Measuring Offshorability: A Survey Approach

by

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preliminary and incomplete

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This paper summarizes a pilot study of the use of conventional household survey methods to measure something quite unconventional: what we call “offshorability,” defined as the ability to perform one’s work duties (for the same employer and customers) from abroad. We see this research as important for two main reasons:

First, as one of us has argued previously (Blinder (2006), 2007(b)), offshoring is potentially a very important labor market phenomenon, perhaps constituting a third Industrial Revolution. In the first Industrial Revolution, over 80 percent of the U.S. workforce migrated from agriculture to “industry.” In the second Industrial Revolution (so far), almost 25 percent of all workers have left manufacturing for the service sector. The estimates presented here, like those of Blinder (2007a), suggest that a significant percentage of U.S. jobs may migrate from what Blinder (2006) calls “impersonal service” jobs to “personal service” jobs (defined precisely below).

Second, We deem the pilot study to have been successful--by several criteria that we will explain later. So we hope our methods will be replicated, improved upon, and eventually incorporated into some regular government survey, such as the Current Population Survey (CPS). Doing so would enable the U.S. government to track this important phenomenon over time.1

The plan of the paper is as follows: Section 1 defines offshorability in more detail, expands upon why we believe that measuring it is important, and reviews some previous attempts to do so. (There are only a few.) Section 2 describes the survey questions we designed as part of an original, multi-purpose labor force survey.2 The survey provides

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1 And also, perhaps, to look backward historically.
2 The data generated by this survey are used in several other studies in the Princeton Data Improvement Initiative (PDII).
two different ways to assess the offshorability of a given job: One asks respondents
directly about the difficulty of having their work performed by someone in a remote
location; the other relies on third-party coding of the worker’s description of his or her
job tasks. Section 3 summarizes the survey results, both in terms of the technical aspects
(e.g., response rates, reliability, etc.) and the substantive findings (e.g., how many jobs
are offshorable?). To us, the two are equally important—at least until the survey
methodology is well established. In Sections 4 and 5, we report on some simple
econometric exercises using the survey data. For example, what sorts of jobs are most
offshorable? What effects, if any, does offshorability have on wages? Finally, Section 6 is
a brief conclusion.

1. What is “offshorability” and why does it matter?

Offshoring refers to the movement of home-country jobs to another country—
whether or not those jobs go to another company. Thus General Electric offshores jobs
when it moves a factory to China, and JP Morgan Chase offshores jobs when it starts
doing security analysis at its offices in India instead of in New York. Offshoring needs to
be distinguished from outsourcing, which refers to moving jobs out of the company,
regardless of whether those jobs leave the country. In the two examples just mentioned,
the jobs are not outsourced. But Citigroup outsources (but does not offshore) jobs when it
hires another U.S. company to run its credit-card call center in South Dakota, and
Goldman Sachs outsources jobs when it hires a New York City janitorial firm to clean its
offices. Of course, sometimes jobs are both outsourced and offshored, as when IBM hires
Wipro to run a call center in India and closes a call center in the U.S.

There is no Section 6 in this preliminary draft.
Offshoring, which is an *observable action*, must also be distinguished from *offshorability*, which is a *job characteristic*. We say that a job is “offshorable” if its nature—e.g., what must be done and where—allows the work to be moved overseas *in principle*, even if that movement has not actually occurred. So, for example, we know that all textile manufacturing jobs in the United States are offshorable even though some of them still remain in the U.S. (most, however, have been offshored). By the same token, virtually all American call-center jobs are offshorable. But performing surgery and driving a taxicab are not.\(^5\)

In some cases, offshorability is clear and unambiguous—as in the examples of call-center operators (offshorable) and taxi drivers (not). But in other cases, the degree of offshorability is not so clear. Think, for example, about accounting, filing documents, watch repair, and paralegal work. The degree of offshorability for positions like that may be a matter of subjective judgment. And therein lies the measurement challenge, for one person’s judgments may not correspond to another’s. One key question for this paper is: Can these judgments be made with a modicum of consistency and validity?

Economists typically shy away from subjective judgments; we prefer “hard data.” But data users often forget that much of the official government data we use routinely are the products of subjective judgments—just judgments made by the people who code survey responses. In the CPS, for example, respondents do not self-categorize themselves into one of the (roughly) 800 Standard Occupation Codes (SOC)—and if they did, they would probably do it poorly. Instead, a trained coder reviews the free-form descriptions

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\(^4\) At least in principle. In practice, it can be difficult. For example, if Mattel opens a toy factory in China without closing one in the U.S., are the jobs in China offshored?

\(^5\) Immigrants or guest workers can move to the U.S. to do non-offshorable jobs. But then those jobs are not offshored. Offshoring refers to the location of activity (as GDP does), not the nationality of the worker (as GNP does).
of what a person does on the job, and assigns that person to one of the SOCs. To be more specific, the coding of occupation in the CPS is based mainly on respondents’ answers to the following two questions:

*What kind of work do you do, that is, what is your occupation?*

*What are your usual activities or duties at this job?*

In neither case do respondents pick from a pre-set list; they answer free form, in their own words. In our survey, responses to the first question included: “inn keeper”; “pastor” and “work in the lobby”. Responses to the second question for these same individuals were: “guest services, housekeeping, reservations, marketing, etc.”; “preach, teaching, visiting home/hospital counseling”; and “clean tables, clean seats and mop the bathroom floors”. Based on this information, the coder in Jeffersonville, IN decides on the occupation. As we explain in detail in the next section, one of our methods for coding offshorability is precisely of this nature. Whether or not professional coders can classify jobs according to their degree of offshorability correctly and consistently is one crucial question for our pilot study. A related question is whether we can develop a reliable mapping from occupational information to offshorability. If so, the BLS or the Census Bureau would be able to track offshorability over time by going back to old CPS and Census data.\(^6\)

But why take on such a hazardous task, involving so many subjective judgments, in the first place? Because we believe that the answer is potentially important to education policy, trade policy, and labor-market policies, to name just three areas.\(^7\) For public policy purposes, it probably does not matter much whether the share of American jobs

\(^6\) One major qualification, of course, is that the upward march of technology is probably making more and more jobs offshorable over time.

\(^7\) For more on policy implications, see Blinder (2006, 2007a, 2008).
that are offshorable is 20% or 30%; that much imprecision in measurement would not affect policy in any substantial way. But we believe that both the economically appropriate and the politically feasible policy responses to offshoring would be fundamentally different depending on whether, say, 2%, 25%, or 75% of the American workforce is deemed to be holding offshorable jobs. In the 2% case, we should probably ignore offshoring as a detail of little importance. In the 75% case, we should perhaps be preparing for massive job transitions. Our estimates, like those of Blinder (2007a), are closer to the 25% case—which, we believe, calls for certain marginal (and some not so marginal) policy adjustments, but certainly not for panic. However, this paper is about measurement, not policy. We use two distinct methods to estimate roughly how many U.S. jobs are offshorable.

We are not the first to attempt to do so. Blinder (2007a) assigned a two-digit *ordinal* offshorability index to *each* of the (roughly) 800 SOC codes, based on information about job content in the O*NET database. Thus, for example, keypunching data was rated as 100, bookkeeping was rated 84, factory workers were (around) 68, stock clerks were 34, and child care workers were 0. Once all the occupations were so rated, Blinder was able to draw the line between offshorable and non-offshorable jobs in a variety of places. His “conservative,” “moderate,” and “aggressive” definitions placed 22.2%, 25.6%, and 29.0%, respectively, of all U.S. jobs (weighted by 2004 employment) in the offshorable category. One limitation of this approach that we seek to overcome with worker-level, rather than occupation-level, data is that the latter misses within-occupation variability. For example, some secretarial and clerking jobs are offshorable while others are not. \(^8\)

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\(^8\) Blinder (2007a) dealt with this problem by arbitrarily dividing occupations like “secretary” into sub-occupations with different degrees of offshorability. This involved a lot of guesswork.
Other studies have obtained a variety of different estimates. For example, the McKinsey Global Institute (2005) used detailed consulting-style analysis of eight “representative sectors” in rich countries around the world to estimate that only about 11% of worldwide (not just U.S.) private-sector service employment might potentially be offshored to developing countries within about the next five years. But that time frame seems too short to us; and U.S. jobs are probably more vulnerable to offshoring than, say German or French jobs, because there are so many more English-speaking (than German-or French-speaking) workers in, e.g., India. Similarly, Bardhan and Kroll (2003) estimated that about 11% of all U.S. jobs are offshorable. But they explicitly restricted themselves to “occupations where at least some [offshore] outsourcing has already taken place or is being planned” (p. 6). Since service-sector offshoring is still in its infancy, their self-imposed purview seems far too limited. Van Welsum and Vickery (2005) based their estimates of offshorability in OECD countries on the intensity of ICT use by industry. Their estimate for the U.S. was about 20% of total employment. Finally, Jensen and Kletzer (2006) used geographical concentration within the United States to estimate how “tradable” each occupation is. They then estimated that 38% of U.S. workers are in tradable, and therefore offshorable, occupations. Thus the pre-existing range of estimates, from 11% to 38%, is quite wide.

Finally, we should note that our distinction between jobs that are or are not offshorable is different from, but related to, Autor, Levy, and Murnane’s (2003) distinction between jobs that are or are not sufficiently rules-based to be done by a computer/robot. While it is certainly true that jobs that can be broken down into simple, routinizable tasks are easier to offshore than jobs requiring complex thinking, judgment,
and human interaction, a wide variety of complex tasks that involve high levels of skill and human judgment can be offshored via the use of simple telecommunication devices such as telephones, fax machines, and the Internet. Think, for example, of statistical analysis, computer programming, manuscript editing, and security analysis, to name just a few. We believe that Blinder’s (2006) distinction between personal and impersonal services (elaborated on in the next section) is far more germane to the offshoring issue than is the question of routinizability. That said, the two criteria do overlap considerably.

2. The Surveys

The two of us, along with other scholars and the staff of Princeton University’s Survey Research Center, worked with Westat, a leading statistical survey research organization to develop a multi-purpose questionnaire for the Princeton Data Improvement Initiative (PDII). Westat was selected for the project, in part, because of its wealth of experience working with the Census Bureau. We began with the Current Population Survey and added additional questions on the feasibility of performing respondents’ work remotely, job tasks, career experience, etc. Westat then administered the random digit dialing (RDD) survey, coded the responses, and tabulated the results. In this section, we report only on the portions of the survey that were designed to estimate offshorability.

According to Blinder (2007a), the offshorability of a particular job depends on two main criteria:

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9 The questionnaire and a description of the survey design are available at [www.krueger.princeton.edu/PDIIMAIN.htm](http://www.krueger.princeton.edu/PDIIMAIN.htm).
1. whether the job must be done at a particular U.S. location (examples: selling food at a sports arena, building a house);

2. whether the work can be done at a remote (presumably foreign) location and the work product—be it a good or a service—delivered to the end user with little or no loss of quality.

Criterion #2 is clearly a continuum rather than a yes-or-no variable—some jobs are more offshorable than others—which is why Blinder (2007a) sought a numerical index.

So, for example, virtually all manufactured goods can be made abroad, put in a box, and transported to the United States. Within the service sector, the work of a keypuncher, call center operator, or computer code writer is approximately as useful to the end user if the work is performed next door, in Bangor, or in Bangladesh. Blinder (2006) labeled jobs like that impersonal services, and noted that they are easily offshorable. At the other extreme, service-sector jobs such as brain surgeon, taxi driver, and day care worker—which Blinder (2006) labeled personal services—are impossible to offshore. In between sits a vast array of service jobs that are less offshorable than writing computer code but more offshorable than performing surgery. College teaching may be one such job, or might become one when technology improves.

Can trained coders—the people who, e.g., classify occupations in the CPS—understand these distinctions and apply them in a consistent way? That is our first research question.

*A pre-existing survey*

As a first step, Westat staff went back to a restricted-use version of the 2003 National Assessment of Adult Literacy (NAAL)—a survey of over 18,000 respondents.
They drew a stratified random sample of 3,000 observations and re-examined the answers to the three questions that coders used to decide on a respondent’s occupation and industry—questions that are very similar to those used in the CPS:

*For what kind of business or industry do you work?*

*What is your occupation, that is, what is your job called?*

*What are the most important activities or duties at this job?*

Based on the answers, coders were then asked to classify each respondent’s job on the following five-point offshorability scale that we developed with Westat explicitly for this purpose:

1 = not offshorable
2 = offshorable only with considerable difficulties and/or loss of quality
3 = mixed or neutral
4 = offshorable, though with some difficulties or loss of quality (that can be overcome)
5 = easily offshorable with only minor (or no) difficulties or loss of quality

In the instructions to the coders, they were told that the following job characteristics push a job toward the low end of this five-point scale:

- Need for face-to-face interaction with customers or suppliers
- Delivering/transporting products or materials that cannot be transported electronically (e.g., mail, meals, fruits and vegetables)
- Public speaking
- Requires “cultural sensitivity” (e.g., newscaster, sports broadcaster)
- Providing supervision, training or motivation to others working in the U.S.
- Physical presence at site (or sites) in U.S. is required
- Maintaining or repairing fixed structures that are in the U.S. (e.g., roofs, plumbing, gardens, yards)
- Maintaining or repairing large objects (e.g., cars, boats, washing machines)

We used as some examples of jobs that are not offshorable (coded 1): mail deliverer, carpenter, waiter, farmer, and surgeon. On the other hand, coders were instructed that the following characteristics push a job toward the high end of the offshorability scale:

- Extensive use of computers/email
- Processing information/data entry
- Talking on the telephone
- Analyzing data
- Assembling or packaging a product

Some jobs that should be coded as 5s that we used as examples were: computer programmer, telemarketer, proofreader, and reservation clerk. Finally, coders were instructed to score any job that involves a mixed set of offshorable and non-offshorable characteristics as a “3”.

Westat selected four coders who had no previous experience with SOC codes, and conducted a one-day training session to familiarize them with the SOC codes, the concept of offshorability, and the five-point scale just explained. In fact, much more of their training was devoted to understanding the 800 SOC codes than the five offshorability codes. In the training, coders examined raw data responses from the three NAAL occupational questions given above, and discussed the SOCs and offshorability codes that should be applied with Westat personal. Westat had, in turn, discussed these same principles extensively with us, including going over many concrete examples.

After the training session, each of the four coders was given 750 randomly-selected cases and asked to assign both an SOC and an offshorability code (on the five-point scale above) to each. During their first week of work, supervisors provided especially close oversight and feedback to the coders regarding the accuracy of their assignments; and throughout the job, a supervisor was always available to answer questions and provide guidance as needed.

The next—and important—step was to test the inter-coder reliability of the assigned codes. About 10% of each coder’s cases were randomly selected to be coded again by another coder. Of these 298 cases, the two coders agreed on the assigned offshorability
score in 226 cases, or 76%—even though they had no previous experience with
occupational coding. It seems virtually certain to us (and to Westat) that experienced
occupational coders would agree even more. This strikes us as a good degree of inter-
coder agreement; coders do, after all, have to make subjective judgments. Furthermore,
coders declared themselves unable to decide on the degree of offshorability in a mere
0.5% of cases, a negligible number. Finally, in cases in which the two coders disagreed,
Westat supervisors adjudicated the disputes. As it turned out, they sided with the first
coder in 93% of the cases, suggesting that even cross-checking every coding decision
would have made little difference. Each of these survey findings bolstered our confidence
in the procedure, and emboldened us to go the next step: creating a de novo survey aimed
specifically at measuring offshorability. 10

New Survey Results: Externally-coded and Self-reported Offshorability

The PDII survey included the CPS occupation and industry questions, and Westat’s
coders applied the same procedures they used for the NAAL data to provide an external
assessment of the offshorability of each respondent’s job. The RDD survey of 2,513 labor
force participants age 18 and older was conducted between June 5 and July 20, 2008.
Although Westat made as many as 15 phone calls to sampled households to elicit a
response, the response rate was only 17.9 percent. Sample weights were developed to
make the sample representative of the population in terms of sex, age, race, Hispanic
ethnicity, education, employment status, geography and other demographic variables.

10 For later reference, the 2,985 NAA L cases were coded for offshoring as follows: 1-not offshorable:
71.9%; 2-offshorable with considerable difficulties: 4.8%; 3-mixed: 6.2%; 4-offshorable with some
difficulties: 5.3%; 5-easily offshorable: 11.8%. Thus the most restrictive definition of offshorability would
encompass 17% of employment while the most generous definition would cover 28%. 
The methods described above for utilizing the standard industry and occupation questions in the NAAL data were used to code the offshorability of the job of each survey respondent. The results were:

1: not offshorable................................. 68.3%
2: offshorable with considerable difficulty ......8.3%
3: mixed or neutral..............................6.3%
4: offshorable with some difficulty.............6.3%
5: offshorable with minor or no difficulty......10.8%

If we divide the 3s equally between “offshorable” and “not offshorable,” we would conclude that 20.2% of jobs are offshorable. But, looking forward to superior technology in the future (as Blinder (2007a) did), we should probably include some of the 2s as potentially offshorable as well. Thus, this worker-level survey measure of offshorability seems to give aggregate estimates comparable to the lower end of Blinder’s (2007a) occupation-based coding (which was 22.2%).

But since this was our own survey, we were also able to devise several new questions to shed light on the nature and extent of offshorability. Our main question assessing self-reported offshorability was:

Q27. Some jobs can be done remotely using a telephone or a computer, while others require face-to-face or physical presence at the job. For example, a telephone survey-taker like me can call you from some other state or even from a foreign country. A computer programmer or a person who takes customer orders over the phone can do the job from anywhere using a computer or telephone. However, a taxi-cab driver, a barber, or a waitress must be at the same place as their customers, and a construction worker has to be physically present at a job site.

So thinking about the distinction I just described, can the work that you do for your current employer or customers be done at a remote location or does it require you to be physical present where the employer or job site is?
The rightmost column shows the distribution of survey responses. Most work is clearly not offshorable in the view of those who do the work. Notice that the 67% of (self-reported) jobs that “require physical presence” is strikingly similar to the 68.3% of jobs that, according to the coders, are “not offshorable.\textsuperscript{11}

Several other features of these results are notable. First, the fraction of respondents who either could not or would not answer the question was negligible—which is very good news for the question as worded. Second, if we simply count the 1s as offshorable, the 3s as not-offshorable, and once again split the 2s and the 4s on a 50-50 basis, we would conclude that about 26% of all jobs are offshorable—which is remarkably similar to Blinder’s (2007a) “moderate” estimate. If we employ a much more restrictive definition, counting only the 1s as offshorable, we get an estimate of 19%, which is slightly below Blinder’s “conservative” estimate.

To examine the credibility of the responses to Q27, Westat asked a random sample of 197 respondents a free form question on why they said their job can be done remotely or why it required their physical presence, depending on their answer to Q27. The answers to these questions give us some cause for believing that respondents correctly understood what we were after. Based on our reading of the data, in only 11.7% of cases were the free form explanations inconsistent with their response to the offshorability

\textsuperscript{11} While the aggregates are almost identical, the compositions of the two groups are not. See below.
question (Q27). The non sequitur rate was about the same for jobs that respondents said could be done remotely (10.8%) as it was for jobs that required their physical presence (11.9%). These results give us reason for cautious optimism.

Another, related offshorability question asked of all respondents was:

Q29. To what extent does the work you do on your main job involve face-to-face contact with people other than your co-workers or supervisors? Would you say a lot, a moderate amount, a little, or none at all?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>A LOT</td>
<td>52.4%</td>
</tr>
<tr>
<td>A MODERATE AMOUNT</td>
<td>17.2%</td>
</tr>
<tr>
<td>A LITTLE</td>
<td>18.2%</td>
</tr>
<tr>
<td>NONE AT ALL</td>
<td>12.2%</td>
</tr>
<tr>
<td>REF OR DK</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Remember that the necessity or desirability of extensive face-to-face contact with someone other than one’s co-workers is an important hallmark of a job that is not offshorable. Thus the 1s and 2s (which comprise about 70% of total employment) are unlikely to be in offshorable jobs; some (perhaps many) of the 3s (18%) might be in jobs that are offshorable, albeit with some effort; and most of the 4s (12%) are probably holding jobs that are easy to offshore. If we split the 3s evenly, we would conclude that about 21% of all jobs are offshorable. The broader range implied by the answers to this question is 12-30%. And notice again the negligible number of refusals and “don’t know”s. People can obviously cope with this question without difficulty.

However, the question about face-to-face contact just above (Q29) and the main self-reported offshorability question discussed earlier (Q27) do not correlate as highly as

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12 An example of an inconsistent response is an individual who replied that his work required his physical presence “because it comes through the computer queues that are on a mainframe at the job location.” From the other perspective, a questionable response was someone who said that his job could be performed remotely and offered as an explanation that he “has to be at the house of residence.”
might be expected. For example, among respondents who say that their jobs require a lot of face-to-face contact with people other than fellow workers, about 76% also say their job cannot be done at a remote location (they answer “3” to Q27)—which makes sense. But about 9% of such people report that their jobs can be done at a remote location (they answer “1” to Q27), which makes us wonder if they understood the question properly. At the other end of the offshorability spectrum, among respondents who say that their jobs require no face-to-face contact with people other than co-workers, only 36% report that their jobs are easily done from a remote location.

There is both good news and bad news in these comparisons. The bad news, of course, is that there appear to be some serious inconsistencies in these responses. The good news is that the answers to Q27 and Q29 each contain independent information not contained in the other. Given how little we know about assessing offshorability, more information should be welcome.

The 88% of the sample who did not answer “None at all” to Q29 above—thereby indicating that at least some face-to-face contact with, say, customers or suppliers is part of their jobs—were asked a further offshorability question:

**Q31.** Now think about the work you do face-to-face with others. To what extent is it possible for you to do that work without being physically present? By that I mean doing the work at a remote location and then delivering it by mail, by telephone, by sending it over the Internet, and so on. Would you say all of the work could be done that way, most of the work, a little of it, or none at all?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>ALL OF THE WORK</td>
<td>3%</td>
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<tr>
<td>MOST OF THE WORK</td>
<td>13%</td>
</tr>
<tr>
<td>A LITTLE OF THE WORK</td>
<td>28%</td>
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<tr>
<td>NONE AT ALL</td>
<td>43%</td>
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<tr>
<td>REF OR DK</td>
<td></td>
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<tr>
<td>[Not asked because they were skipped]</td>
<td>12%</td>
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13 The unusual responses are not literally illogical. But they do make you wonder what kinds of jobs these people have.
Note that this question asks respondents to go beyond current practice; it probes the realm of the possible. While it recognizes the reality that many job tasks are in fact done face-to-face today, it asks respondents to think about whether this face-to-face contact is really necessary.

In this case, if we add up the 1s and the 2s—the people who indicate that *most* or *all* of their work could be done remotely and delivered electronically—plus the 12% of the sample who (in Q29) indicated that *none* of their work involves face-to-face contact anyway, we would conclude that 28% of the sample is doing work that could, in principle, be offshored.

The other twelve percent of the sample told us (in Q29) that *none* of their work involves face-to-face contact with people other than co-workers. Most of these jobs are probably offshorable because the work of the whole work unit can be located abroad. Another 43% told us (in Q31) that *none* of their work could be delivered remotely; these jobs are almost certainly not offshorable. The remaining 45% were asked a follow-up question that probed the degree of offshorability more deeply:

**Q31a. If work like yours is done elsewhere rather than face-to-face, do you think the quality would deteriorate a lot, a moderate amount, a little, or none at all?**

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<tbody>
<tr>
<td><strong>A LOT</strong></td>
<td>1</td>
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<tr>
<td><strong>A MODERATE AMOUNT</strong></td>
<td>2</td>
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<tr>
<td><strong>A LITTLE</strong></td>
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<tr>
<td><strong>NONE AT ALL</strong></td>
<td>4</td>
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<tr>
<td><strong>REF OR DK</strong></td>
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In this question, the 3s and 4s are clearly engaged in highly offshorable activities, the 2s are doing work that may or may not be offshorable, and the 1s are probably working in jobs that are not offshorable. Splitting the 2s evenly, and adding up the other categories,
leads to the conclusion that about 35% of jobs are offshorable. This estimate is an outlier relative to the others, which cluster in the 19-28% range.

To facilitate comparison between the externally-coded and self-reported measures of offshorability data, we compressed the responses to both questions into a 1-2-3 scale, where 1 indicates that the job is unlikely to be offshorable, 2 indicates that it might be offshorable or that parts of it are offshorable, and 3 indicates that the job is very likely offshorable. The following cross tabulation reports the joint distribution and the marginal probabilities for the two variables.

<table>
<thead>
<tr>
<th>Q27 - SELF-REPORTED</th>
<th>WESTAT CODED</th>
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<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>Total</td>
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</tr>
<tr>
<td>1</td>
<td>55.4%</td>
<td>2.9%</td>
<td>8.9%</td>
<td>67.3%</td>
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<tr>
<td>2</td>
<td>10.3</td>
<td>1.1</td>
<td>2.5</td>
<td>13.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10.9</td>
<td>2.2</td>
<td>5.7</td>
<td>18.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>76.6</td>
<td>6.3</td>
<td>17.1</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The first thing to note is that 62.2% of the observations lie along the diagonal. A \( \kappa \)-test of agreement among classifiers in the table above yields \( \kappa = 0.17 \), which is significantly more agreement than would be expected by chance (\( z=10.5 \)), but disappointingly low.\(^{14}\) For example, in nearly 20% of the cases, Westat coders and respondents disagreed strongly, rating the jobs at opposite ends of our three-point scales. We suspect there is considerable signal in both the self-reported data and the externally coded data; but there is probably a nontrivial amount of misclassification noise as well.

\(^{14}\) \( \kappa \), which is analogous to a correlation coefficient, is probably unfamiliar to most economists. See Maxwell (1970) for an explanation. Blinder (2007a) found a \( \kappa \) of 0.79 for a comparison of two assessments of the offshorability of various occupations.
Our overall conclusions, then, is twofold. First, a wide variety of indicators of offshorability, based on both self-reporting and professional coding, suggest that 20-25% of U.S. jobs are offshorable. Second, these two indicators of offshorability are different, either because of measurement error or because they are measuring somewhat different things.

**Offshorability, routinizability, and licensure**

Earlier, we noted that the Autor, Levy, Murnane (2003) concept of “routinizability” is related to but different from offshorability. Our survey also included several questions pertaining to routinizability. For example:

**Q25b. How much of your workday involves carrying out short, repetitive tasks? Would you say...**

- **Almost all the time.............................1** 31.7%
- **More than half the time..........................2** 17.1%
- **Less than half the time, or......................3** 27.9%
- **Almost none of the time.........................4** 22.9%
- **REF OR DK** 0.4%

Clearly a low number on this scale indicates a high degree of routinizability—that is, that a computer might be able to do the job well. If you are looking for an estimate of how many jobs have “high” versus “low” routinizability, the sample divides almost exactly 50-50. On the other hand, if you are looking for an estimate of how many jobs cannot be done by computer to any significant extent, the estimate is a low 23%.

Oddly, we find that workers who rate their job as requiring short, repetitive tasks more than half the time are more likely to believe that their job cannot be performed in a remote location than are those who claim to do repetitive tasks less than half the time. The results for the externally-coded variable are almost as puzzling, as they yield essentially no difference in expected offshorability for the two groups.
One way that workers in particular occupations may seek to protect their positions from the threat of offshoring is by requiring that workers obtain a government license to do the work. We find some support for that notion in the PDII data: Licensed jobs are associated with a greater sense that work cannot be done remotely by someone living abroad. Eleven percent of workers in jobs that require a license said their job requires their physical presence, while 22 percent of workers in unlicensed jobs said so. The discrepancy was even greater for the externally-coded data: Coders placed 5% of licensed jobs, versus 21% of unlicensed jobs, in the most offshorable end of scale.

3. Measuring Offshorability

The survey results outlined in the preceding section yield five different (but not independent) estimates of the fraction of U.S. jobs that are potentially offshorable, four of them based on self-reporting. These estimates span a seemingly-wide range, from 19% to 35%. But the 19% estimate is almost certainly too low, and the 35% estimate is almost certainly too high. A number in the 25% range might be a reasonable distillation of these disparate results. But even if we accept the entire range, these estimates are similar in the policy-relevant sense mentioned in Section 1: Each estimate represents a non-trivial minority of all jobs, roughly comparable to the shift from manufacturing to services from 1960 until now.15 In other words, the shift toward service offshoring is a potentially major labor market transformation.

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15 In 1960, 31.0% of payroll employees worked in the manufacturing sector. By 2007, this share was down to 10.2%.
But raw tabulations can take us only so far. We would like to know, for example, what types of jobs are most and least offshorable, and what types of people are most and least likely to hold offshorable jobs.

**Offshorability by Industry**

In what sorts of industries is offshorability prevalent, and in what industries is it rare? To answer this question, we concentrate on Q27 above, which focuses on the importance of physical presence. In accord with our earlier discussion, we present two measures of offshorability for each occupation:

- **Strict definition**: only the 1s
- **Expansive definition**: the 1s, plus half of the 2s and 4s.

Using these definitions, the fraction of jobs that are offshorable in selected industries is shown in Table 1.\(^\text{16}\)

<table>
<thead>
<tr>
<th>Industry (NAICS)</th>
<th>Percent of all jobs</th>
<th>Percent offshorable (strict-expansive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction (23)</td>
<td>5.24</td>
<td>7.4-12.8</td>
</tr>
<tr>
<td>Manufacturing (31)</td>
<td>12.0</td>
<td>22.0-27.3</td>
</tr>
<tr>
<td>Retail trade (44)</td>
<td>10.9</td>
<td>10.5-17.5</td>
</tr>
<tr>
<td>Transport and warehousing (48)</td>
<td>3.6</td>
<td>7.5-11.9</td>
</tr>
<tr>
<td>Information (51)</td>
<td>3.6</td>
<td>30.4-46.2</td>
</tr>
<tr>
<td>Finance and insurance (52)</td>
<td>4.7</td>
<td>45.2-53.2</td>
</tr>
<tr>
<td>Prof, Sci, and Tech Services (54)</td>
<td>8.1</td>
<td>46.4-58.3</td>
</tr>
<tr>
<td>Admin, Sup, Waste Mgt, Remed Svcs (56)</td>
<td>3.3</td>
<td>19.3-23.0</td>
</tr>
<tr>
<td>Educational Svcs (61)</td>
<td>9.5</td>
<td>8.8-15.6</td>
</tr>
<tr>
<td>Health Care, Social Assistance (62)</td>
<td>13.0</td>
<td>12.0-17.4</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation (71)</td>
<td>3.2</td>
<td>9.3-15.3</td>
</tr>
<tr>
<td>Accommodation, Food Svcs (72)</td>
<td>6.4</td>
<td>8.5-9.7</td>
</tr>
</tbody>
</table>

\(^{16}\) The “selected” industries are all those employing at least 3% of the workforce.
This breakdown is roughly as expected. Offshorability is very high in Finance and Insurance and in Professional and Technical Services; it is very low in Construction, Transport, Education, and Accommodation and Food Services.\textsuperscript{17}

\textit{Offshorability by educational level}

\textit{Offshorability by wage rate}

\textit{Offshorability by race and sex}

\textit{Offshorability by age}

\textit{Offshorability by geographical region}

4. \textbf{Empirical models of offshorability}

Cross tabulations, such as those in Section 3, are useful descriptive devices. But when the various categories are not orthogonal, they take us only so far. In this section, we turn to an initial attempt to develop some ordered probit models of offshorability, based on our three-point scales (in which higher numbers connote higher degrees of offshorability).

Table 2 presents two ordered probit models, one for self-reported offshorability (our Q27), the other for offshorability as recorded by Westat’s coders. (Henceforth, we will

\textsuperscript{17} The fact that manufacturing is about average in offshorability may point to a flaw in the question. Manufacturing workers do have to be physically present. But, in many cases, the factory could be abroad. Respondents may not have understood that.
call these “self-reported” and “coded” offshorability.) The estimates are clearly different. For example, while both models say that more educated workers tend to be in more offshorable jobs,\textsuperscript{18} the relationship is clearly much stronger (and more significant) with self-reported offshorability than with coded offshorability. The relationships between experience and offshorability look superficially similar in the two models, but the peaks of the two quadratics come at quite different levels of experience. The coefficients of the sex, race, and ethnicity dummies are also quite different. Clearly, with such different results, much more work on this topic is necessary before we can say anything econometrically about the determinants of offshorability at the individual level. But Table 2 does underscore the fact that the self-reported and coded offshorability questions convey different messages.

5. Empirical models of the effects of offshorability

We now turn from the determinants of offshorability to its effects. For example, do more offshorable jobs pay lower wages, \textit{ceteris paribus}? And do the people holding such jobs experience more frequent layoffs?

\textsuperscript{18}Blinder (2007a) also found this, though the relationship was weak.
Starting with wages, we estimate two standard log-wage equations in Table 3, adding a pair of offshorability dummies--connoting moderate and high offshorability of the respondent’s job--to each regression. (The control group is people with non-offshorable jobs.) Here the results based on self-reported and coded offshorability are much more consistent. Surprisingly, the least offshorable jobs are estimated to pay the lowest wages,
according to both regressions—which is the opposite of what Blinder (2007a) found. With self-reported offshorability, the *most* offshorable jobs are estimated to pay the highest wages. But with coded offshorability, the relationship is hill-shaped; the highest wages are paid to workers in “moderately offshorable” jobs. All of this, of course, is controlling for education, experience, race, sex, and ethnicity—which get unremarkable coefficients in Table 3.
Table 3

Dependent Variable is Log Wage Rate

<table>
<thead>
<tr>
<th>Variable</th>
<th>Self Reported</th>
<th>Westat Coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately Offshorable</td>
<td>0.172</td>
<td>0.132</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Most Offshorable</td>
<td>0.219</td>
<td>0.072</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.049)</td>
</tr>
<tr>
<td>Education</td>
<td>0.089</td>
<td>0.095</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Experience</td>
<td>0.034</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Experience Squared</td>
<td>-0.054</td>
<td>-0.056</td>
</tr>
<tr>
<td>(/100)</td>
<td>(.008)</td>
<td>(.008)</td>
</tr>
<tr>
<td>Female</td>
<td>-0.302</td>
<td>-0.308</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.147</td>
<td>-0.152</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>Black</td>
<td>-0.181</td>
<td>-0.170</td>
</tr>
<tr>
<td></td>
<td>(.060)</td>
<td>(.064)</td>
</tr>
<tr>
<td>Asian</td>
<td>0.217</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>(.089)</td>
<td>(.099)</td>
</tr>
<tr>
<td>R-Square</td>
<td>0.360</td>
<td>0.344</td>
</tr>
<tr>
<td>P-Value for Joint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Test of Offshoring Vars.</td>
<td>0.000</td>
<td>0.033</td>
</tr>
<tr>
<td>Sample Size</td>
<td>1669</td>
<td>1670</td>
</tr>
</tbody>
</table>

Note: Robust s.e.'s in parentheses. Sample is weighted by sample weights.

[MODEL OF LAYOFF PROBABILITIES... TK]

6. Conclusions [TK]