08-104

A Replication Study of Alan Blinder's "How Many U.S. Jobs Might Be Offshorable?"

Troy Smith
Jan W. Rivkin

A Replication Study of
Alan Blinder's "How Many U.S. Jobs Might Be Offshorable?"*

Troy Smith
228A Morgan Hall
Harvard Business School
Boston, MA 02163
(617) 495-0355
trsmith@hbs.edu

Jan W. Rivkin
239 Morgan Hall
Harvard Business School
Boston, MA 02163
(617) 495-6690
jrivkin@hbs.edu

June 11, 2008

Early draft. Comments welcome. Please do not circulate or cite without permission

Abstract: In a 2007 working paper, Alan Blinder assessed the "offshorability" of hundreds of U.S. occupations and estimated that between 22% and 29% of all U.S. jobs were potentially offshorable. This note reports the results of an exercise in which members of Harvard Business School's MBA Class of 2009 collectively attempted to replicate Blinder's study. Overall, the MBA students' assessments of offshorability matched Blinder's well. Across occupations, the correlation between Blinder's offshorability rating and the students' was 0.60. The students estimated that between 21% and 42% of U.S. jobs are potentially offshorable. Echoing Blinder, the student data suggested a positive correlation between offshorability and education. The student data also revealed a positive or inverted-U relationship between offshorability and wage level, where Blinder found no correlation. While Blinder found a slight wage penalty for the most offshorable jobs, the student data exhibited no evidence of wage depreciation from job contestability due to offshoring.

* Rawi Abdelal, Richard Vietor, and David Collis were instrumental in the design and completion of the replication study described here. Other faculty colleagues in the Business Government and International Economy teaching group and the Strategy teaching group at Harvard Business School provided valuable comments and input. The software for the study was written by HBS's Educational Technology Group, led by Carla Tishler, Michelle Small, and Jeff de Beer. Jenn Cervone, Tammy Sieber, and Juliana Seminerio provided administrative support.

The movement of business activity from developed economies to developing economies—commonly called "offshoring"—has become the focus of heated debates. How, if at all, should business leaders tap unprecedented opportunities to shift activities around the globe? How, if at all, should policy makers act to stem or spur offshoring? Behind these debates lies a pivotal question of scale: *How much business activity and how many jobs are at stake?* Research on this question is sparse. Official statistics are nearly silent; indeed, a 2004 U.S. Government Accountability Office study on the question bore the inauspicious title, "Current government data provide limited insight into offshoring of services." Private-sector researchers vary widely in their estimates of the number of U.S. jobs that have moved offshore, will move offshore, or could move offshore—from hundreds of thousands to over ten million. (See Table 1 for a sample of estimates.) Among the few studies that estimate the extent of offshoring, most ask how many jobs have already moved offshore and leave open the question of future shifts in business activity.

In an effort to address this gap in prior literature, Princeton economist Alan Blinder released an innovative 2007 working paper in which he personally reviewed more than 800 occupations in the United States, assessed the "offshorability" of each, and used the evaluations to estimate the total number of U.S. jobs that might be offshorable. Though insightful, the paper is subject to an important critique: Blinder's study hinged on the assessments made by a single individual (cross-checked by one other person, a human resources professional).

An opportunity to replicate Blinder's study with a much broader set of assessors presented itself recently at Harvard Business School (HBS). In March 2008, two required courses in the first year of the HBS MBA program devoted a day of teaching to the topic of offshoring. Rather than presenting Blinder's results to students, instructors in the courses devised an online exercise that allowed the students, collectively, to recreate Blinder's study. The exercise involved 152 teams, made up of 901 HBS MBA students. Each team rated the offshorability of 20 occupations, with the result that the Class of 2009 as a whole evaluated nearly 800 occupations. Each occupation was scrutinized by, on average, more than 20 individuals.

This note reports the results of the replication effort. It first describes Blinder's paper and summarizes his findings (§1). It then details the HBS student exercise (§2), with an emphasis on differences in methodology and data between Blinder's and students' assessments (§3). We compare the results of the HBS exercise to Blinder's findings (§4) and conclude (§5).

1. Blinder's Study

In his March 2007 working paper "How Many U.S. Jobs Might Be Offshorable?"[1] Alan Blinder set his task as estimating the number of jobs that are *potentially* offshorable, not the number of jobs that will actually be offshored. To arrive at an estimate, Blinder relied on the O*NET database (http://online.onetcenter.org/), a database developed for the U.S. Department of Labor that describes hundreds of occupations in detail. Based on the O*NET descriptions and a set of decision rules, Blinder made a subjective assessment of the potential offshorability of each occupation. He then coupled his assessments with data on the number of people employed in each occupation in order to estimate the potential scale of the offshoring phenomenon.

In developing his decision rules, Blinder defined offshoring as "the migration of employment from the U.S. (and other rich countries) to other (mostly poorer) countries." He also clarified that offshoring "refers to the movement of jobs to other countries, whether or not that movement is within the same firm or to a different firm." Blinder argued that service sector job offshoring has been enabled by advances in computerized telecommunications technology as well as the entry of emerging economies into the global economic system. In considering which jobs could be offshored, Blinder distinguished between two types of services: those which must be personally-delivered and those that can be impersonally delivered. According to Blinder, jobs are less likely to be offshored if they must be performed at a specific U.S. work location and/or they require face-to-face personal communication with end users. The tree in Figure 1 shows Blinder's decision rules.

Blinder forecast offshorability some unspecified number of years in the future by "extrapolating normal technological progress." He focused on the mix of jobs as they existed in 2004 and ignored projections of future changes in the distribution of U.S.

employment. He also noted that his scale is ordinal and not cardinal and that it is "largely subjective rather than objective."

The O*NET database provides many categories of data given for a specific occupation (tasks, knowledge, skills, abilities, work activities, work context, interests, work styles, work values, and work needs—see Figure 2 for an example). Among these categories, Blinder decided that the most relevant information could be found in the "tasks" and "work activities" sections. He devised four broad offshorability designations: Category IV, which represented occupations that were "highly non-offshorable" and for Blinder consisted of any occupation with an offshorability index rating between 0 and 25; Category III, which were "non-offshorable" and represented a rating of 26–50; Category II, which were "offshorable" and were rated between 51 and 75; and Category I, which were "highly offshorable" and rated between 76 and 100. For Blinder, almost all factory jobs fell into Category II. Blinder explained some of the clustering in his ratings: "to create a kind of benchmark, we ranked a 'standard manufacturing job' as 68." Blinder did not assign ratings on a 100-point scale to the occupations classified in his Category IV "because these inherently-domestic jobs are not treated as potentially offshorable under any definition."

Blinder's results for the four categories, as reported in his paper, are shown in Table 2. Blinder found that "somewhere between 22% and 29% of all U.S. jobs are or will be potentially offshorable within a decade or two." He noted that his "best guess is that something like 26%–29% of America's 2004 jobs are or eventually will be potentially offshorable." His conservative estimate included only categories I and II (210 occupations, 28.9 million jobs, which represents 22.2% of U.S. employment); his moderate estimate included all occupations with a rating of 37 or higher as potentially offshorable (240 occupations, 33.4 million jobs, 25.6% of the workforce); and his aggressive estimate included all jobs in Categories I, II, and III (284 occupations, 37.8 million jobs, 29.0% of all U.S. jobs).

Blinder also examined the rank correlation between offshorability and educational attainment, finding slight positive correlation, and the rank correlation between offshorability and wages, finding zero correlation. Finally, he ran a simple regression to test if the contestability of jobs due to offshoring has already resulted in a wage penalty

for U.S. workers. He found a 14% penalty for the 5.7 million jobs with the highest offshorability rating. None of the other coefficients on the offshorability variables were statistically significant.

2. Harvard Business School Student Exercise

On March 19, 2008, the professors teaching courses in Business, Government & the International Economy (BGIE) and Strategy at HBS discussed offshoring with each of the ten sections of the MBA Class of 2009. In preparation for the discussion, each student participated with his or her "learning team" in an exercise on offshoring. (A learning team is a group of five or six MBA students who are assigned to each other at the beginning of the school year and are encouraged to meet each morning to discuss the day's case studies. As much as possible, each learning team is constructed so that members bring diverse professional and personal experiences to the team.) Specifically, during the two weeks prior to class, each team was asked to complete some background reading and then visit an Intranet site at which the team would rate the offshorability of 20 occupations. We discuss the students, the background reading, the Intranet site, and the rating process in turn.

The students. The 901 members of the HBS MBA Class of 2009 are a diverse lot. Thirty-seven percent of them come from 64 countries other than the United States. The average member of the class was 27.5 years old in March 2008 and had 48 months of work experience before matriculation. The Class's collective experience covers a wide spectrum of the economy, with the greatest number of students coming from consulting (20% of the Class), venture capital or private equity (13%), manufacturing (8%), non-profits (8%), and investment banking (8%).

The background reading. Prior to the offshoring exercise, students were instructed to read a general background case on "The Offshoring of America."[2] The case discussed the ambiguity surrounding the definition of "offshoring," outlined some possible definitions, explained that the extent and impact of offshoring was a topic of ongoing debate, and laid out assessments of the extent of offshoring as shown in Table 1. The case did not discuss Blinder's paper, and to our knowledge, few if any students were aware of the paper. "The Offshoring of America" gave examples of some unexpected

services which had been offshored (e.g., radiology, surrogacy)—a fact that might have biased students toward believing that many tasks could be moved offshore. The case also provided examples of failed offshoring attempts. Finally, the case paid special attention to *maquiladoras* in Mexico, special economic zones in China, and business process and software service offshoring to India.[3]

The Intranet site. Having completed the background reading, members of each learning team convened and visited an Intranet site that resembled Figure 3. There, the team saw a list of 20 occupations that had been selected specifically for that team. Occupations for the exercise were taken from the O*NET database, Blinder's source. Rolling over an occupation on the screen brought up a box with O*NET's summary description of the occupation. By clicking on an occupation, the team could view detailed O*NET information on the most relevant tasks, knowledge, skills, abilities, work activities, and work context related to that occupation.[4] Figure 2 gives an example of the information available to the students for a single occupation—in this instance, "Business Teachers, Postsecondary." Students were not given data on each occupation's educational requirements, wage level, or overall employment.

The mix of occupations presented to students was designed to oversample from occupations that Blinder found to be offshorable and from occupations with a high level of education.[5] This oversampling was performed for pedagogical purposes: We wanted to shake students from any preconception that offshoring is limited to low-skill jobs. It is important to note, however, that the oversampling may have biased students toward thinking that many occupations can be moved offshore or that high-skill jobs are especially likely to be moved. Table 3 shows the degree of oversampling. Specifically, the table presents the number of occupations in each of Blinder's categories by education level for all occupations as well as for each sample of 20 given to HBS learning teams. The table shows, for instance, that occupations placed in Category I by Blinder and requiring at least a bachelor's degree comprised 4.3% of all occupations but made up 20% of the occupations rated by each learning team.

For teaching purposes, two occupations, Financial Analysts and Management Analysts, were assessed by every team. Other occupations were assessed by up to 20 groups. The upper panel of Table 4 shows the number of occupations that we intended to

be evaluated by a given number of learning teams. For instance, we expected 20 occupations to be evaluated by 13 different teams and 19 occupations to be evaluated by four teams.

Learning teams could decide not to share their assessments for purposes of academic research (such as this note), and 24 of the 152 teams chose this option. In addition, two teams failed to complete the assignment. The lower panel of Table 4 shows the actual number of occupations that were assessed by each number of learning teams.

The rating process. Teams were asked to assess the offshorability of each occupation on a 100-point scale. For occupations given an offshorability rating above 50, teams were also asked to designate to which country the occupation was likely to move. The menu of countries consisted of nations the students had studied or would soon study in the BGIE course: Brazil, China, India, Mexico, Singapore, Russia, and South Africa.

An instruction document gave students the following guidance about how they should decide on their offshorability rating:[6]

- The rating should reflect the ease and success with which the occupation's tasks can be completed from offshore. A rating of 100 implies that the tasks can be performed with complete ease and success from offshore, while a rating of 0 implies that it is impossible to perform the tasks from offshore. For instance, keyboard data entry might get a score near 100, and child care services might receive a score near 0. The rating should reflect the technical feasibility of performing the occupation's tasks from offshore.
- For developing the rating, one should assume that the current location of the occupation is the United States. The rating, then, should indicate how easily and successfully the occupation's tasks can be moved offshore from the United States.
- The rating should reflect the potential for the occupation's tasks to move offshore in 10 years assuming normal technological progress. One should assume, for instance, that electronic communications develop steadily but with no technological breakthroughs (e.g., no teleportation).
- The relative rankings of the 20 occupations are more important than the absolute ratings. An occupation with a higher rating should be more offshorable than one with a lower rating. To create some comparability across teams, we suggested a rating of:
  - 75 or above to occupations whose tasks students considered highly offshorable;
  - 50-74 to occupations whose tasks students considered somewhat offshorable;
  - 25-49 to occupations whose tasks students considered probably not offshorable; and

  - 0-24 to occupations whose tasks students considered very likely not offshorable.

- Students were likely to encounter occupations that involve multiple activities, some of which can be moved offshore and others of which cannot. The job of bill collector, for instance, includes telephone efforts to collect overdue payments, physical visits to the debtor, and associated record keeping. Students might decide that telephone efforts and record keeping can be moved offshore, but physical visits cannot. Students were told that their assessments in such a situation should reflect their judgments of (1) what portion of the job can be parsed off and sent offshore and (2) how well that portion can be completed from offshore. For example, if a student felt that two-thirds of a job could be performed with complete ease and success from offshore while one-third is completely impossible to perform from a distance, then he or she might assign that occupation an offshorability rating of 67.

- Students were reminded that they were assessing whether tasks associated with each occupation *can* be moved offshore with technical ease and success, not whether they will be or have been moved offshore. Since they were assessing feasibility, students were advised not to reduce their ratings simply because of the possibility of execution errors; students should assume that the offshoring party implements its plans well.

- To decide on a rating for an occupation, each student team was encouraged to imagine that it manages a firm that employs individuals in the occupation and then to ask itself, "How easily and successfully can we redeploy the occupation's tasks to another country and still serve the same customers well?" If the tasks require face-to-face contact between employees and customers (e.g., hair cutting), involve immobile assets that cannot be recreated abroad, or entail face-to-face interactions with workers in other jobs that cannot move abroad, for instance, the occupation deserves a low rating. If the tasks can be performed well at a distance from customers (e.g., telemarketing calls), involve assets that are easy to move to or obtain in another country (e.g., the computer terminals for data entry), and entails little interaction with other immobile workers, the occupation is likely to be highly offshorable.

Note that we offered students quite broad guidance about how to assess offshorability and did not give them Blinder's decision tree (Figure 1). We did so for several reasons. First, we wanted the students to come to their own understanding of what makes a job offshorable. Second and related, we wanted the replication study to explore whether the students and Blinder arrived at functionally equivalent definitions of what makes a job offshorable. (Had we given students Blinder's decision tree, we would be testing only whether Blinder and the students agreed on the deployment of that tree,

not on the nature of the tree itself.) Third, as we developed the exercise, we became increasingly convinced that it was more fruitful to think about the offshoring of *tasks*, not the offshoring of jobs. (We return to this point in our conclusion.) The broad guidance to students allowed us to encourage them to focus on the discrete tasks associated with an occupation and to consider the offshorability of each task.

For most occupations, we received offshorability ratings from multiple teams. For use in subsequent analyses, we obtained a single offshorability rating for each occupation by averaging across the ratings of all teams that evaluated the occupation.

3. Issues of Comparability

The HBS exercise differed from Blinder's study in several important respects. Blinder's analysis required not only offshorability ratings for each occupation, but also wage and total employment figures for each job. Following the lead of the O*NET database, the HBS exercise used employment numbers from the "Occupational Projections and Training Data: 2006-07 Edition," published by the Office of Occupational Statistics and Employment Projections of the Bureau of Labor Statistics in February 2006 (http://www.bls.gov/emp/optd/home.htm), and median wage estimates from May 2005 as found in Occupational Employment Statistics (OES) data (http://www.bls.gov/oes/).[7] Although OES also publishes data on total employment by occupation, it differs from that produced by the Office of Occupational Statistics and Employment Projections, and O*NET uses the latter. In contrast, Blinder used employment data from OES (found at http://www.bls.gov/oes/oes_2005_m.htm). He did not specify his source of wage data. Further, to the extent that O*NET occupation categories and descriptions changed between the time when Blinder tapped the O*NET database and when we did so, differences between the two datasets will exist. The total U.S. employment in Blinder's dataset is 130.3 million (based on OES data), compared to 138.2 million in the HBS dataset (based on O*NET data current as of late 2007). Blinder evaluated 817 job categories, including some categories that he split in order to refine his offshorability ratings, while HBS data included 812 occupations.

For the 817 occupations, Blinder provides offshorability ratings for only 291. Presumably, the other 526 occupations are in Category IV with an offshorability index

rating of 25 or less. Any new occupation categories added to the O*NET database between the completion of Blinder's study and the HBS exercise would automatically be assumed to be in Blinder's Category IV due to a lack of positive category identification in Blinder's paper.

HBS used slightly different cutoff points for the four offshorability categories than did Blinder. While Blinder's offshorability index was as follows:

Category	Description	Offshorability Index
I	Highly offshorable	100-76
II	Offshorable	75-51
III	Non-offshorable	50-26
IV	Highly non-offshorable	25-0

HBS used the following categories:

Category	Description	Offshorability Index
I	Highly offshorable	100-75
II	Offshorable	74-50
III	Non-offshorable	49-25
IV	Highly non-offshorable	24-0

Using Blinder's offshoring rating on a 100-point scale, we placed each occupation into a "modified Blinder" category (I, II, III, or IV) based on the HBS categorization.

Blinder noted the heterogeneity of some jobs within certain occupations and corrected for this by splitting a handful of jobs between two or more offshorability categories and ratings. Thus, Blinder divided the total number of jobs in the "Customer Service Representatives" occupation equally among all four offshorability categories. We at HBS did not allow students to divide jobs within an occupation in this manner, requiring instead that the students make an assessment of the portion of the job that could be offshored and use this to assign the occupation an overall score. Due to this difference in methodology, there are not comparable offshorability ratings for 11 HBS occupation categories that Blinder divided across offshorability categories.[8]

Further, Blinder assesses "All Other" categories such as "Mathematical Science Occupations, All Other." As HBS student ratings were based on descriptions from the

O*NET database and these occupations didn't have complete profiles in O*NET, HBS students were not asked to rate these categories.

Blinder also aggregates some categories that were broken out by HBS. For example, "Architectural Drafters" and "Civil Drafters" represented two different categories for HBS students and received independent ratings. Blinder rated only the parent category, "Architectural and Civil Drafters." For comparison with the HBS data, the rank and offshorability index numbers assigned by Blinder to the broader category were transferred to both of the distinct subcategories.

Excluding the "All Other" categories and breaking out the categories for which O*NET had more data (such as Architectural and Civil Drafters), the designers of the HBS exercise had access to a total of 812 occupations. Excluding the 27 that were not rated by HBS students and the 11 that were put into multiple categories by Blinder, we obtain 774 occupations that both Blinder and HBS students placed into an offshorability category (I, II, III, or IV). Of these 774, Blinder provides no offshorability rating (on a 100-point scale) for 494 occupations, and we assumed them to be in Blinder's Category IV.[9] There are a total of 280 occupations for which we have an offshorability rating on a 100-point scale from both Blinder and HBS students.

As noted, Blinder clustered certain types of jobs (such as manufacturing jobs) by giving many of them the same rating (68). He also placed very few occupations in his Category III. Because different occupation types were split among many different teams in the HBS analysis, there is no benchmark rating for a given job type. The HBS data also exhibit a more even split between Categories III and IV.

4. Comparison of HBS Student Results to Blinder's Findings

Recall that for 774 occupations, we had an assessment of offshorability category (I, II, III, or IV) from Blinder *and* a category assessment from HBS students. The correlation across occupations between Blinder's category assessment and the HBS students' category assessment was 0.668 and was highly statistically significant. Table 5, a cross-tabulation of the two category assessments, shows that Blinder and the HBS students agreed on the category assessments for 462 of 774 occupations—that is, for 60% of the occupations.

For 280 occupations, we had 100-point offshorability ratings from both Blinder and HBS students. The Spearman rank correlation between the two ratings was significant at 0.595. Figure 4 shows a scatter plot of these 280 observations. An interesting set of occupations are in upper left and bottom right quadrants, which represent either a low rating by HBS and a high rating by Blinder or the converse. Editors, for instance, was rated as highly offshorable by Blinder but not by HBS students. The O*NET report for Editor lists the importance of "Face-to-Face Discussions" as a 98 out of 100, and this may have led HBS students to a lower rating for Editor (and for similar occupations).

Figure 5 shows the number of workers employed in occupations above a given offshorability rating, as a function of the rating, both for Blinder and for the HBS students. From this figure, one can read off the Blinder and HBS estimates of the number of offshorable jobs for any given cutoff point. For example, if one believes that occupations with a rating above 60 are offshorable, then one can read from the graph that slightly fewer than 20 million jobs are at stake. The Blinder and HBS lines are extremely similar for cutoff ratings above 50. Below 50, the HBS line is consistently above the Blinder line, reflecting the fact that Blinder placed surprisingly few occupations in Category III.

Table 6 shows Blinder's results adjusted to incorporate HBS employment figures and offshorability categories. Recall that Blinder's conservative estimate of the potentially offshorable jobs included occupations in Categories I and II, while his aggressive estimate added Category III. The table reveals that Blinder's conservative and aggressive estimates are, respectively, 25.2 million and 31.8 million jobs potentially offshored. Table 7 reports the results from HBS student ratings. The comparable, HBS-based conservative and aggressive estimates are 28.4 million and 57.2 million jobs—between 21% and 42% of the total workforce. Blinder and the HBS students have similar conservative estimates of the number of potentially offshorable jobs, but HBS students provide a higher upper bound on offshoring.

An alternative way to create a conservative estimate of the number of potentially offshorable jobs is to take the minimum of Blinder's and students' offshorability rating for each occupation. If an occupation received a rating of 50 from Blinder and 25 from

the students, for instance, then the occupation would be given a rating of 25. Table 8 shows the results of looking at the U.S. economy this way. The table reveals that 4.6 million workers are in jobs that Blinder and HBS students agree to be highly offshorable; 17.4 million are in jobs that Blinder and HBS students agree to be offshorable or highly offshorable.[10]

An alternative way to create an aggressive estimate is to take the maximum of Blinder's and students' offshorability ratings. Table 9 reports this interpretation of the assessments: 11.3 million workers are in an occupation that Blinder, the students, or both believe to be highly offshorable, while 32.7 million are in a job that Blinder, the students, or both perceive to be offshorable or highly offshorable.

Following Blinder, we examined the relationship between education and offshorability. As Blinder did, we constructed for each occupation:

- E1 = the fraction of workers with "high school or less" education.
- E2 = the fraction with "some college" education.
- E3 = the fraction with a "bachelor's degree or higher."
- E4 = E3 – E1 = a measure ranging from -1 to 1 that reflects an occupation's balance between college graduates and those with high school or less education.
- E5 = 10E1 + 14E2 + 18E3 = a measure that estimates the years of education of the typical worker in an occupation.

E4 and E5 serve as summaries for the educational level associated with an occupation. The two are very closely related, with a rank correlation of 0.999. Where Blinder found a 0.08 rank correlation between an occupation's offshorability rating and its educational attainment, the HBS data reveal a stronger relationship: a highly significant Spearman correlation of 0.18. (When we restrict our analysis of the HBS data to those occupations that Blinder also rated, we obtain a Spearman correlation of 0.05—quite close to Blinder's finding.) For both datasets, this rank correlation is small and positive, "indicating that occupations with higher educational attainment are (slightly) more offshorable."

While Blinder does not provide wage data in his paper, he does report that the rank correlation between offshorability and wages is essentially zero for his data. For the HBS data, the Spearman correlation between annual median wage and offshorability rating was found to be 0.15 and highly significant. This suggests that high-wage jobs are more likely to be offshored. (When we restrict our analysis of the HBS data to those occupations that Blinder also rated, the Spearman correlation drops to a marginally significant -0.13.) In addition, when we regress the HBS offshorability rating on wages and wages^2, we obtain a significant positive coefficient on wages and a significant negative coefficient on wages^2; the relationship is an inverted-U, with its peak inside the range of data on wages. This provides some modest evidence that medium-wage occupations, not the highest-wage occupations, are the most offshorable. Consistent with this finding is the logic that high-wage workers such as surgeons and chief executives are safe from offshoring pressures, as are low-wage workers such as janitors, waiters, and nannies…but medium-wage workers are at risk.

To explore the impact of offshorability on wage levels, Blinder ran the log-wage regression:

$$\ln(w_i) = \alpha + \beta(E5_i) + \gamma \mathbf{OD}_i + \varepsilon_i,$$

where **OD** is a vector of dummy variables that correspond to different ranges of offshorability ratings. He found a wage penalty of 14% for the 5.7 million most offshorable jobs, a penalty he attributed to job contestability. In a similar regression with HBS data, we found no effect.

5. Conclusions

At the level of the specific occupation, Blinder's assessment of offshorability often differs substantially from the evaluation of Harvard MBA students. At a high level, however, we see the HBS exercise as validating Blinder's broad findings in two ways. First, the aggregate number of U.S. jobs that may feel the pressure of offshoring is large. The very most conservative estimates put the number in the millions, and a number above 20 million seems quite reasonable. One should not dismiss the offshoring phenomenon as a conjured concern of politicians who are seeking the attention of voters. Rather, offshoring deserves the attention of policy makers and scholars. Second, there is no

reason to believe that offshoring will affect only low-wage, low-skill occupations. Indeed, if HBS students are to be believed, the opposite is true: On average, occupations paying higher wages and requiring more education are more offshorable. One cannot dismiss offshoring by saying that it threatens only "jobs that Americans don't want anyhow." There is modest evidence that medium-wage occupations are the most at risk, suggesting particular vulnerability for the middle class.

When Blinder and the HBS students disagree about the offshorability ratings of specific occupations, who should we believe? Each source has its strengths and weaknesses. In Blinder, we have an extraordinarily accomplished economist who has applied a consistent set of explicit decision rules to all 817 occupations, but we also have a single individual. In the HBS students collectively, we have more than three millennia of work experience, including some experience in many of the occupations examined, and we have assessments made by teams and averaged over teams. But we also have a situation in which each team examined only 20 occupations and developed its own approach to making assessments. This raises doubts as we aggregate assessments across teams. Our sense is that one can trust the high-level findings on which Blinder and the HBS students agree, and one should not put too much stock in occupation-specific findings on which Blinder and the HBS students disagree.

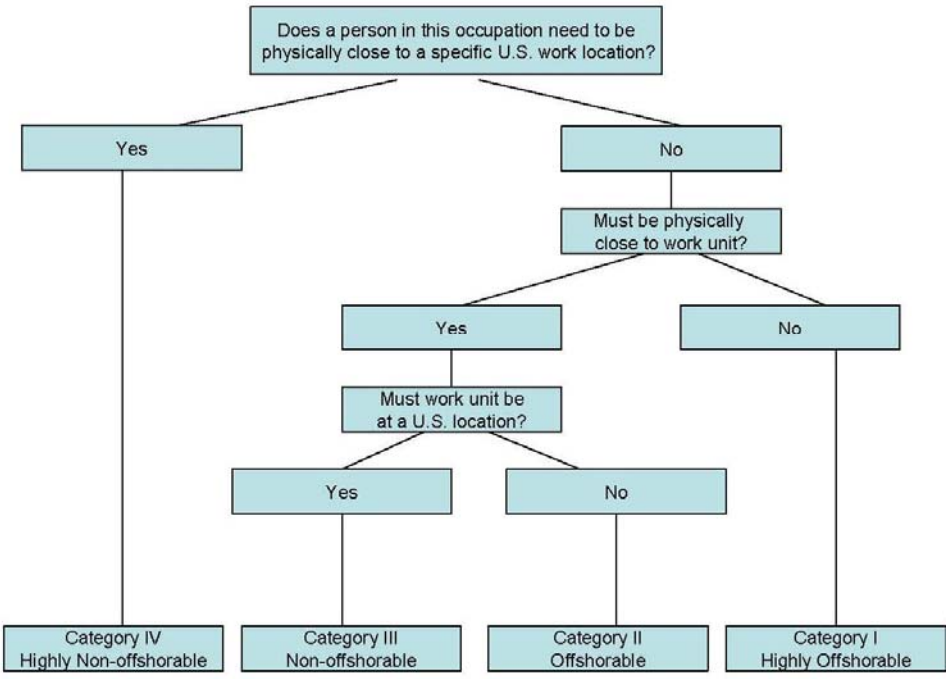
One might expect HBS students to be able to assess certain occupations with authority. For instance, we received offshorability ratings from 126 teams for the occupation "management analyst"—a position that roughly 20% of HBS students held in their consulting jobs before school. Interestingly, teams diverged widely in their offshorability ratings for this occupation. The ratings ranged from 0 to 95, with an average of 44.6 and a standard deviation of 20.9. Casual observation suggested that teams with former consultants tended to see the management analyst job as easier to move offshore. In future research, we may examine whether there are systematic relationships between the offshorability ratings submitted by a team and the professional backgrounds or citizenships of team members.

Our efforts to replicate Blinder's study led us to two further insights about the nature of offshoring. First, Blinder's notion of assessing the "potential offshorability" of an occupation is tricky. It requires one to downplay the forces that economists typically

believe determine the location of business activity—the relative factor costs and productivity levels that comprise comparative advantage—and to focus on the physical feasibility of conducting different types of work at a distance from customers. The surge in the number of potentially offshorable jobs in recent decades tells us that fewer and fewer business activities are tied to a specific location by the laws of physics; more and more, the laws of economics drive the geography of business activity.

Second, we feel that one misses something important when one thinks of moving *occupations* or *jobs* offshore. It is actually the tasks or activities associated with an occupation or job that move. A job is, in essence, a bundle of tasks that have been clumped together and assigned to an individual. There is no reason to assume, however, that tasks must continue to be bundled together in the future in the same pattern they have been bundled in the past. Indeed, some of the most creative applications of offshoring have taken historical bundles of tasks (= jobs), broken them down into component tasks, bundled them in new ways, and relocated each new bundle to the place where its tasks can be completed best or cheapest. It is this opportunity to rethink the fundamental grouping of tasks, not just to adjust the geographic array of historical bundles, that makes offshoring so powerful from the perspective of a business leader. The possibility of grouping tasks in novel ways gives businesspeople a breathtakingly broad menu of new options for taking advantage of differences across borders.

Figure 1 Blinder's Decision Tree and Occupational Categories



Source: Alan S. Blinder, "How Many U.S. Jobs Might be Offshorable?" CEPS Working Paper No. 142, March 2007, p. 18, http://www.princeton.edu/~ceps/workingpapers/142blinder.pdf, accessed May 2008.

Figure 2 Job Description of "Business Teachers, Postsecondary" from the O*NET Database

Figure 2 Job Description of "Business Teachers, Postsecondary" from the O*NET Database (cont.)

Knowledge

Save Table (XLS/CSV)

Importance	Knowledge
89	**Education and Training** — Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.
86	**English Language** — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
75	**Computers and Electronics** — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
75	**Economics and Accounting** — Knowledge of economic and accounting principles and practices, the financial markets, banking and the analysis and reporting of financial data.
71	**Customer and Personal Service** — Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
70	**Administration and Management** — Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
70	**Mathematics** — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.

back to top

Skills

Save Table (XLS/CSV)

Importance	Skill
97	**Instructing** — Teaching others how to do something.
93	**Reading Comprehension** — Understanding written sentences and paragraphs in work related documents.
92	**Speaking** — Talking to others to convey information effectively.
86	**Critical Thinking** — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
85	**Active Learning** — Understanding the implications of new information for both current and future problem-solving and decision-making.
85	**Active Listening** — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
85	**Learning Strategies** — Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
85	**Writing** — Communicating effectively in writing as appropriate for the needs of the audience.
84	**Time Management** — Managing one's own time and the time of others.
81	**Monitoring** — Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
71	**Social Perceptiveness** — Being aware of others' reactions and understanding why they react as they do.
70	**Judgment and Decision Making** — Considering the relative costs and benefits of potential actions to choose the most appropriate one.

Figure 2 Job Description of "Business Teachers, Postsecondary" from the O*NET Database (cont.)

Abilities

Save Table (XLS/CSV)

Importance	Ability
94	**Oral Expression** — The ability to communicate information and ideas in speaking so others will understand.
81	**Written Comprehension** — The ability to read and understand information and ideas presented in writing.
78	**Oral Comprehension** — The ability to listen to and understand information and ideas presented through spoken words and sentences.
78	**Written Expression** — The ability to communicate information and ideas in writing so others will understand.
75	**Speech Clarity** — The ability to speak clearly so others can understand you.
72	**Deductive Reasoning** — The ability to apply general rules to specific problems to produce answers that make sense.
72	**Inductive Reasoning** — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).

back to top

Work Activities

Save Table (XLS/CSV)

Importance	Work Activity
93	**Training and Teaching Others** — Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.
87	**Updating and Using Relevant Knowledge** — Keeping up-to-date technically and applying new knowledge to your job.
84	**Interpreting the Meaning of Information for Others** — Translating or explaining what information means and how it can be used.
83	**Interacting With Computers** — Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
82	**Getting Information** — Observing, receiving, and otherwise obtaining information from all relevant sources.
80	**Thinking Creatively** — Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.
78	**Coaching and Developing Others** — Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.
76	**Analyzing Data or Information** — Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.
76	**Establishing and Maintaining Interpersonal Relationships** — Developing constructive and cooperative working relationships with others, and maintaining them over time.
75	**Communicating with Supervisors, Peers, or Subordinates** — Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in

Figure 3 Input Screen for the HBS Exercise on Offshoring

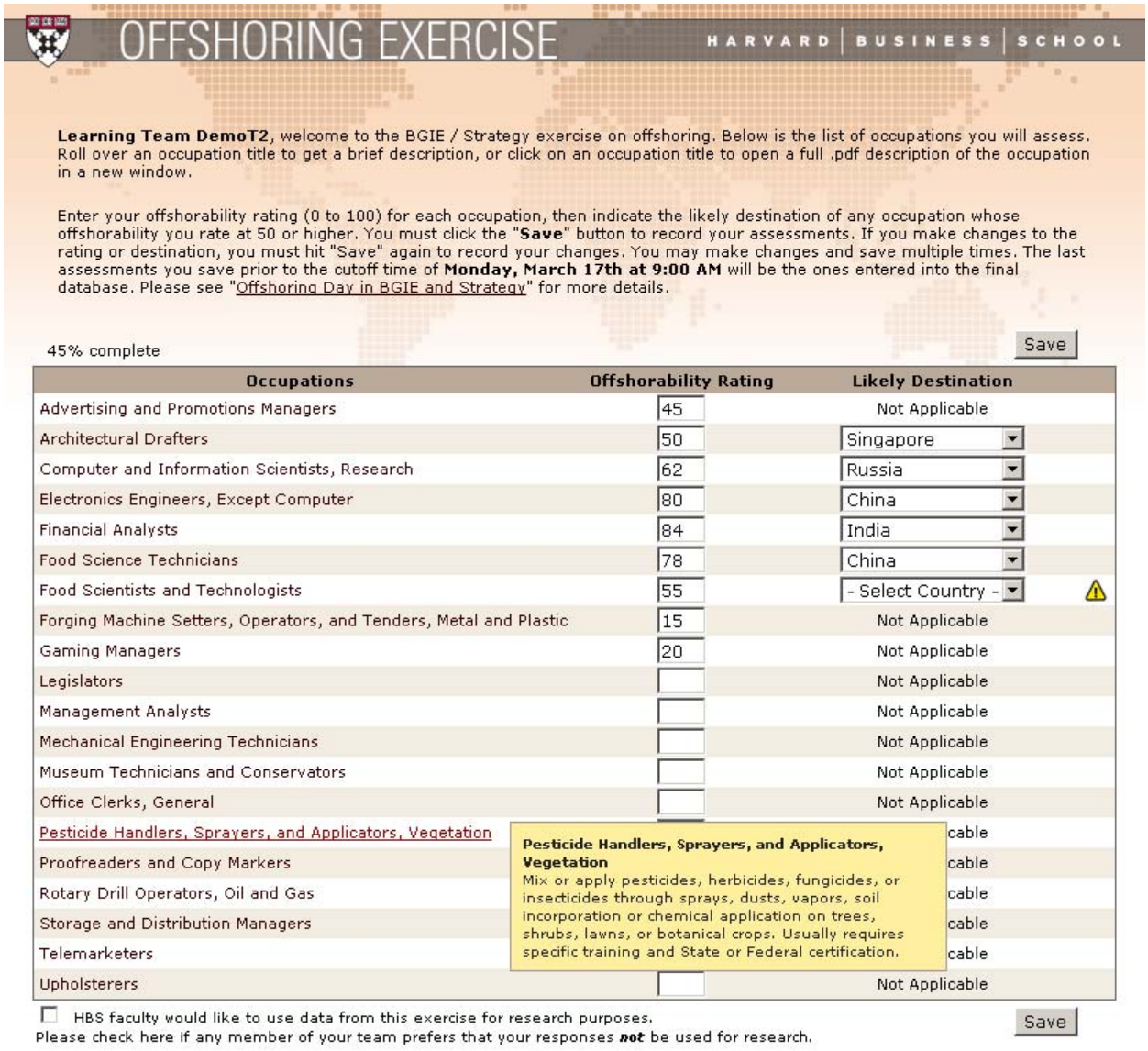


Figure 4 Scatterplot of HBS Rating and Blinder Rating

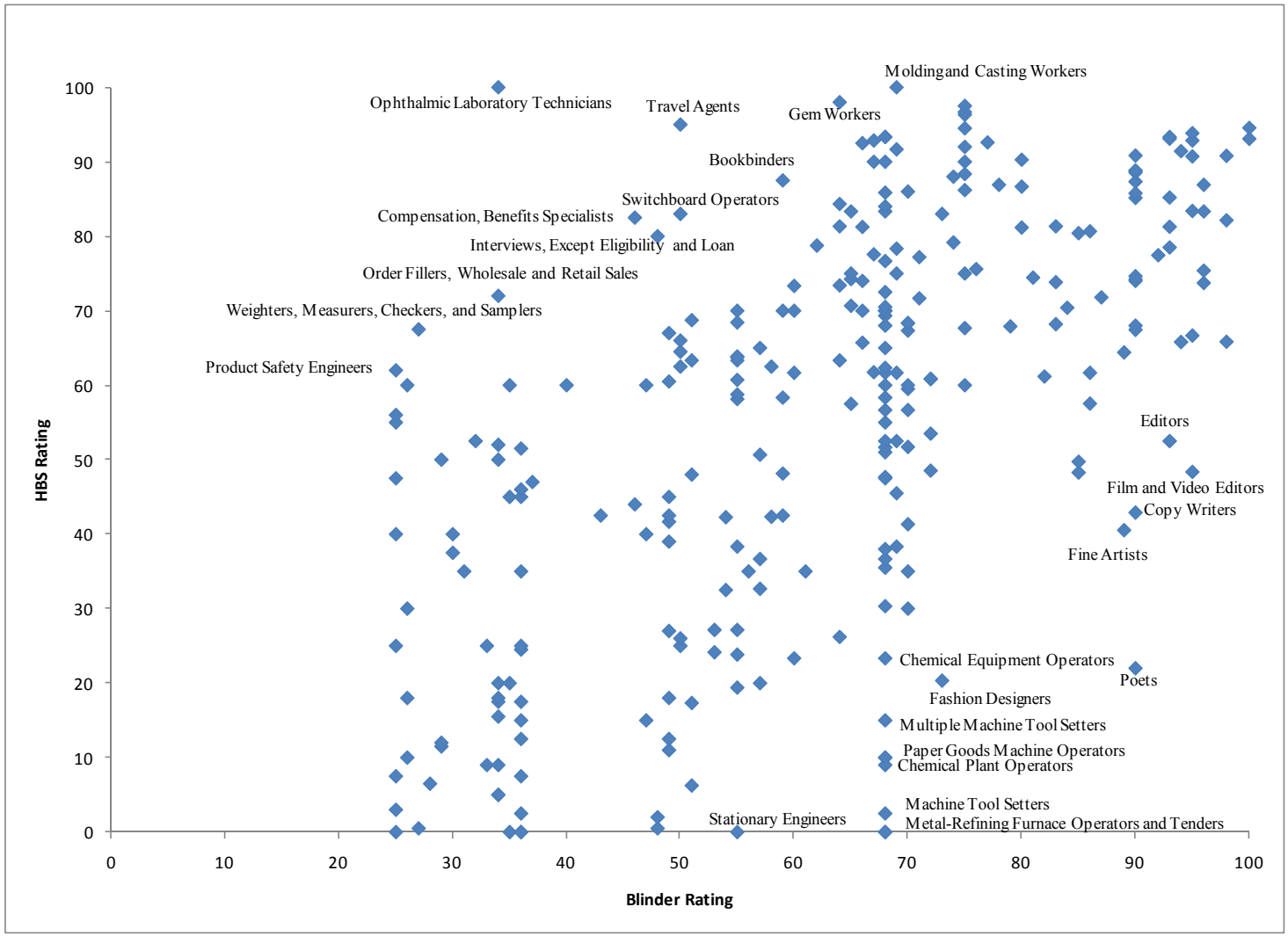


Figure 5 Number Employed Above a Given Offshorability Rating

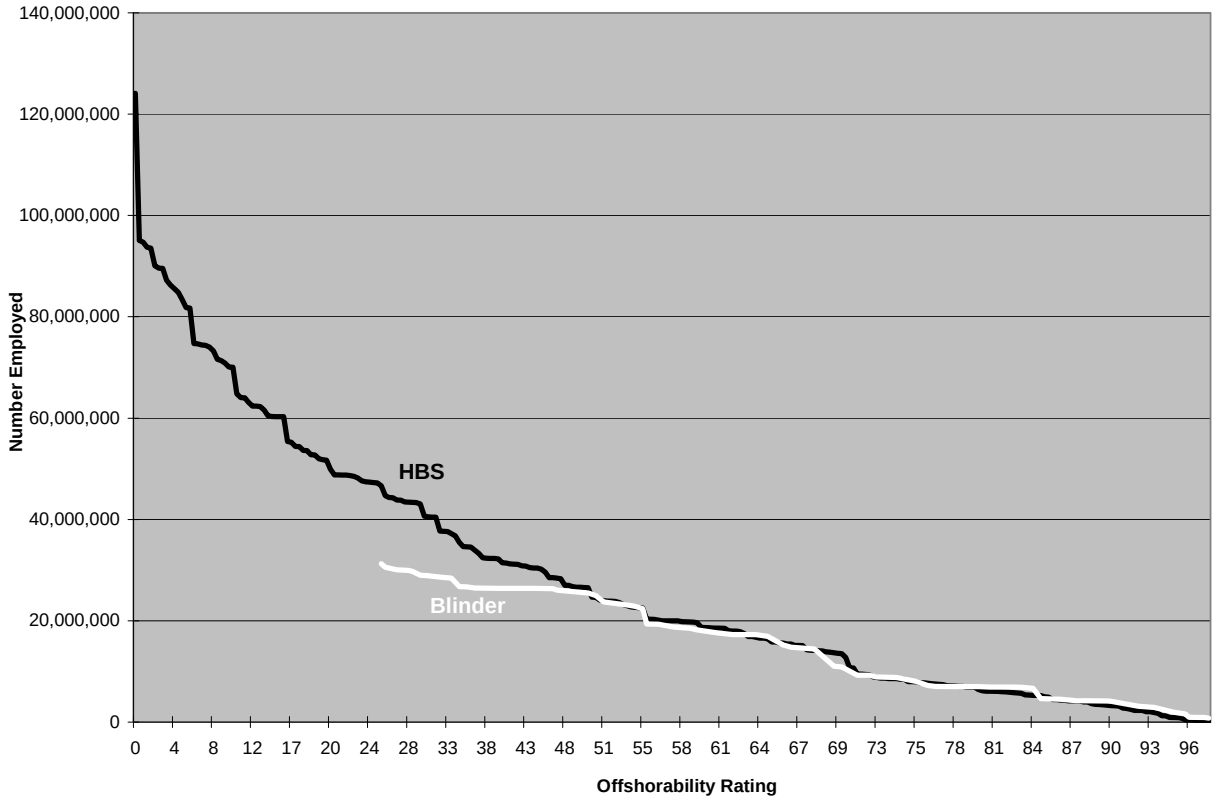


Table 1 Private-sector Estimates of Offshoring and Its Potential Effects

Source	Findings
Bardhan & Kroll[a] (University of California, Berkeley)	Finds fourteen million jobs in "at-risk" occupations in 2001, or 11 percent of U.S. workforce. These occupations include both IT and other occupations. Describes this as the "outer limit" of potential direct job loss, not actual number of jobs that will be offshored. Study does not provide a lower limit of potential job losses.
Deloitte Research[b]	In the financial services sector, 850,000 jobs may move offshore (15% of industry employment).
Forrester Research[c]	Across all services occupations, 3.3 million jobs are projected to move offshore by 2015.
Gartner, Inc.[d]	By the end of 2004, 500,000 IT jobs may be displaced. One out of every 10 jobs within U.S.-based IT vendors and IT service providers may move to emerging markets, as may 1 of every 20 IT jobs within user enterprises (non-IT companies that employ IT workers).
Goldman Sachs[e]	Estimates that U.S. producers have cumulatively moved fewer than 200,000 jobs to overseas affiliates but could increase the number of jobs overseas to a few hundred thousand per year over the next two to three years. Up to six million jobs could be affected by offshoring over the next decade.
Global Insight, Inc.[f]	About 104,000 of the 372,000 IT jobs were lost from 2000 to 2003 owing to offshoring (or 2.8% of total core IT jobs in 2000). After initial higher unemployment (2000 to 2002) primarily due to displaced IT jobs, net employment rebounded with jobs being created in both the IT sector (though more slowly than if there were no offshoring) and in other sectors of the economy. Other effects include higher real earnings (due to lower inflation and higher productivity), increased spending on IT (diffusion through the economy), higher gross domestic product, and increased exports.

Source: Adapted from United States Government Accountability Office, *International Trade: Current Government Data Provide Limited Insight into Offshoring of Services* (Washington, DC: Government Printing Office, September 2004), pp. 44-45, http://www.gao.gov/new.items/d04932.pdf, accessed September 2007.

[a] Ashok Deo Bardhan and Cynthia Kroll, "The New Wave of Outsourcing," (University of California, Berkeley, Fall 2003).

[b] Deloitte Research, "The Cusp of a Revolution: How Offshoring Will Transform the Financial Services Industry" (2003).

[c] John McCarthy, Forrester Research, "3.3 Million U.S. Services Jobs to Go Offshore" (Nov. 11, 2002).

[d] Diane Morello, Gartner Inc., "U.S. Offshore Outsourcing: Structural Changes, Big Impact" (July 15, 2003).

[e] Goldman Sachs, "Offshoring: Where Have All The Jobs Gone?" (Sept. 19, 2003).

[f] Global Insight, "The Impact of Offshore IT Software and Services Outsourcing on the U.S. Economy and the IT Industry" (March 2004).

Table 2 Blinder's Occupational Categories

Category	Description	Offshorability rating	Number of occupations	Percent of occupations	Millions of workers	Percent of workers
I	Highly offshorable	76-100	59	7.2%	8.2	6.3%
II	Offshorable	51-75	151	18.5%	20.7	15.9%
III	Non-offshorable	26-50	74	9.1%	8.8	6.8%
IV	Highly non-offshorable	0-25	533	65.2%	92.6	71.1%
All		0-100	817	100.0%	130.3	100.0%

Source: Adapted from Alan S. Blinder, "How Many U.S. Jobs Might be Offshorable?" CEPS Working Paper No. 142, March 2007, p. 19, http://www.princeton.edu/~ceps/workingpapers/142blinder.pdf, accessed May 2008.

Table 3 Occupation Mix for Each Learning Team

Total of all occupations

	Category I		Category II		Category III & IV		Total	Percent
	Number	% of total	Number	% of total	Number	% of total		
Bachelor's or higher	35	4.3%	43	5.3%	230	28.3%	308	37.9%
Some college	22	2.7%	9	1.1%	108	13.3%	139	17.1%
High school or less	7	0.9%	95	11.7%	263	32.4%	365	45.0%
Total	64	7.9%	147	18.1%	601	74.0%	812	

Sample for each team

	Category I		Category II		Category III & IV		Total	Percent
	Number	% of total	Number	% of total	Number	% of total		
Bachelor's or higher	4	20.0%	2	10.0%	4	20.0%	10	50.0%
Some college	1	5.0%	1	5.0%	1	5.0%	3	15.0%
High school or less	1	5.0%	2	10.0%	4	20.0%	7	35.0%
Total	6	30.0%	5	25.0%	9	45.0%	20	

Category refers to the category of offshorability assigned by Blinder.

Table 4 Number of Teams Reviewing Each Occupation

Initial design

Number of learning teams reviewing the occupation	Number of occupations
152	2
22	5
21	2
17	8
16	1
14	14
13	20
8	3
7	60
6	2
4	19
3	158
2	452
1	66

Actual results, excluding teams that opted out of research and non-respondents

Number of learning teams reviewing the occupation	Number of occupations
126	2
20	1
19	1
18	4
15	4
14	6
13	4
12	7
11	11
10	10
9	2
7	14
6	30
5	17
4	14
3	97
2	367
1	194
0	27

Table 5 Cross-tabulation of Occupational Categories

Number of occupations

		Modified Blinder category				
		I	II	III	IV	All
HBS student category	I	43	30	3	9	85
	II	22	60	16	42	140
	III	5	28	22	106	161
	IV	1	17	33	337	388
	All	71	135	74	494	774

Table 6 Blinder Ratings Using HBS Categories and Employment Data

Category	Description	Offshorability rating	Number of occupations in this category	Percent of all rated occupations	Percent of all occupations	Millions of workers in this category	Percent of workers in all rated occupations	Percent of all workers
I	Highly offshorable	75-100	71	8.9%	8.7%	8.0	6.3%	5.8%
II	Offshorable	50-74	136	17.0%	16.7%	17.2	13.6%	12.4%
III	Non-offshorable	25-49	75	9.4%	9.2%	6.6	5.2%	4.8%
IV	Highly non-offshorable	0-24	519	64.8%	63.9%	95.1	74.9%	68.8%
All		0-100	801	100.0%	98.6%	126.9	100.0%	91.8%
Not rated			11		1.4%	11.3		8.2%
Total			812		100.0%	138.2		100.0%

Table 7 HBS Offshorability Ratings by Category

Category	Description	Offshorability rating	Number of occupations in this category	Percent of all rated occupations	Percent of all occupations	Millions of workers in this category	Percent of workers in all rated occupations	Percent of all workers
I	Highly offshorable	75-100	88	11.2%	10.8%	11.1	8.2%	8.0%
II	Offshorable	50-74	142	18.1%	17.5%	17.3	12.8%	12.5%
III	Non-offshorable	25-49	166	21.1%	20.4%	28.8	21.3%	20.8%
IV	Highly non-offshorable	0-24	389	49.6%	47.9%	78.2	57.8%	56.6%
All		0-100	785	100.0%	96.7%	135.4	100.0%	98.0%
Not rated			27		3.3%	2.8		2.0%
Total			812		100.0%	138.2		100.0%

Table 8 Minimum of HBS and Blinder Offshorability Ratings by Category

Category	Description	Offshorability rating	Number of occupations in this category	Percent of all rated occupations	Percent of all occupations	Millions of workers in this category	Percent of workers in all rated occupations	Percent of all workers
I	Highly offshorable	75-100	43	5.4%	5.3%	4.6	3.6%	3.3%
II	Offshorable	50-74	113	14.1%	13.9%	12.8	10.1%	9.3%
III	Non-offshorable	25-49	75	9.4%	9.2%	7.2	5.7%	5.2%
IV	Highly non-offshorable	0-24	570	71.2%	70.2%	102.2	80.6%	74.0%
All		0-100	801	100.0%	98.6%	126.8	100.0%	91.8%
Not rated			11		1.4%	11.3		8.2%
Total			812		100.0%	138.1		100.0%

Table 9 Maximum of HBS and Blinder Offshorability Ratings by Category

Category	Description	Offshorability rating	Number of occupations in this category	Percent of all rated occupations	Percent of all occupations	Millions of workers in this category	Percent of workers in all rated occupations	Percent of all workers
I	Highly offshorable	75-100	113	14.1%	13.9%	11.3	8.9%	8.2%
II	Offshorable	50-74	164	20.5%	20.2%	21.4	16.9%	15.5%
III	Non-offshorable	25-49	162	20.2%	20.0%	21.6	17.0%	15.6%
IV	Highly non-offshorable	0-24	362	45.2%	44.6%	72.6	57.2%	52.5%
All		0-100	801	100.0%	98.6%	126.9	100.0%	91.8%
Not rated			11		1.4%	11.3		8.2%
Total			812		100.0%	138.2		100.0%

Endnotes

[1] See Alan S. Blinder, "How Many U.S. Jobs Might be Offshorable?" CEPS Working Paper No. 142, March 2007, http://www.princeton.edu/~ceps/workingpapers/142blinder.pdf, accessed May 2008.

[2] Richard H.K. Vietor, Jan W. Rivkin, and Juliana Seminerio, "The Offshoring of America," HBS No. 708-030 (Boston: Harvard Business School Publishing, 2008).

[3] For class on March 19, 2008, students were also asked to prepare a case study on a consulting firm that is considering relocating various activities, especially business research, to India. See Jan W. Rivkin and Juan Alcacer, "Monitor's Opportunities in India (A)," HBS No. 708-482 (Boston: Harvard Business School Publishing, 2008). We believe that the vast majority of students completed the learning team exercise described here *before* preparing the consulting firm case study.

[4] Students saw only a subset of the data on tasks, knowledge, skills, abilities, work activities, and work context listed in the full O*NET database. Specifically, the items rated above 70 on the 100-point scale of importance in the O*NET database appeared in the files available to the students. In addition, not all occupations had information available for all of the categories listed above: tasks, knowledge, skills, abilities, work activities, and work context. At a minimum, each occupation had information available for tasks.

[5] O*NET gives the percent of respondents in each occupation who have "high school or below," "some college," and "bachelors or higher" levels of education. For each occupation, "education level" was designated as the educational category with the highest percentage.

[6] Jan W. Rivkin and Troy Smith, "Offshoring Day in BGIE and Strategy," HBS No. 708-492 (Boston: Harvard Business School Publishing, 2008).

[7] For eight observations for which the median wage was not available, the mean wage was used. For three additional observations, the median annual wage was calculated from the median hourly wage.

[8] The eleven occupations are treasurers and controllers; financial managers, branch or department; accountants; auditors; computer support specialists; lawyers; interpreters and translators; customer service representatives; receptionists and information clerks; secretaries, except legal, medical, and executive; and office clerks, general.

[9] Nine of these were in Category I according to HBS students, 42 were in Category II, 106 were in Category III, and 337 were in Category IV.

[10] For this analysis and the one in the following paragraph, we assigned a rating of 12.5 to all occupations that Blinder placed in Category IV. (Recall that he did not provide a 100-point offshorability rating for these occupations.)