximately 493 of the GSS-derived cases will consist of for-profit firms, and that 212 cases will consist of not-for-profit organizations, including those in the public sector (see Table 2).

TABLE 2. 2002 NOS GSS-DERIVED SAMPLE CHARACTERISTICS AND 2009 ESTIMATES

Type of organization	2002 NOS Responses	2002 NOS % of total responses	2009 NOS estimates**
Part of a larger organization	181	35%	248
For-profit	98	19%	134
Not-for-profit*	83	16%	114
Completely independent	334	65%	457
For-profit	262	51%	359
Not-for-profit*	72	14%	99
<i>Total for-profit</i>	<i>360</i>	<i>70%</i>	<i>493</i>
<i>Total not-for-profit</i>	<i>155</i>	<i>30%</i>	<i>212</i>
Total organizations	515	100%	705

* Includes public institutions and other non-profit organizations

** Assumes 60% response rate for a frame of 1,265 organizations, less 10% self-employed and 37 organizations with less than 10 employees where the GSS respondent might be readily identified.

The mix of organization types will provide a unique view of the forces we are interested in. Given that employees in public and private sector organizations alike experience the transformation of work through computerization and automation, and that there have been moves in the public sector toward domestic, and in some cases international outsourcing, these data will provide a rare glimpse of how these forces of change are affecting the *entire* workforce. For establishments that are part of a larger organization (approximately 35% of the sample), we will collect the data at the business line divisional level (or its equivalent). In our fieldwork we have observed that decisions about outsourcing and offshoring business functions and development of innovations are usually made at this level because strategic decisions about outsourcing and offshoring are typically integrated across business-line level business functions, and the parameters for these decisions depend on the technology-specific factors for the products and processes that business-line organizations focus on.

The second frame: a sample of Fortune 1,000 business line divisions

The GSS-derived sample frame provides the benefit of representative coverage of U.S. organizations as workplaces. However, we expect the share of highly innovative and globally engaged organizations in the GSS-derived frame to be quite modest. This assumption is based, in part, on our review of a preliminary list of organizations from GSS-derived contact names provided by NORC. To increase our sample of large, for-profit organizations, we propose to oversample large firms by drawing a random sample from the 2008 Fortune 1000, i.e., the list of the largest 1,000 United States-based corporations (by sales) as compiled by Forbes magazine. For the same reasons we cite in describing our approach to surveying multi-site establishments in the GSS frame, we plan to focus on specific lines of business within these large corporations by sampling business-line divisional units.

We used power analysis to estimate the Fortune 1000 sample size necessary for a reliable statistical analysis of firms with and without business functions abroad (denoted FwB and FwoB). We want to have a sample size sufficient to reject the null hypothesis that firms with business functions abroad are similar to firms without business functions abroad in two types of variables: the firm's job characteristics (e.g., % sticky jobs by computer use; % of high wage jobs; % R&D jobs); and the firm's innovation activities (e.g., % developing new products or services). At 5% significance level, we calculate the Fortune 1000 sample size, denoted N, required to obtain statistical power of 0.80 (i.e., Type II error =

0.20). We assume a common standard deviation for a given job characteristic variable for the two groups of firms; the innovation variables do not vary over observations (i.e. firms or divisions). Then assuming the difference in means for a given variable between FwB and FwoB, we calculate N required to have desired power of 0.80. Preliminary results from GSS indicate that NOS will have data on 300 multi-site firms, which are the most likely to have some business functions abroad and to resemble Fortune 1000 firms. We call this group MS. We calculate n, the number of Fortune 1000 business line divisions that must be added to MS to reliably compare FwB and FwoB for a range of realistic differences in variable means between the two groups.² We estimate that a sample size of 600 should allow us to statistically compare the innovation activities of this expanded sample³, and estimate that the N required to statistically compare the job characteristics of this expanded sample is much smaller.⁴ The same sample size also would permit a comparison of the innovation activities of Fortune 1000 FwB to the NOS representative sample of FwB.⁵ As a result, we will draw a sample of 1000 Fortune 1000 business line divisions in order to acquire data on 600 units, given a response rate of 60%.

A planned third frame: venture-backed start-ups

Because GSS respondents were assured that they would not be re-contacted for other surveys, self-employed and very small firms will be excluded from GSS-derived sample frame. The second frame of Fortune 1,000 firms will certainly not include any start-ups. For these reasons, we expect to have very few newly-formed organizations in the two sample frames described above. We therefore are seeking funds (in a separate proposal to the Ewing Marion Kauffman Foundation) to develop a third sample of newly-venture-funded enterprises for the 2009 NOS. The sample will be based upon a random sample of the population of firms receiving first-time venture funding in 2004-2008 Sand Hill Econometrics (SHE) database. The SHE database contains nearly all known enterprises that receive venture funding in each year, including firms receiving their initial venture financing (See Sturgeon, Brown, and Woodward (2008) for a detailed discussion of this proposed research). The Kauffman Foundation has expressed interest in funding this research module if the research on the first two frames receives support from the NSF.

Linked worker-organizations surveys

To investigate the organization's location of business functions and jobs, the stickiness of jobs, use of technology, and innovation-related activities, we will collect data on key variables by business function. We will also collect variables for employers similar to the variables for employees in the GSS about portability of jobs. The 2009 NOS will collect the following data from employers at the establishment level (single site) or for the business line unit (multiple sites):

- Employment by business function: How many domestic employees work in each business function? How many worked in each business function in September 2008?
- Computerization of jobs (by business function): Have new computer systems, new software,

² We also assume the ratio of FwoB to FwB for MS is 2 to 4, and for Fortune 1000 is 0 to .10. For the N's reported here, we use ratio of 2 for MS and of 0.1 for Fortune 1000.

³ Provided the difference in the means of the two groups, FwB and FwoB, is approximately .010, then N is below 600 using realistic assumptions for the probabilities, e.g., N is 280 when probability of innovating is 0.3 for FwB and 0.2 for FwoB; N is 570 when probability of innovating is 0.5 for FwB and 0.4 for FwoB.

⁴ Provided the difference in the means is over 0.02 and the common standard deviation is under 0.20, then N remains under 600. For example, assuming a common standard deviation of 0.2, and a difference of 0.5 in the means of a given job variable, then N = 210.

⁵ Assuming (conservatively) 140 firms in the NOS sample have business functions abroad, then a difference of the probability of innovating is 0.15 or greater implies N<600. For example, if the probability of innovating is 0.35 for Fortune 1000 and 0.20 for NOS firms, then N = 140. However N rises quickly as the difference in probabilities approaches 0.10.

computerized equipment, or other forms of automation been brought on line since September 2008?

- Job stickiness (by business function): What percent of jobs can be performed equally well for the same customers at another location?
- (Re)location of jobs (by business function): Have the same or similar jobs been set up at other locations in the U.S. and/or abroad in the past three years? Since September 2008?
- Earnings of jobs (by business function): How many workers earn <\$21,000 (approximately \$10/hour)? How many workers earn >\$62,000 (approximately \$30/hour)?
- Job security: In the past twelve months, has your organization laid off workers? If so, what is the number of lay offs by business function.

In addition, we will ask the organization about its global engagement and innovation-related activities:

- Outsourcing and off-shoring by business function: Which business functions are outsourced and/or off-shored? What was it in 2008? For functions not provided at the site, what is the city and country of the main, or most important source of this function? Is this source an affiliated or independent firm?
- Markets: What percent of your revenue is from the U.S. market? What percent in 2008?
- Innovative activity: In the past twelve months has the organization or business unit developed new processes, products, and/or services?

Descriptive Analysis

Because we have very few baseline measures that can help to establish trends in the areas of globalization, innovation, and effects of technology on the “portability” of work, the project will seek to establish a set of facts in five areas:

- 1) Employment by business function. What is the employment by business function? This can provide an important benchmark for future research on domestic jobs according to standardized business functions.
- 2) The organizational patterns of off-shoring and outsourcing. What business functions are organizations sourcing abroad, what functions are they sourcing domestically, and what functions are they keeping within their own organizations at home and abroad? Are strategic and innovative functions being sourced at home while mundane functions are sourced abroad? How are organizations mixing in- and out-of-house business functions and on- and off-shore locations? Are firms that source business functions internationally more or less likely to sell internationally?
- 3) The geographic patterns of off-shoring and outsourcing. Are specific outsourced business functions likely to be located in specific cities, regions, and countries? Are specific business functions likely to be co-located? Are some business functions, when they are outsourced, likely to be located near the respondent’s establishment? Are some likely to be located abroad?
- 4) Innovation occurring at the organization level. How many organizations generate new products, processes, and services? How many organizations are “moribund” in regard to innovation?
- 5) The characteristics of domestic jobs and the location of business functions. Which business functions are likely to contain jobs that resist automation and relocation? Which business functions appear to be at risk for off-shoring?

Our descriptive analysis will allow us to establish a baseline for these basic facts to be used as reference points for future representative studies of global engagement, innovation, and use of technology by business function both before and during the current economic crisis.

Empirical Analysis

Using the framework presented above, we will undertake the following statistical analysis of the three major research questions.

Technology, Off-shoring, and Jobs

Our first set of research questions explore the impact of an organization’s use of technology on job characteristics and its related ability to perform business functions remotely and examine the

relationship between the organization's outsourcing and off-shoring of business functions and the number and pay level of their domestic jobs.

We begin by estimating a set of probit regressions that examine whether or not each establishment locates jobs associated with each business function abroad or at home. We can do this both for September 2008 and at the time of the survey. The location decision will be related to the job characteristics, the organization's use of technology, and control factors such as the size and industry of the organization. We then estimate a set of regressions with employment and earnings as dependent variables, and with the same set of independent variables, to examine how establishments' employment mix and earnings levels vary by their location of business functions at home and abroad, both before and during the downturn. Because of identification problems, we will develop a strategy that uses a two-stage estimation procedure, and devise an instrument for the location of key business functions abroad, such as growth of product markets and measures of economic shock.

Innovation, Off-shoring and Jobs

The America COMPETES Act draws a very clear link between American innovation, competitiveness and jobs. Our focus in this segment is to examine the relationship between innovation and the types of jobs (in terms of earnings) that are provided by organizations that are engaged in innovation activity, and the relationship between job composition and the location of business functions.

We first establish a set of facts by tabulating the domestic jobs related to innovation and the location of innovation-related business functions, both before and during the downturn. Note that business functions #9 (technology development) and #4 (product development) in Table 1 above roughly correspond to the research and development elements of R&D. Because we are interested in the relationship between an organization's probability of engaging in a specific innovation activity and the onshore/offshore structure of these activities, we estimate a simple limited dependent variable regression correlating these factors. We also include control factors such as industry and organization size. We then examine the relationships in more detail by estimating a set of regressions with firm-level employment and earnings as dependent variables and type of innovation activity as independent variables. We will examine how this has changed between September 2008 and the time of the survey.

This statistical exercise indicates how employment, innovation activities and location of business functions are related at a given point in time over a cross section of organizations. Given the cross-sectional nature of the data set and the dynamic relationship between innovation activities, location of business functions, and domestic jobs, a more ambitious undertaking to disentangle this relationship will have to await the collection of these data over time and a combination of these data with a fuller range of variables that characterize the firm's global market over time.

Employment Security in an Economic Downturn

The severe global economic crisis that began in Fall 2008 presents us with labor market conditions that are dramatically different than when the GSS was collected earlier in 2008. In response, we have revised our earlier plan to use the direct link of NOS to the GSS to examine the links between worker attitudes toward globalization and organizational practices and their job security. Now, we see an opportunity to use the link between the NOS and GSS to examine the relationship between what employees expected to happen to their jobs at the time of the GSS and how the economic downturn has actually impacted domestic jobs according to the practices of employers and job characteristics. We will estimate a set of simple regressions that examine the proportion of jobs eliminated by the organization over the past twelve months by business function. The decision will be related to the job characteristics (whether the jobs in the business function are sticky or not, as reported by employee and employer) and practices of employers in regard to outsourcing, off-shoring, and use of technology, and control factors such as the size and industry of the organization. Because of identification problems, we will develop a strategy that uses a two-stage estimation procedure, and devise an instrument for the downsizing of employment, such as growth of product markets. In order to examine the extent that employees' perceptions of their own job security are reflected in what happens during a recession, we will run similar regressions only on the GSS frame and include employees' responses on how portable and how secure

their jobs are.

The 2009 NOS also provides future opportunities to study the dynamics of the business cycle on firms' sourcing and location decisions by business function. The 2009 NOS will provide benchmarks for the organization's location of business functions globally and the downsizing of domestic employment by business function over the past twelve months. These benchmarks, obtained during a deep recession, will provide a critical reference point for researchers to study how firms expand activities by business function at home and abroad and how the composition of domestic employment changes during the expansionary phase of the business cycle. In our fieldwork in the electronics industry, we observed that firms often use the bottom of the business cycle to relocate business functions through outsourcing and off-shoring.

Contributions to Globalization and Innovation Research

To summarize, our proposed project develops an innovative approach to quantifying global engagement that overcomes the increasingly false divide between manufacturing and services, and links these outcomes to the quantity and quality of domestic jobs in a representative sample of American organizations, both before and during the deep recession. It is the first representative implementation of the business function-based survey in the United States, and provides several significant advances over previous research. We collect data on a host of variables according to business function, including employment, location, use of technology, job stickiness, recent job relocations, and earnings distribution, and collect data both at the time of the survey and in September 2008. These data will provide a wealth of information about the relationships between outsourcing, off-shoring, use of technology, the nature of work, and the quality of jobs, and how these relationships have changed in response to the economic crisis. These data can provide a benchmark for how business functions (including two closely associated with innovation) and related jobs are bundled within organizations, and how they have changed in response to the deep recession. This benchmark will be invaluable when cross-sectional and longitudinal elements become available in future firm-based surveys using the same approach to examine such areas as the ongoing reorganization of businesses through outsourcing, off-shoring, and introduction of new products and processes.

The proposed project will become part of a larger stream of integrated work. This includes the module of questions that is part of the 2008 General Social Survey, the 2009 NOS, proposed here, and a complementary project to expand the study to include a third sample frame of venture-backed start-ups. In this work we have, and will continue to engage with a network of colleagues that includes survey experts and academics with domain knowledge in innovation, technology and work, globalization, use of business functions in data collection, and the dynamics of specific industries. For example, in preparing the GSS globalization module, we received detailed input on a draft questionnaire from Eileen Appelbaum (Rutgers), Arne Kalleberg (University of North Carolina), Rosemary Batt (Cornell), Frank Levy (MIT), Susan Helper (Case Western Reserve University), Melissa Appleyard (Portland State), Lori Kletzer (UC Santa Cruz), Peter Gourevitch (UC San Diego), Rafiq Dossani (Stanford), and John Paul Macduffie (Wharton), as well as Norman Bradburn, a survey design experts at NORC. In preparing the study, we held a workshop in Boston in May 2008, funded by the Alfred P. Sloan Foundation, to collect ideas on how to design the 2009 NOS. Workshop participants included members of our research team (Brown, Marsden, and Sturgeon), as well as Ana Aizcorbe (US Bureau of Economic Analysis), Sharon Brown (US Bureau of Labor Statistics), Wesley Cohen (Duke University), Michael Handel (Northeastern University), Susan Helper, (Case Western Reserve University), Ursula Huws, (London Metropolitan University), John Paul MacDuffie (Wharton), Margaret McMillan (Tufts University), Frits Pil (University of Pittsburgh), and Tom Smith (NORC). We have also been in contact with Alan Krueger (Princeton) to discuss his recent survey on the portability of jobs. In these meetings and workshops, participants expressed a great deal of interest in working with the data. We will continue to draw on this network as we further develop the 2009 NOS survey questions.

We believe this research will have substantial and broad impact on both a scientific level and a policy level. First, the data collection effort should make contributions far beyond our analysis, because of the broad dissemination to the research community: the 2009 NOS will be linked to the 2008 GSS public

use files that are available through ICPSR, the Roper Center at the University of Connecticut, the University of California at Berkeley, and the NORC data enclave, which has a collaborative environment designed to develop the capacities of junior researchers as well as more senior scholars. Researchers studying globalization and innovation will finally have a representative organization-based data set that provides key variables on how organizations are engaged globally and how they contribute to the overall innovation process. Second, the survey and analysis will provide a valuable addition to the empirical basis for formulating policies related to innovation and globalization. We think it will attract substantial attention, since the analysis will provide policy makers the first large-scale scientific evidence of the pattern of U.S. organizations' global location of their business functions, and how this global location is related to domestic jobs and to innovation activities. This will provide some of the scientific evidence required to understand the impact of off-shoring of service jobs on U.S. workers. In addition, the survey will provide evidence of employees' views of job security and how organization's job composition has changed during the recession. Finally, there is the potential for follow-on NOS linked to the General Social Survey, which is fielded every two years and has a longitudinal as well as a cross-sectional component. We note again that it is urgent that this project be funded now in order to preserve the link to the GSS and to collect data that documents changes in organizational practice and employment during the recession.

Responses to reviewer comments

We wrote this proposal to respond fully to reviewers' useful comments on an earlier version. We have provided a detailed explanation and more complete justification for using a business function framework, based on the BLS approach, to collect data. We dropped the detailed collection of information on innovative inputs and outputs and instead focused the innovation segment on organization of business functions (two of which, product and technology development, contain activities related to innovation) and domestic employment. This enabled us to reduce the budget (by nearly \$100,000), reduce respondent burden, and focus the study more tightly on the question of how domestic employment is affected by specific business practices. We have revised our analysis of employment security to reflect current economic conditions and to allow analysis of the current recession. We have explained that we can develop weights for the Fortune 1,000 frame that hypothetically adjusts for under-representation of firms that locate jobs abroad (given assumptions about counterfactual conditions). We have included a discussion of how the 2009 NOS can be linked to earlier NOS waves for specific business functions to provide some insight into dynamic process. We have provided a detailed justification of the cost of survey development and data collection, which is driven by the guaranteed 60% response rate and the cognitive testing and reflect competitive bidding. We have clarified the survey methods, particularly the identification of the correct respondent for the survey. Finally, we have discussed the value of using the 2009 NOS as proof of concept for using business functions to collect data in firm-based surveys.

Senior Researcher Team

The project's senior researchers, Clair Brown (UC Berkeley), Timothy Sturgeon (MIT), and Frank Potter (Mathematica) are well-qualified to carry out the proposed project. This core team will benefit from the formal consulting of Peter Marsden (Harvard) during the survey development phase. Together, these researchers represent expertise in economics, sociology, geography, and statistics, and have research experience across a variety of methods, including design and implementation of probability surveys of firms, design and implementation of fieldwork-based surveys, statistical analysis of large data sets, use of qualitative fieldwork data to interpret statistical results of large data sets, and contextual analysis of rich qualitative fieldwork in specific industries. The researchers have a long record of conducting collaborative research, and of combining multi-discipline and multi-faceted scientific approaches to complex economic topics.

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