Measuring Tradable Services and the Task Content of Offshorable Services Jobs

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Introduction

The services offshoring debate reached headline status several years ago, fueled in large part by the 2004 Presidential campaign and the slow recovery of the labor market from the 2001 downturn. To (try to) be clear, services offshoring refers to the (potential) migration of jobs (but not the people performing them) across national borders (mostly from rich countries to poor ones, with imported products and activities flowing back to the US). The literature on services offshoring remains in its infancy, although the number of contributions is expanding rapidly. A non-exhaustive list of recent contributions includes: Amiti and Wei (2004); Arora and Gambardella (2004); Bardhan and Kroll (2003): Bhagwati, Panagariya, and Srinivasan (2004); Blinder (2006, 2007); Brainard and Litan (2004); Bronfenbrenner and Luce (2004); Jensen and Kletzer (2006); Kirkegaard (2004); Mankiw and Swagel (2006); Samuelson (2004); and Schultze (2004). Despite the attention, relatively little is known about how many jobs may be at risk of relocation or how much job loss is associated with these business decisions.

There are a few prominent projections, advanced mostly by consulting firms. An early estimate of the likely scale of future job losses due to movement of jobs off shore is Forrester Research's "3.3 Million US Services Jobs To Go Offshore" (McCarthy (2002)).[1] Other estimates include: Deloitte Research estimates that by 2008 the world's largest financial service companies will have relocated up to two million jobs to low-cost offshore countries; Gartner Research predicts that by the end of 2004 10% of IT jobs at US IT companies and 5% of IT-jobs at non-IT companies will have moved offshore; another Gartner Research survey revealed that 300 of the Fortune 500 companies today do business with Indian IT services companies. Goldman Sachs estimates 300,000 to 400,000 services jobs have moved offshore in the past three years, and anticipates a monthly rate of 15,000 to 30,000 jobs, in manufacturing and services combined, to be subject to offshoring in the future. Bardhan and Kroll (2003) put out an estimate of 14 million jobs potentially at risk.

In an earlier paper (Jensen and Kletzer (2006)), we advanced a new empirical approach to identify, at a detailed level, service activities that are potentially exposed to international trade. The approach uses the geographic concentration of service activities within the U.S. to identify which service activities are traded domestically, and then classifies activities that are traded

[1] The Forrester projection was updated in 2004 to 3.4 million.

domestically as *potentially* tradable internationally. With the tradability classification, we developed estimates of the number of workers who are in tradable activities for all sectors of the economy. The paper offered comparisons of the demographic characteristics of workers in tradable and non-tradable activities and employment growth in traded and non-traded service activities. The tradability designation also allowed an examination of the risk of job loss and other employment outcomes for workers in tradable activities.

While we believe we made an important contribution to identifying tradable activities using the notion of geographic concentration, we recognize that the measure is not perfect. There are two potential problems with the geographic concentration methodology. The first potential problem is if something is tradable but not in an increasing returns activity, it might not be geographically concentrated. The second potential issue is that something might be geographically concentrated because of some feature of demand (though our methodology addresses this in principle) even though the activity is not tradable. For example, certain occupations appear concentrated in large metropolitan area or tourist areas even though they are not tradable (e.g. limousine drivers, manicurists). The task content approach will provide additional information for classifying activities as tradable and non-tradable.

This paper focuses on the task and activity content of jobs, to develop measures of the occupational job tasks, activities and characteristics associated with potential offshoring. The literature on offshoring notes that movable jobs are those with: little face-to-face customer contact; high information content, work process is internet enabled and/or telecommutable (see Bardhan and Kroll (2003); Dossani and Kenney (2003), and Blinder (2006)). More informally, it is commonly believed that if "it can be sent down a wire (or wireless)," it is offshorable. Empirically, this investigation tries to bring these basic principles of the characteristics of potentially offshorable jobs to detailed microdata on occupations. The task content investigation offers us a second and independent measure of potential tradability, to be used to refine the understanding obtained from our geographical concentration measure. More specifically, we can ask if the jobs identified as potentially internationally tradable, using geographic concentration, involve activities and characteristics that fit current notions of offshorability.

This paper begins with a summary of the methodology and findings in Jensen and Kletzer (2006). The next step involves an operational assessment of how the basic principles of offshorability (high information content, remote from customer, internet-enabled) match up to

the characteristics of "real" jobs. Detailed information on the content and context of jobs (occupations) is available from O*Net, a U.S. Department of Labor database of 450 occupations.[2] For each of hundreds of occupations, O*Net contains detailed qualitative information on job tasks, work activities (interacting with computers, processing information), and work context (face-to-face discussions, work with others, work outdoors). A very preliminary version of this paper focused on qualitative information, available from O*Net on-line. This version develops more quantitative and objective measures of offshorability using the information available from the publicly available and downloadable O*Net production dataset (version 11).

Briefly summarizing the results, based on job task content the occupational groups with large shares of employment in the highest potentially tradable group include: Business and Financial Operations (74.7 percent of employment); Computer and Mathematical Occupations (93.4 percent); Architecture and Engineering (80.8 percent), Life, Physical and Social Sciences (75.9 percent) and Office/administrative support (64.3 percent). The notable non-tradable occupational groups, with large shares of employment identified as least potentially tradable include: Education and Library (43.7 percent); Healthcare Practitioners (78 percent); Healthcare Support (94.4 percent), Food Preparation (100 percent). Overall for the service occupations, 27.4 percent of May 2005 employment was in the most potentially tradable group, while 43.8 percent of employment was in occupations rated as least potentially tradable. There is a considerable overlap between the job task content measure of potential tradable and our geographic concentration measure. We also find a positive correlation between skill (measured as educational attainment) and potential tradability – occupations with a greater share of workers with a college degree are more highly ranked as offshorable

1. Geographical concentration and tradability: empirical approach

To develop a measure of tradable services, our earlier empirical approach relied on the basic economic intuition that non-traded services will not exhibit geographic concentration in production. Goods that are traded tend to be geographically concentrated (to capitalize on increasing returns to scale, access to inputs like natural resources, etc), while goods that are not

[2]O*Net is the successor to the well-known Dictionary of Occupational Titles.

traded tend to be more ubiquitously distributed. We applied this same intuition to service production. With the identification of industries and occupations that appear to be traded within the U.S., the inference is that service activities that can be traded within the U.S. are also potentially traded internationally.

The intuition is described in Krugman (1991, pg. 65), where he notes "In the late twentieth century the great bulk of our labor force makes services rather than goods. Many of these services are nontradable and simply follow the geographical distribution of the goods-producing population – fast-food outlets, day-care providers, divorce lawyers surely have locational Ginis pretty close to zero. Some services, however, especially in the financial sector, can be traded. Hartford is an insurance city; Chicago the center of futures trading; Los Angeles the entertainment capital; and so on. …. The most spectacular examples of localization in today's world are, in fact, services rather than manufacturing. …. Transportation of goods has not gotten much cheaper in the past eighty years… But the ability to transmit *information* has grown spectacularly, with telecommunications, computers, fiber optics, etc."

The idea is that when something is traded, the production of the activity is concentrated in a particular region to take advantage of some economies in production. As a result, not all regions will support local production of the good and some regions will devote a disproportionate share of productive activity to a good and then trade it.

Measuring geographical concentration

Measures of geographic concentration are a way to implement the intuition presented in the Helpman and Krugman model. Most measures of concentration use the region's share of employment in an industry relative to the region's share of total employment. One issue with measures of concentration for our purposes is that they do not differentiate between the reasons activity is concentrated. In general, the reason for the concentration does not matter to us except for one instance. If a service is non-tradable and demand for the service is concentrated (industries that use the non-traded service are geographically concentrated), the service industry will be geographically concentrated and we will infer that the service is tradable. To incorporate this case, we extend the intuition from the framework. If a non-tradable industry provides intermediate inputs to a downstream industry, we would expect the geographical distribution of the non-traded intermediate industry to follow the distribution of the downstream industry.

Instead of being distributed with income, the non-traded good is distributed in proportion to the demand for that industry.[3]

We focus here on the Gini coefficient of geographic concentration.[4] The Gini coefficient (***G***) for the concentration of industry activity is given by:

$$\boldsymbol{G} = | 1 - \sum_i (\sigma Y_{i-1} + \sigma Y_i) * (\sigma X_{i-1} - \sigma X_i) |$$

Where i is an index for regions (sorted by the region's share of industry employment), σY_i is the cumulative share of industry or occupation employment in region i, σY_{i-1} is the cumulative share of industry or occupation employment in the region (i-1) with the next lowest share of industry employment, σX_i is the cumulative share of total employment in region i, and σX_{i-1} is the cumulative share of total employment in region i-1. We modify the Gini measure to:

$$\boldsymbol{G} = | 1 - \sum_i (\sigma Y_{i-1} + \sigma Y_i) * (\sigma IDS_{i-1} - \sigma IDS_i) |$$

where IDS_i is the region's share of demand for industry i.

Implementation

These measures were implemented using employment information from the 2000 Decennial Census of Population Public Use Micro Sample (PUMS) files. The geographic entity is the Consolidated Metropolitan Statistical Area or the Metropolitan Statistical Area where an individual reports working.[5] The use of worker level data to investigate economic concentration is somewhat unusual. One advantage of this strategy is that it allows consideration of both industrial concentration and *occupational* concentration. The ability to identify both industries and occupations that are tradable is an important feature of the empirical strategy because many

[3] To address this issue, we modify the general measures of geographic concentration by developing an industry-region specific measure of the concentration of demand for an industry. We construct a downstream industry weighted average demand for each industry-region using the input-output tables. More details on the construction of the weights are provided in Jensen and Kletzer (2006). The adjustment takes account of the concentration of downstream industry concentration and adjusts the "denominator" in the concentration measures accordingly.

[4] Our 2006 paper discusses a measure of economic concentration, ***EC,*** as described in Ellison and Glaeser (1997). The correlation between the ***EC*** measure and the ***G*** measure is quite high, .713 for industries and .732 for occupations.

[5] For regions, we use the Place of Work Consolidated Metropolitan Area (POWCMA5) field on the Decennial PUMS. When POWCMA is coded as a non-metropolitan area or a mixed metro/non-metro area, we concatenate the Place of Work state code with the POWCMA5 code. For more information on the 5 percent sample PUMS, see: http://www.census.gov/Press-Release/www/2003/PUMS5.html.

of the service activities that are reportedly being globally sourced are tasks within the service "production" process (for example, the banking relationship is not relocated offshore, rather the customer service/call center component is moved); occupations correspond more closely to these types of activities than do industries. In addition, occupations have job task content and activities, while industries (often similar to products) do not.

2. Classifying industries and occupations as tradable vs. non-tradable

Industries

In our 2006 paper we discussed extensively how to determine a tradable vs. non-tradable distinction for industries and occupations. Starting with industry, where intuition tends to be stronger, we initially placed industries into 3 roughly equal groups: Gini class 1 (least geographically concentrated) when the industry Gini was less than .1; Gini class 2 when the industry Gini was between .1 and .3; Gini class 3 (most geographically concentrated) when the Gini coefficient was greater than or equal to .3. Approximately 36 percent of industries are in Gini class 1, about 37 percent are in Gini class 2, and 27 percent are in Gini class 3.

Figure 1 plots the Gini coefficients for all industries by 2-digit NAICS code. The pattern exhibited in Figure 1 is generally consistent with our priors that tradable industries will be geographically concentrated. For example, industries in the goods producing sectors of Agriculture, Mining, and Manufacturing are typically in the top two Gini classes. Only 5 of the 92 industries in these sectors are in Gini class 1: Cement and Concrete, Machine Shops, Miscellaneous Manufacturing n.e.c., Structural Metals and Tanks, and Printing and Related Activities. All of these industries seem to be either non-traded because of a high weight to value ratio (e.g., Cement and Concrete) or they are categories that include a range of potentially dissimilar activities (Miscellaneous manufacturing n.e.c.) that make them appear to be broadly geographically distributed. Most agriculture, mining, and manufacturing products are considered tradable; so as a first-order approximation classifying the lowest geographical concentration category (Gini class 1) as non-tradable seems appropriate for these sectors. [6] Using a Gini coefficient of .1 as the threshold for tradable seems to make sense in other sectors as well. Industries in the retail trade sector are primarily classified as non-tradable. Industries in the Transportation sector are mostly classified as tradable. For Public Administration, most activities

[6] There is a positive correlation between Gini class and mean trade share.

are non-tradable except for Public Finance and the military. For the Service sector, industries are balanced between non-tradable and tradable. Table 1 provides a complete list of service industries by 2-digit NAICS sector and the industry's Gini class.

Occupation Results

We constructed a similar demand-weighted Gini coefficient for each occupation, using the same Gini = .1 threshold for the non-tradable/tradable categorization. Table 2 shows the share of employment by Major Standard Occupational Classification group by Gini class. The groupings largely are consistent with our priors. The occupational groups with large shares of employment classified as tradable include: Business and Financial Operations (68 percent); Computer and Mathematical Occupations (100 percent); Architecture and Engineering (63 percent), Legal (96 percent), and Life, Physical and Social Sciences (83 percent).[7] The notable non-tradable occupational groups include Education and Library (99 percent non-tradable); Healthcare Practitioners (86 percent); Healthcare Support (97 percent), Food Preparation (96 percent). On the goods production side, 90 percent of employment in Installation, Maintenance and Repair is classified as non-tradable, as is 80 percent of Production[8] and 89 percent of Transportation and Material Moving.

Table 3 brings together information on industries and occupations for a selection of "white-collar" occupations. In the aggregate, across occupations, the share of workers in tradable occupations and non-tradable industries is not large, about 10 percent. However, as table 3 shows, for business and professional occupations, the share of workers in tradable occupations but non-tradable industries is much larger. The typical professional occupation has about 25 percent of employment in tradable occupations but non-tradable industries. To the extent that firms can vertically "disintegrate" the provision of these intermediate service inputs, workers in these tradable occupations are potentially vulnerable to trade even though their industry is not

[7] van Welsum and Reif (2006) offer a list of U.S. occupations (at the 3-digit level) identified as "potentially affected by offshoring," in Appendix table 2. As explained in the chapter, their method relies on occupations having "offshorability attributes," that rely on the use of information and communication technologies, highly codifiable knowledge, and no face-to-face contact. There is overlap between the two lists of occupations, although our method identifies a larger set of tradable occupations. van Welsum and Vickery (2005a) offer a list of U.S. industries potentially affected by offshoring, in table 6. Our detailed industry list shares similarities with theirs, but our list excludes a number of retail industries (e.g., Dairy Stores, Liquor Stores, etc) included in their list.

[8] The geographic concentration results are at first counter-intuitive for production occupations given the manufacturing industry results. Production occupations are typically not industry specific but instead functional activities and are thus distributed more broadly.

tradable. This suggests that for service activities, the industry results on the share of workers potentially vulnerable to trade are probably understated. Outside of education and healthcare occupations, the typical "white-collar" occupation involves a potentially tradable activity.

From here, we focus on occupations and potential tradability, bringing in job task characteristics associated with offshorability.

3. Measuring task content of potentially tradable services occupations

The literature on offshoring posits that movable jobs are those with: little face-to-face customer contact; high information content, work process is internet enabled and/or telecommutable.[9] A great deal of attention is paid to internet-enabled: the expansion of broadband and wireless (and the broad use of "off the shelf" software programs) having greatly reduced the "transportation costs" of information. Having developed a set of tradable services occupations, the next step is to consider the detailed characteristics of these jobs and whether the characteristics fit a description of offshorability. Based on these offshorability characteristics, van Welsum and Vickery (2005a, b) perform a similar exercise for a selection of OECD countries. Their methodology is based on subjective judgments of the task content of jobs, not data on work activities or content.

The use here of O*Net is in the spirit of Autor, Levy, and Murnane (2003), who explored the spread of computerization, using the Dictionary of Occupational Titles (DOT) to measure the routine vs. non-routine, and cognitive vs. non-cognitive aspects of occupations. O*Net is the successor to the DOT. Information is organized by detailed occupation, at the Standard Occupational Classification level. The O*Net Content model identifies the most important types of information about work and jobs and integrates the information into a structured system of six major categories:[10]

- Worker Characteristics (Abilities; Occupational Interests; Work Values; Work Styles)
- Worker Requirements (Skills & Knowledge; Education)
- Experience Requirements (Experience & Training; Skills & Entry Requirements;

[9] See Bardhan and Kroll (2003) for a list of attributes.
[10] Information on the O*Net Context Model comes from National Center for O*Net Development (2006).

Licensing)

- **Occupational Requirements (Generalized and Detailed Work Activities; Organizational Context; Work Context)**
- Labor Market Characteristics (Labor Market Information; Occupational Outlook)
- Occupation-Specific Information (Tasks; Tools & Technology)

The first three categories (Worker Characteristics, Worker Requirements, Experience Requirements) are worker-oriented. The second three are the job-oriented categories, with Occupational Requirements as the focus of interest here. Occupational requirements are designed to cross occupations, at both a general and detailed level, while Occupation-specific Information is meant to be quite detailed and literally occupation-specific.

The domain/category **Occupational Requirements** is designed to provide ". . .a comprehensive set of variables or detailed elements that describe what various occupations require." (National Center for O*Net Development, 2006, pg. 20) The focus is on typical activities required across occupations. Within the Generalized and Detailed Work Activities sub-domain, we selected eleven measures to construct an index of offshorability/potential tradability:

On information content:
Getting information (+)
Processing information (+)
Analyzing Data or Information (+)
Documenting/Recording Information (+)

On Internet-enabled:
Interacting with computers (+)

On face-to-face contact:
Assisting or Caring for Others (-)
Performing or Working Directly with the Public (-)
Establishing or Maintaining Interpersonal Relationships (-)

On the routine or creative nature of work:
Making Decisions and Solving Problems (-)
Thinking Creatively (-)

On the "on-site" nature of work:
Inspecting equipment, structures or material (-)

The sign in parentheses [(+) or (-)] denotes our prior on whether the characteristic is positively related to offshorability or negatively related.

For each occupation, O*Net provides information on the "importance" and "level" required of each characteristic. Explaining the difference between the two terms is perhaps best done by example. For the attribute "Performing or Working Directly with the Public," data entry keyers are assigned importance (I) =43, and level (L) = 33. For Security Guards, I=74 and L=62. Importance appears to be literally just that: how "important" the attribute is to the job. Level appears to be "how much" of the attribute is involved in the job. Tables 3.1, 3.2 and 3.3 provide summary information on importance, level, and the various work activities.

Table 3.1 provides summary statistics across occupations on the eleven work activities and their importance and level. The various attributes that involve working with information via computers have higher scores on importance than the attributes involving working directly with the public or assisting and caring for others. Importance of attributes appears to vary more across occupations than level.

Tables 3.2 and 3.3 illustrate some of the work activities for two specific occupations. In table 3.2, mathematical technicians are profiled; in table 3.3 bookkeeping, accounting and auditing clerks are profiled. For each occupation, the tables list the work activities with the highest shares of importance. It is notable that for both occupations, interacting with computers and various aspects of processing information are the highest (most important) work activities.[11]

In constructing an index, it is not obvious how to weight importance and level. Starting (arbitrarily) with a weight of three-quarters to importance and one-quarter to level, a composite index of offshorability is the sum of the eleven components, using my priors on the sign of the attribute in regard to offshoring potential. Higher values of the index indicate more offshorability potential, yielding a ranking of all occupations for which the attributes are available.

The usefulness of the index is ordinal, not cardinal. Occupations are judged on their offshorability relative to each other, not compared to some absolute standard. Paralleling our discussion of economic concentration, we explore whether to divide potentially tradable/offshorable from "sticky" and non-tradable. Index values span a range of +1.777 (Mathematical technicians) to -1.889 (Barbers). Dividing the set of occupations roughly in thirds, we established "Index class 1" (low tradability) as index values less than -0.7, "Index class 2" (medium tradability) as values between -0.7 and zero (0.0), and "Index class 3" (high potential

[11] In the O*Net data, both importance and level are measured on a scale of 0 to 100. Table 3.1 and the constructed index transform both importance and level to measures ranging from 0 to 1.

tradability) as values greater than or equal to zero. Each class contains approximately 152-154 occupations.

Table 4 reports shares of employment (for May 2005), for major (SOC 2-digit) occupational groups, across the three index classes. The occupational groups with large shares of employment in the highest potentially tradable group include: Business and Financial Operations (74.7 percent); Computer and Mathematical Occupations (93.4 percent); Architecture and Engineering (80.8 percent), Life, Physical and Social Sciences (75.9 percent) and Office/administrative support (64.3 percent). The notable non-tradable occupational groups, with large shares in index class 1 (least potentially tradable) include: Education and Library (43.7 percent); Healthcare Practitioners (78 percent); Healthcare Support (94.4 percent), Food Preparation (100 percent). Overall for the service occupations, 27.4 percent of May 2005 employment was in the most potentially tradable group, while 43.8 percent of employment was in occupations rated as least potentially tradable.

The full listing of occupations, ranked by job task content, is presented in table 5. How "good" are the results? Occupations at the top of the list seem unsurprising: credit authorizers, data entry keyers, accountants, medical transcriptionists, market research analysts, bookkeeping and account clerks. One of the columns in the table indicates occupations identified as tradable by geographic concentration, and there is a close match both at the top of the table with most tradable and at the bottom of the table with least tradable. The O*Net information corrects some obvious misfits of geographic concentration: crossing guards, massage therapists, manicurists (see the bottom of the table).

With three economic concentration "classes" and three task content "classes," there is a natural question of how well the two measures match up. Overall, where the two measures can be constructed at the same detailed level, 41 percent of occupations match completely (index class 1 matches to Gini class 1; index class 2 matches to Gini class 2, etc.). Looking just at non-tradable occupations, 48 percent of the occupations classified as non-tradable using the economic concentration measure are also classified as non-tradable using the job task content measure. Similarly, 55 percent of the most tradable occupations, by Gini, are most tradable by job task content.

An alternative measure of fit simply counts the number of geographically concentrated "tradable" occupations within each task content class. In the highest task content class (most

tradable/offshorable by task content), 51.6 percent of those occupations are tradable by geographic concentration. In the middle task content class, 35.6 percent of occupations are "tradable" by the first of our measures, and in the lowest (least offshorable/tradable) task content class, 21.2 percent of occupations were previously denoted "tradable" by geographic concentration.

Potential offshorability and skill is of interest. The O*Net data offer information on educational attainment, based on BLS data on fractions of jobholders with varying levels of education. Table 5 offers two categories: percent with a high school diploma or less and percent with a BA degree or more. Using the BA category, the rank correlation between educational attainment and relative offshorability is +0.306 – occupations with a greater share of BA holders are more highly ranked as offshorable. The top quartile of jobs in the ranking has a mean percentage of BA+ degree holders of 61%, the second quartile, 53.7%, the third quartile 47.3% and the bottom quartile, 29.1%. The least offshorable jobs are the least formally educated and have lower median annual earnings.

Blinder (2007) explores a subjective index based on two characteristics: 1) can the work be delivered to a remote location; and 2) must the job be performed at a specific (US) location. In his subjective measure, Blinder concentrates one characteristic of the delivery of services, the separation of customer and supplier that he labels "impersonally-delivered services." Basically, impersonally-delivered services can be delivered electronically, incorporating the vast improvement in ICT. His measure does not incorporate any attributes related to the kind of work sent down the wire, such as information context or internet enabling. Most importantly, in terms of the area of traditional US comparative advantage, Blinder does not consider the creativity or routineness of work.[12] In an area that needs more exploration, there are many high-skill and high-value (creative) services, that while transmittable electronically, pose opportunities for American workers and firms to penetrate foreign markets.

Using both production and non-production occupations, Blinder estimates that 30 to 40 million workers are currently in potentially tradable jobs, based on May 2005 employment levels. Objective measures may well be preferred, given the number of occupations (>450) and desire for replication.

[12] The routineness of work, or the codification of tasks, is a characteristic emphasized by Autor, Levy, and Murnane (2003).

Drawing a line in table 5 is admittedly arbitrary. One starting point, entirely subjective, draws a line around the offshore rank of 236 (Real estate brokers) suggests 38 million potentially offshorable jobs; 55 million not (below the line).

Our focus here is on services occupations. One natural question is where the other major occupational groups lie within this ranking. The average Production occupation, with an index value of -0.310, lies at rank 214, just below "Sales Engineers." The average Farming, Forestry and Fishing occupation, with an index value of -0.441, lies at rank 238, just below "Hotel, Motel and Resort Desk Clerks." Similarly, the average Transportation & Material Moving Occupation, with index value -0.456, lies at rank 247, just below "Psychiatric Technicians." Finally Installation, Maintenance and Repair Occupations, with an average index value of -0.568, lies at rank 269, just below "Nursing Instructors."

One of the next steps will be to refine our estimates, within occupations. Not all jobs in an occupation will be offshored. Perhaps there will be variation by firm size and industry (some industries being more tradable than others).

There is an important question of timing, which is largely an unknown. It is clear that advancing technology will continue to increase the feasibility of providing services from remote locations. For now and perhaps the foreseeable future, however, most high-value work will require creative interaction among employees, interaction which is facilitated by physical proximity and personal contact. Moreover, in many fields, closeness to customers and knowledge of local conditions are also of great importance. The "how soon" question is very important for understanding the costs of adjustment. A process that takes 20 years to establish itself on a real scale allows for more adjustment than offshoring over a 5-year period.

4. Evidence on the risk of job loss, by industry, occupation and tradability

The Displaced Worker Surveys (DWS) provide basic information on the scope and cost of involuntary job loss. The DWSs offer large sample sizes, are nationally representative, and allow several key elements to be investigated, including the incidence of job loss; the characteristics of workers affected; likelihood of re-employment; re-employment industry and

occupation; and earnings changes. These surveys have been used extensively to study manufacturing job loss (see Kletzer (2001) and Farber (2005)).

Only the 2000 and later Census industry and occupational classifications allow study of the services and white-collar jobs of primary interest. This need for updated detail on industry and occupation (currently) limits our use of the Displaced Worker Surveys to the two most recent surveys, January 2004 and January 2006. Although we lose the ability to observe services and white job loss over an extended period of time, we gain the industry and occupational detail necessary for studying services offshoring.

Job loss rates by industry are reported in Table 6, with information presented for two 3-year periods, 2001-03 and 2003-05. Remembering that the 2001-03 time period covered the dot-com bust and the most recent recession, the Information sector (NAICS 51) had a notably high rate of job loss (.232). The rate of job loss from manufacturing was .209 for this period. With stronger economic growth over 2003-05, the rate of job loss from Information fell, to .039, a rate very similar to other services sectors. Overall, the risk of job loss was lower in services than in manufacturing, and even more so for the 2003-05 period. Financial Services, Professional and Business Services, and Information all had much lower rates of job loss for 2003-05 than was the case for manufacturing.

There is (at least one) interesting difference between 2001-03 and 2003-05. For the earlier period, when we apply our tradable-non-tradable distinction to the overall economy, the rate of job loss is notably higher from tradable industries (.153) than from non-tradable industries (.076). Within the broad sectors of manufacturing and non-manufacturing, tradable industries also had higher rates of job loss. The tradable-non-tradable distinction was small within manufacturing, with tradable industries at a rate of job loss of .213, and non-tradable (of which there are few) at a rate of .192. Outside of manufacturing, the tradable distinction was large. Tradable non-manufacturing industries had a rate of job loss of .128, and non-tradable industries, .073. This difference is most notable in the Information sector, where the rate of job loss from tradable (3-digit) industries was .317 and the non-tradable job loss rate was .075. For the later period, overall rates of job loss are much lower, with the tradable-non-tradable difference small (.056 compared to .030). In manufacturing, non-tradable industries had a higher rate of job loss (.174), compared to a tradable job loss rate of .116. Outside of manufacturing, the non-tradable job loss rate was slightly higher than the tradable rate. In the Information sector, the non-tradable

rate was .149, compared to the tradable rate of .035. In Professional and Business Services (another focus of attention in the services offshoring debate), the tradable rate of job loss was .048 (close to the overall economy-wide rate of .041), while the non-tradable rate was .018.

Job loss rates by occupation are reported in Table XXX. Workers in all occupational categories faced a higher rate of job loss in 2001-2003 than in 2003-05. Production workers faced the highest rate of job loss, at .210 (virtually the same across the two time periods). Some of the traditional "white-collar" occupational categories forecasted to be at risk of services offshoring had high job loss rates (but lower than Production workers), including Computer and Mathematical Occupations (.156) and Architecture and Engineering (.126).

For the overall economy, the difference in the rate of job loss between tradable and non-tradable occupations narrowed in 2003-05, compared to 2001-03. There is no clear pattern of exposure to the risk of job loss by tradability within detailed occupations.

Table 8 reports demographic and educational characteristics for workers displaced from tradable and non-tradable non-manufacturing industries for the two time periods, with (tradable) manufacturing industries offered as a reference group. Unsurprisingly, worker characteristics are fairly constant across the two short (and overlapping) time periods. As noted in Kletzer (2001), workers displaced from non-manufacturing industries are slightly younger, less tenured, less likely to be male, and considerably more educated than workers displaced from manufacturing. From tradable non-manufacturing workers, just under 75 percent of displaced workers had at least some college experience. That share for displaced manufacturing workers was .46.

Also evident in Table 8 is that for non-manufacturing industries, workers displaced from tradable industries were more educated, more likely to have health insurance, more likely to lose fulltime jobs, and have higher pre-displacement earnings than workers displaced from non-tradable industries. The educational attainment differences are stark: 41 percent of workers displaced from non-tradable non-manufacturing industries had a high school diploma or less, compared to 26 percent of workers displaced from tradable non-manufacturing industries. The educational differences show up in pre-displacement weekly earnings, and are consistent with the comparative advantage characteristics noted above.

In terms of post-displacement outcomes (also reported in Table 8), reemployment rates are higher slightly higher for displaced manufacturing workers for the 2003-05 period (.67) compared to the 2001-03 period (.64). For non-manufacturing, reemployment rates were lower

for the later period than seen in the earlier period. Reemployment rates were higher for tradable non-manufacturing than for non-tradable non-manufacturing.

With a stronger economy, the earnings cost of job displacement were lower for 2003-05 than seen in 2001-03. The median change in weekly earnings for manufacturing workers was a loss of 15 percent in 2001-03, compared to a loss of 5.4 percent for 2003-05. For non-manufacturing the median change was a smaller loss as well, comparing 2003-05 to 2001-03. Median earnings losses are smaller for non-manufacturing than for manufacturing, and a larger share of non-manufacturing workers experience no earnings loss. Consistent with lower pre-displacement earnings, workers displaced from non-tradable non-manufacturing industries experienced smaller earnings losses than workers displaced from tradable non-manufacturing industries.

5. Conclusions

In this paper we offer a second measure of tradability, built from common notions of job characteristics related to "offshorability." We find a selection of tradable occupations do indeed have characteristics of offshorability (internet-enabled, high information content, no face-to-face customer contact). The calculated index of offshorability offers strong potential for understanding jobs (tasks) at risk. The two measures of tradability and offshorability offer a combined potential to do the same. Future work will focus on high-skill tradable occupations and lower-skill occupations, and how they differ on these dimensions of offshorability. We will also examine the earnings implications of potential offshorability.

In our earlier paper, we provided evidence that service activities employ workers with higher education and more skill than non-tradable (service) activities and manufacturing. This seems to suggest that tradable services are consistent with U.S. comparative advantage in high skill production. Unlike Blinder's view that only personally-delivered services are likely to "stay" in the US, we consider it important to understand how tradable services can consistent with U.S. comparative advantage, with the expectation that as technology and policy allow for

more trade in these activities the U.S. should gain world market share in these activities, not lose it.[13]

[13] Though over the longer-term, if the U.S. ceases to make investments in education and training, it is possible that it would cease to have comparative advantage in high-skill activities.

References

Amiti, Mary and Shang-Jin Wei. 2004. "Fear of Service Outsourcing: Is It Justified?," IMF Working Paper, WP/04/186, October.

Arora, Ashish and Alfonso Gambardella. 2004. "The Globalization of the Software Industry: Perspectives and Opportunities for Developed and Developing Countries," NBER Working Paper #10538, June.

Autor, David, Richard J. Murnane, and Frank Levy. 2003. "The Skill Content of Recent Technological Change: An Empirical Exploration," *Quarterly Journal of Economics*, 118(4): pp. 1279-1334.

Bardhan, Ashok Deo and Cynthia A. Kroll. 2003. "The New Wave of Outsourcing," Fisher Center for Real Estate and Urban Economics, Report Series No. 1103, University of California, Berkeley, Fall.

Blinder, Alan S. 2006. "Offshoring: The Next Industrial Revolution?," *Foreign Affairs*, Vol. 85, No. 2 (March-April): pp. 113-128.

Blinder, Alan S. 2007. "How Many U.S. Jobs Might Be Offshorable,?" CEPS Working Paper No. 142, Princeton University, March.

Brainard, Lael and Robert E. Litan. 2004. "Offshoring Service Jobs: Bane or Boon – and What to Do?," Brookings Institution Policy Brief, #132, April.

Bronfenbrenner, Kate and Stephanie Luce. 2004. "The Changing Nature of Corporate Global Restructuring: The Impact of Production Shifts on Jobs in the US, China, and around the Globe," US-China Economic and Security Review Commission, October.

Dossani, Rafiq and Martin Kenney. 2003. "Went for Cost, Stayed for Quality?: Moving the Back Office to India," Asia-Pacific Research Center, Stanford University, November.

Dossani, Rafiq and Martin Kenney. 2004. "The Next Wave of Globalization? Exploring the Relocation of Service Provision to India," Working Paper #156, Asia Pacific Research Center, Stanford University, September.

Ellison, Glenn and Edward L. Glaeser. 1997. "Geographic Concentration of U.S. Manufacturing Industries: A Dartboard Approach," *Journal of Political Economy*, Vol. 105, No. 5 (October): 889-927.

Farber, Henry S. 2005. "What do we know about Job Loss in the United States? Evidence from the Displaced Worker Survey, 1984-2004," Working Paper #498, Industrial Relations Section, Princeton University, January.

Helpman, Elhanan and Paul R. Krugman. 1985. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. Cambridge: MIT Press.

Jensen, J. Bradford and Lori G. Kletzer. 2006. "Tradable Services: Understanding the Scope and Impact of Services Offshoring," in Susan M. Collins and Lael Brainard, eds., *Brookings Trade Forum 2005, Offshoring White-Collar Work*. Brookings Institution: Washington, DC, pp. 75-134.

Kirkegaard, Jacob F. 2004. "Outsourcing – Stains on the White Collar?," Institute for International Economics, manuscript, February.

Kletzer, Lori G. 2001. *Job Loss from Imports: Measuring the Costs*, Washington, DC: Institute for International Economics.

Krugman, Paul R. 1991. *Geography and Trade*. Cambridge: MIT Press.

Mankiw, N. Gregory and Phillip Swagel. 2006. "The politics and economics of offshore outsourcing," *Journal of Monetary Economics*, Vol. 53, pp. 1027-1056.

McCarthy, John C. 2002. "3.3 Million US Services Jobs To Go Offshore," TechStrategy™ Research, Forrester Research, November.

National Center for O*Net Development. 2006. "The O*Net Content Model," accessed at http://www.onetcenter.org/content.html.

Samuelson, Paul A. 2004. "Where Ricardo and Mill Rebut and Confrim Arguments of Mainstream Economists Against Globalization," *Journal of Economic Perspectives*, 18(Summer): pp. 135-146.

Schultze, Charles L. 2004. "Offshoring, Import Competition, and the Jobless Recovery," Brookings Institution Policy Brief #136, August.

van Welsum, Desiree and Xavier Reif. 2006. "Potential Offshoring: Evidence from Selected OECD Countries," in Susan M. Collins and Lael Brainard, eds., *Brookings Trade Forum 2005, Offshoring White-Collar Work*. Brookings Institution: Washington, DC, pp. 165-194.

van Welsum, Desiree and Graham Vickery. 2005a. "Potential Offshoring of ICT-intensive using occupations," DSTI Information Economy Working Paper, DSTI/ICCP/IE(2004)19/FINAL, OECD, Paris.

van Welsum, Desiree and Graham Vickery. 2005b. "New Perspectives on ICT Skills and Employment," DSTI Information Economy Working Paper, DSTI/ICCP/IE(2004)10/FINAL, OECD, Paris.

Figure 1

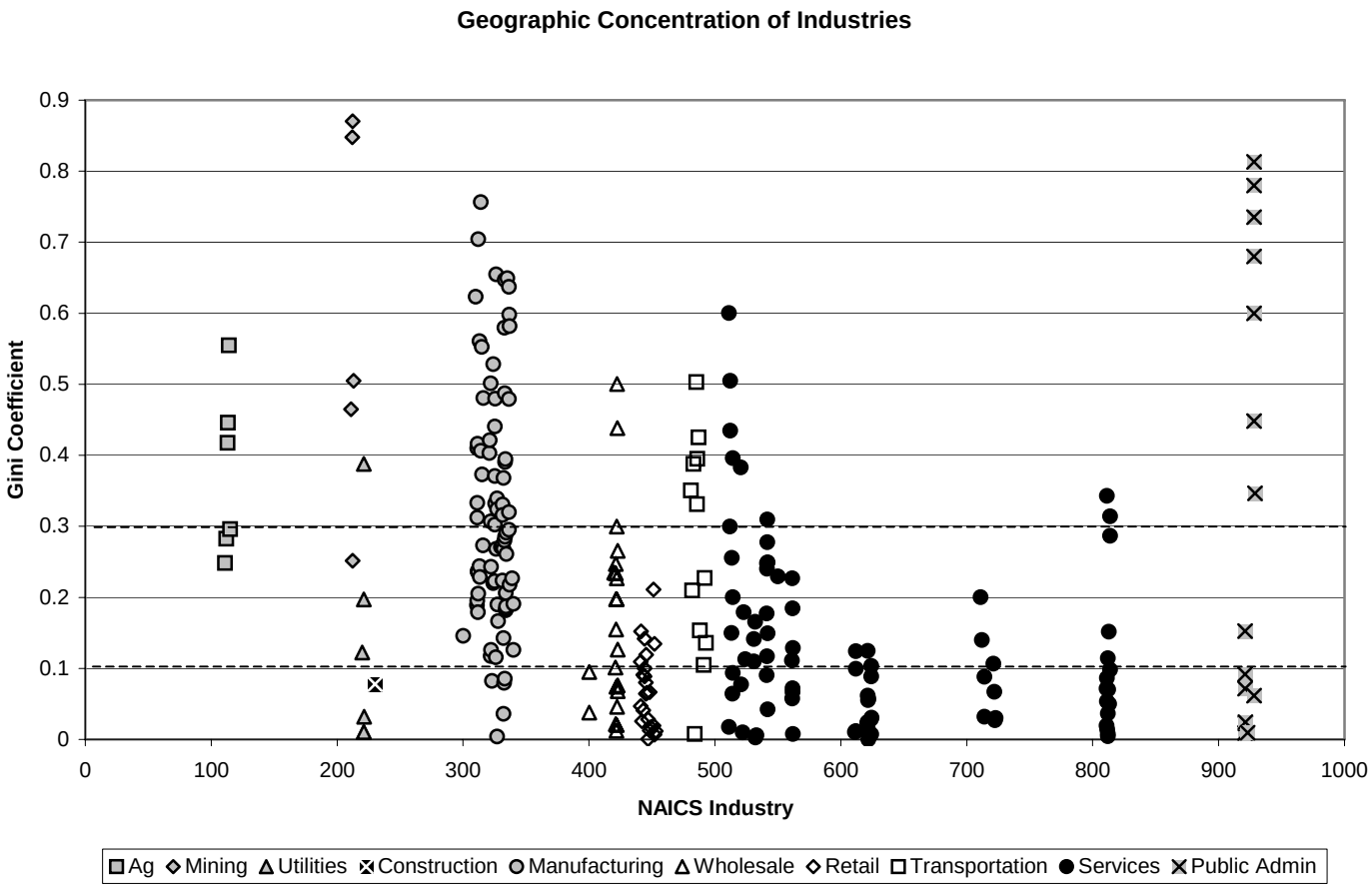
Geographic Concentration of Industries
Gini Coefficient
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
100
200
300
400
500
600
700
800
900
1000
NAICS Industry
Ag
Mining
Utilities
Construction
Manufacturing
Wholesale
Retail
Transportation
Services
Public Admin

Table 1
Service Industries
Gini Coefficient Class

2-digit NAICS	Industry Description	Gini Coefficient Class
	Information	
51	Newspaper publishers	1
51	Radio and television broadcasting and cable	1
51	Libraries and archives	1
51	Wired telecommunications carriers	2
51	Data processing services	2
51	Other telecommunication services	2
51	Publishing except newspapers and software	2
51	Other information services	3
51	Motion pictures and video industries	3
51	Sound recording industries	3
51	Software publishing	3
	Finance and Insurance	
52	Savings institutions, including credit unions	1
52	Banking and related activities	1
52	Insurance carriers and related activities	2
52	Non-depository credit and related activities	2
52	Securities, commodities, funds, trusts, and other financial investm	3
	Real Estate and Rental	
53	Video tape and disk rental	1
53	Other consumer goods rental	1
53	Commercial, industrial, and other intangible assets rental and leas	2
53	Real estate	2
53	Automotive equipment rental and leasing	2
	Professional, Scientific, and Technical Services	
54	Veterinary services	1
54	Accounting, tax preparation, bookkeeping and payroll services	1
54	Architectural, engineering, and related services	2
54	Other professional, scientific and technical services	2
54	Legal services	2
54	Specialized design services	2
54	Computer systems design and related services	2
54	Advertising and related services	2
54	Management, scientific and technical consulting services	2
54	Scientific research and development services	3
	Management	
55	Management of companies and enterprises	2

	Administrative Support	
56	Waste management and remediation services	1
56	Business support services	1
56	Services to buildings and dwellings	1
56	Landscaping services	1
56	Employment services	2
56	Other administrative and other support services	2
56	Investigation and security services	2
56	Travel arrangement and reservation services	2
	Education	
61	Elementary and secondary schools	1
61	Colleges and universities, including junior colleges	1
61	Other schools, instruction, and educational services	1
61	Business, technical, and trade schools and training	2
	Health Care and Social Services	
62	Hospitals	1
62	Nursing care facilities	1
62	Vocational rehabilitation services	1
62	Offices of physicians	1
62	Outpatient care centers	1
62	Offices of dentists	1
62	Offices of optometrists	1
62	Residential care facilities, without nursing	1
62	Child day care services	1
62	Home health care services	1
62	Other health care services	1
62	Office of chiropractors	1
62	Individual and family services	1
62	Community food and housing, and emergency services	2
62	Offices of other health practitioners	2
	Arts, Entertainment, and Recreation	
71	Bowling centers	1
71	Other amusement, gambling, and recreation industries	1
71	Museums, art galleries, historical sites, and similar institutions	2
71	Independent artists, performing arts, spectator sports, and related	2
	Accommodation	
72	Drinking places, alcoholic beverages	1
72	Restaurants and other food services	1
72	Recreational vehicle parks and camps, and rooming and boarding hous	1
72	Traveler accommodation	2

	Other Services	
81	Beauty salons	1
81	Funeral homes, cemeteries and crematories	1
81	Personal and household goods repair and maintenance	1
81	Automotive repair and maintenance	1
81	Barber shops	1
81	Religious organizations	1
81	Commercial and industrial machinery and equipment repair and mainte	1
81	Drycleaning and laundry services	1
81	Car washes	1
81	Electronic and precision equipment repair and maintenance	1
81	Civic, social, advocacy organizations, and grantmaking and giving	1
81	Nail salons and other personal care services	2
81	Other personal services	2
81	Business, professional, political, and similar organizations	2
81	Labor unions	3
81	Footwear and leather goods repair	3
	Public Administration	
92	Justice, public order, and safety activities	1
92	Administration of human resource programs	1
92	Other general government and support	1
92	Executive offices and legislative bodies	1
92	Military Reserves or National Guard	1
92	Administration of economic programs and space research	1
92	Administration of environmental quality and housing programs	1
92	Public finance activities	2
92	National security and international affairs	3
92	U. S. Armed Forces, branch not specified	3
92	U. S. Coast Guard	3
92	U. S. Air Force	3
92	U. S. Army	3
92	U. S. Navy	3
92	U. S. Marines	3

Table 2
Share of Occupation Employment by Gini Class Coefficient
By Major Occupation Category

SOC	Description	Gini Class 1	Gini Class 2	Gini Class 3
11	Management	34.48	61.15	4.37
13	Business/Fin. Oper.	31.73	65.96	2.32
15	Computer/Mathematical	0	73.07	26.93
17	Architecture/Engineering	36.04	58.31	5.65
19	Life, Physical, Social Sci.	16.32	58.61	25.08
21	Community/Social Svs.	100.00	0	0
23	Legal	3.78	96.22	0
25	Education and Library	99.54	0.46	0
27	Arts, Design, Entertain.	17.13	75.02	7.85
29	Healthcare Prac./Tech	86.56	13.10	0.34
31	Healthcare Support	96.73	3.27	0
33	Protective Service	59.83	40.17	0
35	Food Prep./Serving	95.68	4.32	0
37	Building Maintenance	98.54	1.46	0
39	Personal Care Service	82.64	7.22	10.13
41	Sales and Related	75.41	21.82	2.77
43	Office/Admin. Support	93.14	6.66	0.20
45	Farm, Fish, Forestry	0	81.01	18.99
47	Construction/Extraction	61.37	36.18	2.45
49	Install., Maint., Repair	90.00	8.89	1.11
51	Production	80.30	17.15	2.55
53	Trans./Material Moving	89.20	5.86	4.95
55	Military Specific	0	0	100.00
	All Occupations	**71.66**	**24.86**	**3.47**

Table 3
Share of Employment in Tradable Occupations and Industries by Major Occupation Category

Management Occupations (11)

	Non-tradable Occupations	Tradable Occupations
Non-tradable Industries	23.97	26.58
Tradable Industries	10.51	38.94

Business and Financial Operations Occupations (13)

	Non-tradable Occupations	Tradable Occupations
Non-tradable Industries	14.11	27.72
Tradable Industries	17.61	40.56

Computer and Mathematical Occupations (15)

	Non-tradable Occupations	Tradable Occupations
Non-tradable Industries	0	24.22
Tradable Industries	0	75.78

Architecture and Engineering Occupations (17)

	Non-tradable Occupations	Tradable Occupations
Non-tradable Industries	8.46	13.30
Tradable Industries	27.59	50.66

Life, Physical and Social Science Occupations (19)

	Non-tradable Occupations	Tradable Occupations
Non-tradable Industries	7.28	36.49
Tradable Industries	9.03	47.20

Legal Occupations (23)

	Non-tradable Occupations	Tradable Occupations
Non-tradable Industries	3.54	18.89
Tradable Industries	0.24	77.33

Table 3.1
Summary statistics for work activities, across occupations

Work Activity	Mean	Std. Deviation	Min	Max
Getting Information				
Importance	0.815	0.097	0.366	1
Level	0.548	0.152	0.118	0.951
Inspecting Equipment, Structures or Material				
Importance	0.606	0.173	0.2	0.966
Level	0.391	0.158	0	0.855
Processing Information				
Importance	0.651	0.156	0.2	1
Level	0.499	0.193	0.028	0.911
Analyzing Data or Information				
Importance	0.628	0.161	0.2	0.988
Level	0.451	0.194	0	0.951
Making Decisions and Solving Problems				
Importance	0.729	0.144	0.24	0.996
Level	0.547	0.178	0.071	0.94
Thinking Creatively				
Importance	0.603	0.183	0.2	0.992
Level	0.474	0.206	0.023	0.951
Interacting w/ computers				
Importance	0.604	0.243	0.2	1
Level	0.353	0.2	0	0.875
Documenting / Recording Information				
Importance	0.653	0.178	0.2	0.984
Level	0.436	0.179	0	0.8
Establishing & Maintaining Interpersonal Relationships				
Importance	0.683	0.167	0.2	0.976
Level	0.583	0.177	0.028	0.897
Assisting and Caring for Others				
Importance	0.528	0.182	0.2	1
Level	0.378	0.192	0	0.961
Performing for or Working Directly w/ Public				
Importance	0.56	0.221	0.2	0.984
Level	0.405	0.232	0	0.924

Source: O*Net

Table 6
Job loss rates by industry, 2001-03 and 2003-05

	2001-03			2003-05		
	Overall	Tradable	Not tradable	Overall	Tradable	Not tradable
Agriculture	0.049			0.042		
Mining	0.127			0.115		
Construction	0.131			0.042		
Manufacturing	0.209	0.213	0.192	0.119	0.116	0.174
Wholesale & Retail Trade	0.113	0.077	0.091	0.065	0.168	0.053
Transport & Utilities	0.089			0.104	0.115	0.093
Information	0.232	0.317	0.075	0.039	0.035	0.149
Financial Services	0.081	0.08	0.081	0.041	0.033	0.125
Professional & Business Services	0.144	0.158	0.113	0.035	0.048	0.018
Education & Health Services	0.040	0.071	0.039	0.015	0.009	0.015
Leisure & Hospitality Services	0.105	0.083	0.113	0.144	0.102	0.168
Other Services	0.051	0.03	0.057	0.036	0.016	0.087
Public Administration	0.020			0.004	0.005	0.004
Total	0.103	0.153	0.076	0.041	0.056	0.030
Mfg. - Tradable	0.213			0.116		
Mfg. - Not tradable	0.192			0.174		
Non- Mfg. - Tradable	0.128			0.024		
Non- Mfg. - Not tradable	0.073			0.036		

Source: Authors' calculations from 2004 and 2006 Displaced Worker Surveys

Table 7
Job Loss rates by occupation, 2001-03 and 2003-05

	2001-03			2003-05		
	Overall	Tradable	Not tradable	Overall	Tradable	Not tradable
Management, Business, Financial (WC)	0.089	0.077	0.091	0.026	0.029	0.020
BusinessOperationsSpecialists	0.143	0.121	0.171	0.022	0.023	0.022
Financial Specialists	0.054	0.057	0.044	0.045	0.096	0.015
Professional & related (WC)	0.070	0.109	0.033	0.039	0.036	0.160
Computer & Math	0.177	0.177		0.156	0.156	
Architecture & Engineering	0.128	0.113	0.158	0.126	0.111	0.165
Life, Physical & Social Science	0.059	0.057	0.066	0.006	0.006	0.000
All Other Services (WC)	0.073	0.072	0.056	0.025	0.029	0.023
Sales (WC)	0.106	0.123	0.079	0.052	0.053	0.052
Office & Administrative Support (WC)	0.109	0.067	0.092	0.053	0.064	0.050
Farming, Forestry, Fishing (BC)	0.110	0.110		0.078	0.078	
Construction & Extraction (BC)	0.149	0.128	0.152	0.139	0.119	0.142
Installation, maintenance, repair (BC)	0.112	0.117	0.083	0.023	0.114	0.017
Production (BC)	0.206	0.163	0.169	0.210	0.242	0.188
Transport & Material Moving (BC)	0.117	0.057	0.096	0.143	0.128	0.147
Total	0.102	0.101	0.078	0.040	0.042	0.039

Notes: Agriculture, Forestry, Mining and Construction industries omitted
Source: Authors' calculations from 2004 and 2006 Displaced Worker Surveys

Table 8
Characteristics of displaced workers, by industrial sector and tradability

	2001-03			2003-05		
	Manufacturing tradable	Non-mfg tradable	Non-mfg not tradable	Manufacturing tradable	Non-mfg tradable	Non-mfg not tradable
Age (mean in yrs.)	41.6	39.6	38.1	42.9	41.5	39.6
Std. deviation	11.2	11.1	11.7	11.8	12.2	13.0
Job tenure (mean in yrs.)	7.1	4.4	4.3	7.6	5.3	4.7
Std. deviation	8.43	5.6	5.61	8.26	6.4	6.2
Job tenure > 10 yrs	0.23	0.12	0.14	0.24	0.13	0.13
Educational attainment: Share:						
HS dropout	0.14	0.05	0.11	0.15	0.04	0.1
HS grad	0.4	0.19	0.31	0.4	0.22	0.31
Some college	0.24	0.3	0.33	0.25	0.35	0.34
College +	0.22	0.45	0.25	0.2	0.38	0.25
Male	0.61	0.54	0.45	0.57	0.53	0.44
On pre-displacement job: Share w/ health insurance	0.75	0.66	0.47	0.69	0.58	0.42
Fulltime	0.96	0.9	0.82	0.95	0.85	0.76
If fulltime, real weekly earnings	$587.90	$760.55	$506.10	$723.21	$855.38	$605.10
Std. deviation	$515.75	$657.41	$465.42	$520.50	$573.17	$465.65
Share reemployed	0.64	0.77	0.75	0.67	0.74	0.66
Of reemployed, share fulltime	0.8	0.78	0.72	0.85	0.67	0.66
All reemployed: Change in ln earnings (mean)	-0.32	-0.3	-0.14	-0.17	-0.082	-0.073
Std. deviation	0.89	0.98	1.02	0.51	0.61	0.68
Median change	-0.15	-0.11	-0.03	-0.054	-0.028	0
Share no earnings loss	0.42	0.45	0.51	0.37	0.43	0.48
Fulltime to fulltime Change in ln earnings (mean)	-0.21	-0.21	-0.12	-0.016	0.0024	-0.002
Std. deviation	0.76	0.69	0.97	0.35	0.32	0.41
Median change	-0.1	-0.07	-0.03	0	0	0.028
Share no loss	0.42	0.46	0.52	0.47	0.48	0.53

Source: Authors' calculations from the 2004 and Displaced Worker Surveys, using sampling weights.
Agriculture, Mining, Forestry, Construction omitted