TEMPORARILY FOREIGN? THE LABOR MARKET FOR MIGRANT PROFESSIONALS IN HIGH-TECH AT THE PEAK OF THE BOOM

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Almost four decades after it liberalized immigration policies, the United States remains locked in an ongoing debate over how best to manage the flow of persons from abroad. For the most part, debate has focused on those policies affecting and regulating the movement of less skilled persons. Throughout, however, there has been concern with the flow of high-skilled foreign-born workers; in recent years, the presence of these highly skilled foreigners—admitted as "non-immigrant workers" under an H1B visa, but often later on ending as permanent components of the U.S. workforce, first as greencarders and eventually as citizens—has become a matter of heated public discussion.

The terms of the debate, which has centered on proposals to expand this category of temporary labor, are fully predictable, as all of the echoes of earlier controversies can be heard. On the one hand, opponents contend that the temporary high-skilled workers provide employers with a cheap, tractable labor force, reducing opportunities for citizens and forestalling those changes in labor markets that would otherwise compel firms to provide training to those domestic workers who do not quite possess the necessary skills. Those who make the case for greater admissions of H1 labor contend that we have no other choice. The American economy is increasingly integrated with the world economy, not just in product, but in labor markets; the demand for highly educated labor of the specialized sort needed by high technology is growing at a pace that domestic sources cannot supply; and since jobs are increasingly mobile, a failure to bring the people to the United States will mean that the positions will travel abroad to

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wherever the right kind of labor is to be found. Given the importance of high technology to America's competitive position, this is an outcome to be avoided.

As befits the immigration field, this has largely been a controversy with much noise and relatively little light. While each side has been successful in trotting out its scholar/advocates, they have been much less successful in advancing our state of knowledge.[1] Although the phenomenon has received growing attention, we still know relatively little about the role that temporary high-skilled foreign-born workers play in American labor markets, and how that role may vary by sector or by occupation.[2] These lacunae in turn impede our understanding of the interests that drive that policy debate.

This article seeks to begin to fill in some of the holes. We focus on the role of engineers, systems analysts, and programmers in the high-technology sector in California. The sectoral focus, we think, is appropriate, as it is high technology—both as actor and subject of concern—that has largely driven the debate. So too is the occupational focus, precisely because it is broader than the topic of political debate, namely the role of systems analysts and computer programmers: the object of research is to understand how high-technology organizations recruit, utilize, and deploy H1B workers within the context of their overall employment strategy, which is why restricting the analysis to a single, isolated occupation makes little sense. This is clearly the appropriate analytic strategy, as both pro and con in the policy debate assume a particular employment strategy, about which almost nothing is known.

The paper chiefly relies on a set of forty-four in-depth interviews conducted with human resource managers in high-technology firms in the southern California and Silicon Valley areas in 1998.[3] The interviews focused on a set of common topics, related to the

1. *See*, *e.g.*, Norman Matloff, *Debunking the Myth of a Desperate Software Labor Shortage, Testimony to the U.S. House Comm. on the Judiciary, Subcomm. on Immigration*, 105th Cong. (Apr. 21, 1998), *available at* http://heather.cs.ucdavis.edu/itaa.real.html; Eric Weinstein, *How and Why Government, Universities, and Industry Create Domestic Labor Shortages: An Introduction to the Real NSF "Shortage" Study* (Working Paper 1999), *available at* http://www.nber.org/~peat/PapersFolders/Papers/SG/NSF.html.

2. *See* NAT'L SCIENCE FOUNDATION, 1 SCIENCE AND ENGINEERING INDICATORS 2002 (2002), *available at* http://www.nsf.gov/sbe/srs/seind02/pdf_v2.htm#c3 [hereinafter SCI. & ENG. INDICATORS 2002]; INTERNATIONAL MIGRATION OF THE HIGHLY SKILLED: DEMAND, SUPPLY, AND DEVELOPMENT CONSEQUENCES IN SENDING AND RECEIVING COUNTRIES, CENTER FOR COMPARATIVE IMMIGRATION STUDIES (Wayne A. Cornelius et al. eds., 2001); ANNA LEE SAXENIAN ET AL., LOCAL AND GLOBAL NETWORKS OF IMMIGRANT PROFESSIONALS IN SILICON VALLEY (2002), *available at* http://www.ppic.org/content/pubs/R_502ASR.pdf.

3. Interviews were mainly conducted from spring through fall 1998.

recruitment of engineers, systems analysts, and programmers in general; while we consistently directed the interviews toward the topic of H1B workers, we also sought to collect the information needed to relate this to the overall human resource practices followed by the firms we visited.

The interviews took the form of open-ended question and response, in our view the appropriate procedure in light of the exploratory nature of the research: there is no established body of knowledge on which our research might have begun. Consequently, the interviews were designed to both generate and assess hypotheses, with the assessment aspect more important as our understanding deepened. The open-ended nature of the interviews allowed us to identify actors' own explanations of the phenomenon and then ask others to assess them in light of their own experience, the situation of their particular organization, and the logic of the argument. By implication, the precise substance of the interviews varied from case to case. Given the relatively small size of the sample, and the variability in the nature of the interview, caution is warranted in generalizing from any of the findings reported here. On the other hand, the ability to explore matters in depth, and the interactive character of the interviews, provides considerable illumination of the underlying process in question.

Not surprisingly, we find that the reality is much more complex than as depicted by the various scholar-advocates. The hiring and deployment of foreign workers on H1B visas exacts significant costs as well as benefits for employers. We do not attempt to take a strong stand on the dichotomous debates over "whether there is a real labor shortage" or "whether employers use foreign workers just to reduce compensation and avoid training costs," but rather attempt to describe some of the complexities we discovered in the hiring and deployment of workers on H1B visas, with an emphasis on the costs to employers.

Finally, we note that we conducted our research toward the peak of the dot-com boom and during the period of "fixing the Y2K bugs," when programmers were in particularly high demand. During the more recent downturn, there is evidence that the shortages (whether real or not) have lessened, along with the application and approval rates for H1B's.[4]

4. Rick Green, *As the Tech Economy Goes, So Do Special Visas*, N.Y. TIMES, June 16, 2002, at 1.

I. THE POPULATION IN QUESTION

While the policy debate has focused on the issue of whether to increase the number of persons admitted under the H1B visa, an exclusive focus on admissions exclusively does not serve us well, directing our attention to those persons entering the country under temporary auspices as opposed to the large population already here. In 2000, 136,740 petitions for initial H1B visas were approved.[5] Just over half of these petitions were filed on behalf of persons residing abroad; the remainder was submitted on behalf of persons already residing in the United States. As the H1B visa is valid for three years and can then be renewed for another three-year term, an additional 120,853 petitions for continuing employment were approved in 2000.[6]

Precise figures on the actual size of the H1B population do not exist, as administrative data do not track this population. A recent estimate, taking into account mortality, re-migration, and adjustment to permanent residence, projects a total H1B population of 424,000 as of 2000.[7] Occupational or sectoral data on the H1B workforce is similarly unavailable, although the National Research Council's report estimated that H1Bs comprise roughly 10% of Category 1 Information Technology workers.[8]

Thus, it is clear that H1B workers access the U.S. labor market in a variety of ways. Some start as foreign students, who enter the United States under a variety of statuses. In 2000, roughly 659,000 persons entered the United States under an F visa, which is assigned to students only; an additional 304,000 persons entered under J visas, designated for "exchange visitors," some portion of whom are students, others of whom are teachers or trainees.[9] As of academic year 2000–01, there were 547,000 foreign students in the United States, an increase of one-third since 1990–2001.[10]

Foreign students play a particularly important role in science and engineering higher education, comprising 12% of undergraduates enrolled in these fields in 1999, but 31% of those enrolled in graduate

5. *See* U.S. IMMIGRATION AND NATURALIZATION SERVICE, U.S. DEP'T OF JUSTICE, 2000 STATISTICAL YEARBOOK OF THE IMMIGRATION AND NATURALIZATION SERVICE 3 (2002).

6. *Id.*

7. *See* B. Lindsay Lowell, *H-1B Temporary Workers: Estimating the Population*, (Apr. 17, 2000), at Appx. Table 2B, 32, *at* http://www.ieeeusa.org/forum/issues/H1bvisa/h1report.pdf (last visited July 22, 2004).

8. NAT'L RESEARCH COUNCIL, BUILDING A WORKFORCE FOR THE INFORMATION ECONOMY 163 (2001).

9. *See supra* note 5, at Table 37.

10. Inst. of Int'l Education, *Open Doors on the Web*, *at* http://www.opendoors.iienetwork.org/?p=31667 (last visited, July 22, 2004).

programs at either the M.S. or Ph.D.-level, and 40% of those enrolled in graduate engineering, math, and computer science programs.[11] Foreign students face some restrictions to labor market participation, the nature of which varies according to the visa category. Nonetheless they have considerable opportunity to acquire U.S. labor market experience and thereby establish contact with employers. Those on F visas can work during summers, and they are also eligible for a year of "practical training" following graduation, without a change in visa status; many are motivated to take advantage of this opportunity.

Other H1B workers first enter the U.S. labor market directly from abroad. The mechanisms by which professionals living abroad obtain H1B visas is highly complex, affected by the organizations to which they are attached. The most important axis of variation probably involves those who move directly into the internal labor market of the organization where they work as opposed to those recruited by consulting organizations, who get assigned on a temporary basis to any number of organizations of varying type.

II. THE ARGUMENTS IN PLAY

The past fifteen years have witnessed a considerable increase in the number of persons admitted under H1B visas, with the 2000 total representing an increase of more than 300%, relative to 1990.[12] Unfortunately, as we just noted above, there is relatively little scholarship that could tell us why the utilization of skilled temporary professionals has increased and to what effects. Conventional economic theory would suggest that in response to high prices that arise in the market due to an imbalance of supply and demand (in this case, high wages for engineers, systems analysts, and programmers due to insufficient supply relative to demand), individual economic agents will take actions to produce the in-demand product. But some goods take considerable time to produce; in those cases, the individually rational actions of the actors can first lead to aggregate oversupply, due to lack of coordination, and subsequently to undersupply, as agents stop producing the now over-supplied good. In the end, one has the "cobweb cycle."[13]

Pig farming furnishes the classic example: high prices this year lead pig farmers to invest in baby pigs for next year, at which time the slaughtered pigs over-saturate the market, discouraging farmers from

11. SCI. & ENG. INDICATORS 2002, *supra* note 2, at Appx. Tables 2-35, 2-38.
12. *See supra* note 5, Table 37.
13. PAUL A. SAMUELSON & WILLIAM D. NORDHAUS, ECONOMICS 405–07 (12th ed. 1985).

investing in baby pigs, which yields under-supply the following year, and on and on. The production of scientific and engineering personnel is not all that different. First, the demand for highly trained engineers and computer scientists has gone through many gyrations over the past twenty-five years. Second, supply reacts to demand with a very considerable lag: the ability to acquire the necessary skills is probably decided before the age of twenty, if not earlier, which means that the size of today's new labor market entrants is largely determined by decisions made several years before. This process tends to work itself out in the following way: at T1, demand is intense, and college freshmen run to major in engineering and computer science. That change does little to satisfy demand in the short run, especially at the highest end, since the additional M.S. or Ph.D. engineers wanted just now by industry will not move into the pipeline for another six years or more. By T2, however, wages for engineers and computer specialists are slipping, leading college students to seek other majors. As of T3, wages are headed back up as demand revives, but the appropriate additions to the labor supply are only now beginning to be trained.

Human capital theory thus predicts that today's shortage of highly skilled engineers and computer specialists will be relieved in due course: (potential) workers will respond rationally to today's economic signals, obtaining the skills that employers want. But whether and when it will prove rational to acquire skills at the very high end—where foreign-born workers are concentrated—the theory cannot say. If, as appears to be the case, the demand for workers with advanced skills in the broad computer-related field is growing generally, then new workers might well be diverted into those areas where the costs (and opportunity costs) of skill acquisition are not quite so high, reason enough not to continue for the M.S., let alone the Ph.D.

A variety of short-term adjustments might parallel or precede the longer-term shifts entailed in the "cobweb" cycle, mitigating its effects: less skilled workers with related experience could invest in needed, additional skills; experienced workers, with relevant skills, might shift out of related industries; firms might also reconfigure jobs by deskilling, so as to increase their access to the available labor supply. On the other hand, if demand spikes in the highest skilled categories, then the time required for market adjustments is likely to be further extended. In addition, firms may be tightly constrained from relaxing skill requirements as a result of technological or organizational factors that reduce the ability to provide investment in

training. For all of these reasons, the short-term adjustments sketched out above may not mitigate the effects of the cobweb cycle, given the skill requirements at the very top end of the high-technology sector.

As noted above, the cobweb cycle presumes a market delimited by national boundaries. However, the incentives to invest in a specific high-level competency—such as that required by the most skilled engineers or system analysts—may differ from one country to the next. If, for example, demand for engineers or systems analysts is growing in India, while it is declining in the United States, then the ranks of new Indian engineers and software analysts may continue to increase, even as the size of new additions to the U.S. supply falls off. Furthermore, the costs and benefits to extended investment in human capital may differ cross-nationally, independent of short-term, business cycle factors. The relative return to investment in human capital is greater in developing societies—such as those from which most foreign-born engineers and systems analysts come—as opposed to in the United States, with its lower (though growing) levels of inequality. Consequently, the supply of scientific and engineering labor produced in developing societies may not respond with the same sensitivity to shifts in demand as in the United States. And finally, it's likely that for some prospective engineers and computer scientists in developing countries, the relevant calculus is one that assesses the costs and opportunity costs of investment in human capital in the home country relative to the returns to those skills in the United States, in which case even a relatively long period of unemployment in the United States or employment at wages below the U.S. average would not deter the acquisition of the necessary skills. Since the costs of migration diminish as the size of the immigrant population expands, and newcomers can rely on connections to established veterans to find jobs and secure labor market information, the incentives to invest in skills in order to migrate are also likely to grow. All of which is to say that the supply of scientific and engineering labor is likely to expand in developing societies, independent of short-term shifts in the United States.

Consequently, market adjustments to the late 1990s spike in demand for high-level engineering and computer science talent may take a different form than in the past. The downturn of the early 1990s may well have deterred the college students of the time from pursuing engineering or computer science degrees, yielding adverse effects on the size of the cohorts entering high-technology labor markets at the end of the decade. But if we ask about changes in the size of the population practically able to work in the United States, in

the sense of possessing the skills appropriate to employers' requirements, the story may look different. Those criteria are most clearly met by foreign students, but the globalization of technology, the international expansion of higher, technical education, and the tendency of many high-technology organizations to sell to a world market has effectively internationalized the appropriate labor supply. Not only is the appropriate labor force to be found overseas, but it is also growing at a rapid rate and is one with which many "American" high-technology firms have considerable experience. If the costs of mobilizing foreign-trained professionals are also declining, for the many reasons noted below, then the least-cost, short-term adjustment takes the form of recruitment of "foreign labor."

III. LESSONS FROM THE INDUSTRY CASE STUDY

As described earlier, our interviews with human resource managers in high-technology firms in California were exploratory, in the sense that we did not enter the field with clearly established hypotheses. However, our interviews did not simply focus on issues related to the recruitment of temporary immigrants, but rather sought to embed that topic within a discussion of the nature and logic of the overall employment strategies pursued by the firms.

Our study, like others, found that the market for engineers and systems analysts had tightened considerably in the late 1990s.[14] In this paper, we go on to show that the market for high technology is structured in such a way as to impede the type of adjustments that would be entailed in upgrading non-professional workers. As an alternative, firms turn to temporary foreign workers who possess the requisite skills, and to whom access is facilitated by a variety of factors. As we have noted, many are already in the United States, either as students or as employees in private industry. Globalization and the advent of Internet recruiting further facilitate access to a foreign labor force; the widespread recourse to consultants creates an additional set of opportunities for temporary foreign workers.

On the other hand, the costs of recruiting temporary workers are not trivial, encompassing fees paid to lawyers and perhaps recruiters, substantial administrative time, delay, and some uncertainty as to whether an application for an H1 worker will in fact be approved. Moreover, foreign workers are being inserted into a context where "foreign-ness" may entail a penalty of a sort. Communication, oral

14. NAT'L RESEARCH COUNCIL, *supra* note 8.

and written, is increasingly important in the firms that we visited, especially as they move to team forms of organization. These considerations matter as counterfactuals: there are plenty of good reasons not to recruit temporary foreign professionals. That companies do so nonetheless testifies to the paucity of superior (or at least superior and low-cost) alternatives, at least in the short run.

A. Precipitating Factors

1. Changes in Skill Requirements

At the time of our interviews, growth at the aggregate level was straining supply; other factors, peculiar to the high-technology sector, aggravated firms' ability to secure the workforce they sought. In particular, the rapid pace of innovation ensured that skill requirements were constantly evolving, with yesterday's needs quickly devalued, and today's often unavailable in sufficient supply. The effect of short-term shortages seemed aggravated by the highly specialized nature of the relevant skills, whose weight varies with market niche, firm size, and product cycle. Certain occupational specializations posed particular difficulties. Niche players often had highly specialized needs, and, as one manager put it, "the more specialized and advanced the company, the smaller your labor pool." While a high level of product specialization did not necessarily generate the same demand for skill specificity, the difference between what was desirable and acceptable was by no means trivial, since professionals moving from one firm to another, but within the same niche, were more likely to adjust quickly as opposed to those who came from outside. Thus, needs were likely to be highly focused on particular products, which, precisely because they stood at the cutting edge, required skills that all too few workers possess. And those demands pushed firms to focus recruitment efforts narrowly, concentrating on persons with the related experience and background needed to make a quick and easy fit.

2. Importance of Formal Skills

A related issue involves the importance of formal skills as opposed to those learned on the job. Though the broader computer workforce includes a large portion of persons who have not completed a college education, as well as many college graduates with little or no formal training in computer science, formal training appears more important in the high-technology sector. In general, the organizations

we visited employed and recruited a relatively selective group, most of whom held degrees from an engineering or computer science program of some sort. The prevalence of degree holders seemed a function of both recruitment and self-selection. As our respondents conceded, the signaling functions of credentials played an important role in any initial sorting: focusing just on those persons, "among the tons of applicants," with degrees significantly simplified the hiring process. Noise didn't necessarily crowd out sources of information that might validate credentials of a different sort. But bringing that information to managers required intervention of a personal sort, such that "non-degreed types" are more likely to filter in through "word of mouth. They know somebody who knows somebody, you're in a conversation with someone who mentions a job vacancy."

In our respondents' views, possession of a degree also signaled a variety of attributes thought essential for the job. In part, a preference for degree holders was a preference for those personal qualities likely to be associated with completing a difficult undergraduate program. Respondents also saw the degree as a correlate of an ability to acquire additional knowledge, not just the stock of know-how with which applicants entered the firm. To be sure, non-degreed workers were more likely to be found on the Management Information Systems (MIS) side than on the engineering, whether hardware or software, sides of many of the organizations we visited. On the other hand, our informants drew a line between MIS and engineering functions, whether related to hardware or software, in which cases the fundamental consideration had to do with the technical body of knowledge associated with the degree.[15]

3. Experienced Workers vs. College Recruits

Organizations' willingness and ability to train affects the degree of the mismatch between supply and demand. Not all firms engaged in college recruiting—whether at the B.S. or M.S./Ph.D. levels—though its prevalence was roughly correlated with firm size. The informants all reported that starting salaries for college graduates were rising—and markedly so for those completing programs at the most prestigious schools. Nonetheless, college recruitment still

15. For similar conclusions, *see* Harold Salzman, *The Information Technology Industries and Workforces: Work Organizations and Human Resource Issues* 23–25 (Center for Industrial Competitiveness, Univ. of Mass., Lowell, 2000), *available at* http://www.uml.edu/centers/CIC/pdf/salzman/nas-it-report.pdf (last visited July 22, 2004).

represented an opportunity to get skilled labor relatively cheaply, especially in a labor-short, high-cost area like Silicon Valley. As in all industries, however, not all firms are equally prepared to source labor this way, and all the more so in high technology, with its many start-ups and large number of smaller firms, many of which may not have the structures in place needed to recruit college graduates and train them.

4. Pressures for Reliance on External Labor Market

Regardless of the advantages of recruiting college graduates, doing so also entailed long-term costs: "several times their annual salary is what it costs you to train a new college grad until they are productive." Indeed, several respondents thought that high technology was putting increasing emphasis on experience, a trend they attributed to the continual generation of new technologies and their ever-shorter life spans.[16] Thus, even though college recruitment generated "excellent people," informants commonly thought that a "recent grad won't have all of the technical requirements. The hope is, that if they are very bright, they'll end up learning." More importantly, the knowledge conveyed by formal, university education provided only a rough match with the "real world" skills desired by employers. While firms needed technical skills that were most likely to be taught on-the-job, our respondents emphasized the importance of experience in teaching one how to function in the distinctive organizational world familiar to high tech: "a stressful, deadline driven environment [where] people are literally working 24 hours a day, with no standard work week," in managers' eyes a set of pressures quite different from those to which students were accustomed. The fact that so many firms run lean simultaneously thins the ranks of persons who could provide training, while also inflating entry-level requirements, leading companies to insist that "everyone has to be a star."

In general, it seemed as if differences in organization were correlated with hiring strategies with respect to the recruitment of both college graduates and foreign workers. On the one hand, the large company would rather hire and train new college graduates for lifetime employment in a variety of different types of jobs within the company, while the smaller company would prefer to hire people with experience in the particular skills that are needed for a given job that

16. *Id.* at 31.

has to be filled. On the other hand, the larger companies also hire foreign workers with an eye to sponsoring them for citizenship and lifetime employment, while the smaller companies more commonly hire them to fill short-term needs.

5. Costs and Difficulties of Retention

Thus training new graduates entails substantial costs; the return also involves considerable uncertainty. As one manager asked, "If you train that person in these new technologies, will they go some place else?" The answer appears to often be "yes," in part because the rules of the game as high technology plays it make it hard to build up a skilled, in-house labor force along the old IBM model: "There isn't any more loyalty on part of employee than there is on the company to retain them," noted an informant with one of the larger firms we visited.

The high turnover rate among programmers and computer professionals more generally was a matter of particular concern to the companies we interviewed; they had developed a variety of strategies to retain their skilled workers. For reasons detailed below, hiring H1Bs was too cumbersome a process to be undertaken simply in order to improve retention; on the other hand, it did tie workers to companies, as a non-resident needs to go through the extra work of changing H1 sponsors when changing employers. Some of the companies we visited did point out that green-card sponsorship (and the implicit threat of withdrawal of sponsorship) did help keep foreign workers tied to the firm for a number of years, until the green-card process is completed. Events since our interviews may have "solved" these retention problems; the intensity of the retention difficulties encountered during the boom period are relevant insofar as they identify the factors that led firms to source labor abroad.

6. Obstacles to Interindustry Mobility

If there was leakage from one firm to another within high technology, the prospects for mobility across industry lines appeared dim. We interviewed at a time when the worst of the aerospace downsizing was over, and thus respondents did not report a flood of applications from former aerospace engineers of whatever the type. Nonetheless, our respondents did not regard the ex-aerospace workers with much degree of favor, and only partly because of a perceived lack of the necessary technical skills. To a considerable extent, rather, the problem involved "attributes," to use the

terminology of our interviewees: they perceived the ex-aerospace workers as lacking the personal and interpersonal characteristics required for success in high technology. "They were parastatal," noted one sophisticated respondent, who also admitted that the perception was shaped by the stereotype that "they don't act quickly, they're not accustomed to a real fast-paced environment, used to unlimited resources . . . used to more bureaucratic environment." While aerospace may carry a particular stigma of its own, our respondents did not think that careers in the rest of corporate America prepared engineers for the type of environment that they would encounter in high technology. "Someone coming from IBM or TRW wouldn't be viewed as positively" as an applicant from elsewhere in high tech, noted an Human Resources (HR) person with a start-up company. Moreover, contrasting industry norms regarding mobility heightened any prejudice against established professionals without high-technology experience. In Silicon Valley, for example, "it is hard to find a software professional who has been with the same company for more than 5 or 6 years. In fact, such a person would be viewed with suspicion." For that reason, applicants looking to switch jobs in mid-career raised red flags.

Thus, intensity of demand, combined with the high level of product- and technology-driven segmentation, seems to have produced a pervasive tightening of the labor supply to the extent that every organization we visited was involved in the recruitment of non-immigrant workers of one sort or another—with the one exception of a defense contractor prohibited from doing so and (therefore?) experiencing monumental delays in filling vacancies. Growth on the demand side stimulated the absorption of non-immigrants through the alternative channels of university recruitment, which connected firms with foreign students residing in the United States; "normal recruitment," by which resident H1 workers sought to change jobs; and foreign-recruitment, in which the linkage was made to foreigners living abroad.

B. Facilitating Factors

1. Internet Recruiting

At the time of our interviews, companies relied on a wide variety of recruitment techniques. The clearest trend involved a shift away from those sources that principally provided access to the local labor supply; most importantly, want ads placed in the local press was of diminishing importance. Specialized recruiters provided the principal

alternative, offering the advantage of seeking out those people who were not necessarily looking for jobs. However, many firms were also shifting or had shifted recruitment efforts to the Internet, posting vacancies on the company's own Web pages and also encouraging applicants to e-mail resumes.[17] They were also using a wide variety of job posting boards, including all-purpose as well as computer- or engineering-focused boards that allow users to hunt for jobs by geography as well as broad occupational category (for example, systems analyst or client/server), as well as specific programming or engineering skill (for example, expertise in a generic language, such as C++, or a specific type of software, such as Oracle financials). Using the Internet as a recruitment device effectively internationalized the labor market, creating the potential for connecting with a worker regardless of location, if and when the worker possessed the appropriate skills and the benefits of recruiting internationally outweighed the substantial costs. Often, neither condition applied. But when they did, the Internet bridged American firms with the global labor supply in a way that was never true before.

2. Globalization

Globalization facilitates the influx of foreign workers in two related ways, one having to do with the globalization of skills, the second having to do with the globalization of U.S. high technology firms. To some extent, the globalization of skills results from the diffusion of American-style higher education and instruction, as for example in Taiwan or Korea, as well as from more indigenous forces that promote the growth of sophisticated higher technical education, as in India. Whatever the context in which technical, higher education is acquired, technology diffuses in such a way that professionals using the same skills regardless of location. Referring to a skill in hot demand, one informant pointed out that "Oracle is a universal," learned equally well in either a foreign or American context and transferred easily from one to another. Moreover, the context may well be multinational, which extends both the spread of the technique and its diffusion across the globe. Consequently, foreign personnel could be imported with limited worry about adaptability. "Sometimes a person arrives from Madras without ever having set foot outside of India, and the second day you can put him at a client's site."

17. The pattern reported by our informants fits a broader trend: almost five million resumes were posted electronically in 1999. NAT'L RESEARCH COUNCIL, *supra* note 8.

At the same time, the market is such that companies rapidly move to a stage of international marketing, and possibly production, which in turn puts them in touch with a labor force on an international scale. L visas allow for inter-company transfers, but global operations often take place through the involvement of intermediaries, in which case the L visa is not appropriate. As would be true in a domestic operation, interaction with employees working for a distributor or an end user often serves as a way of identifying appropriate workers who, by virtue of their familiarity with the technology, can be transferred to the United States with no, or little, loss in productivity. Likewise, managers with foreign experience also return home with the contacts and know-how needed to recruit appropriate sources of foreign labor.

Bringing the right talent to the United States is one way to respond to geographic imbalance in the supply and demand of skills; sending the work to the existing labor force represents an alternative. Clearly, globalization has the potential for reducing labor needs in the United States. While the concept of sending the work abroad (rather than bringing workers to California) seems to make sense in theory, several of our interviewees pointed out the current limits of such a strategy. One company owner who had not sent his work abroad articulated his concerns: "Taking delivery of software is very tricky. You need a virtual office to make it work. Infrastructural cost are very high to go abroad. You need a lot of quality control." Another human resource manager mentioned the significance of the cross-functionality of departments within the company: "It's easier to facilitate communication between teams [if the workers are all on-site]. It's related to the evolution of the company structures, which are becoming flatter and more cross-functional. People are no longer 'siloed' into particular roles. Bringing the people here facilitates communication between departments." One human resource manager, in addition to noting the importance of linking workers to the company production process and the importance of maintaining control over what the workers are doing, also noted that many high-tech companies are moving operations to remote locations within the United States to accommodate the desires of the workers they are trying to recruit and retain. He therefore put an emphasis on "territorial management" (or the desires of U.S.–based managers to avoid making their own jobs obsolete) and the fact that "headhunters get paid for bringing people here, not for taking the work elsewhere" as explanations for the currently low levels of foreign outsourcing of software development. Finally, the nature of some jobs is such that they can only be done on site; thus, the company above, which formed

a working group in Europe, 6,000 miles away from its southern California headquarters, saw no choice but to import an Indian systems analyst with Oracle experience for its MIS department, in which on-site integration with "core engineers" was a daily necessity.

C. Costs: The H1 Process

In general, the firms we visited drew on labor from distances well beyond the ambit of the local labor market, though smaller firms were more likely than others to recruit locally. National recruitment is not just costly, but, as one informant pointed out, entails higher risks: "retention is the main issue. Whether the person comes from the East Coast or another part of the world, a lot can go wrong that will make the person decide they made the wrong choice to come here."

Nonetheless, most, if not all, of our informants described the downside of recruiting workers with non-immigrant visas in considerable detail. The disadvantages took any number of forms, most importantly time and money. The administrative inconvenience was not an insignificant deterrent either. Even companies with extensive experience in foreign recruitment saw limited inherent advantages in the process. As we interpret the interviews, our respondents came to consensus around the view that "all things being equal, we'd go with the candidate who doesn't need sponsorship."

As we have suggested before, all things often were not equal. Nonetheless, the costs and complications entailed in hiring H1 workers—whether from the pool of resident foreign students, resident H1 workers, or potential H1 workers living abroad—were such as to drive many employers away from the process altogether. In general, F's were preferred to H's: "Foreign students, people who don't require visas are even more sought after, communication skills are even better." Even so, the interviews provided some evidence that F's were at the end of the queue, as several respondents told us that high-quality F graduate student applicants were still likely to be available toward the tail end of the college recruiting season, long after their domestic counterparts had been snapped up.

1. Uncertainties

In addition to the simple monetary outlay for lawyers and related fees, the H1 process involves several uncertainties, each one of which provides reason for caution. The first uncertainty stems from the upfront factor: one can make a considerable investment of time and money and then have the application turned down, though most

respondents seemed to think that the probability of approval ranked very high. More important is the fact that the H1 visa involves a time limit, thereby adding to the uncertainty, as an H1 worker may be forced to leave the country within a two- to four-year period after initial employment. Given the then-current labor shortage, however, most of the HR managers with whom we spoke had resigned themselves to thinking about tomorrow, not the long term. On the one hand, "there's no guarantee in the [Silicon] Valley, where unemployment rate is 3 percent that anyone would stay any length of time." And on the other hand, "We can't worry about what will happen in three years. We need H1s now."

2. Costs

Thus, if the uncertainties were acceptable, the financial costs still loomed large. Costs are by no means trivial. "The downside is absolutely the cost. $2500-3000 for visa. Relocation cost of probably 3000-5000. If he's married, probably double that. We have paid it." Nonetheless, for most firms the additional costs involved in obtaining workers with H1B visas had become a normal operating cost. The policy in a manufacturer of network components took the following form:

> The COO has told me and the recruiting firm: I don't care about status, if he's good I want him, it's our policy to pay for the attorney. There's some additional cost, but if right skills set, forget it, that's the cost of doing business, if we want to stay on the cutting edge, we'll pay for more. [The] H1 visa is irrelevant. Not an issue for [a] high skilled person.

3. Time

Time is also an additional cost constraint, as well as a factor that might lead companies to prefer Americans or greencarders who are mobile at will. "Generally, when we have a position, we want to fill it ASAP." With H1s—whether working abroad or already in the United States, by contrast—each job change requires another application to INS. "It's not the cost with the H1, it's the delay. The cost is minimal, compared to the other thing, that's not the issue."

In general, it seems fair to say that the need for H1 workers was far from absolute, and was assessed relative to other exigencies—most notably time. When a company operated with a "very narrow timeline, then the visa issue was a problem, because [people were] needed . . . to start right away." Even under less dire circumstances,

knowing that an H1 worker could only be obtained with a delay was reason to prefer someone not similarly constrained, if only because a more protracted recruitment was less likely to be completed successfully. In other cases, firms hired citizens or green-card workers for the vacancy to be filled immediately; in the case of applicants needing an H visa, the philosophy was to "find the right person" and then "create the job" once the visa came through. That approach worked best when the professionals requiring a temporary visa were recruited directly from college or graduate school:

> Plus too, if we're looking for college graduates, we have tried to look at college recruiting as planning for the future, rather than an immediate stopgap measure. They're not going to be up and running anyway; they won't be effective for four months, so waiting for 2 months [to get the visa] doesn't matter. . . .

On the other hand, the additional time involved in recruiting H1Bs was tolerable because it didn't affect most recruitments. "If it ended up as though most of our people were coming from countries requiring visa support, we couldn't stand the delay either."

Thus, the interviews suggest that time factors do significantly add to recruitment and personnel costs. Nonetheless, the wait is justified on the same grounds as the additional monetary costs involved in processing the H1 application: these are necessary costs of business, especially when there are no alternatives. "It's really difficult to get [a] high level person right now, so when you find someone good you wait. For the right person it's worth waiting." In one of our interviews, we had a lengthy discussion of the trade-off between having two people who are equally qualified, only one of whom was immediately eligible to work. The answer: " 'the quality is never the same.' For [the] person of higher quality it's always worth the longer wait and slight risk that [the] H1 [will be] turned down."

4. Types of H Workers

Of course, the expected and unpredictable costs of recruiting non-immigrant labor extend beyond the factors associated with the H1 process as such. In considering such cost calculations, one needs to distinguish between direct recruitment from abroad and recruitment of foreign graduates of U.S. universities, though there are certain commonalities linking the two. Though the latter group has closer, more direct ties to the U.S. labor market, access is still impeded; leaping over the barriers involves investment as well as a learning curve:

> Previously the company was saying that it wouldn't hire F1 students. But F1 students were going to the recruiter and saying that they were available. We didn't do it because [we] didn't know how to do the process. The learning process wasn't difficult once we found a good attorney.

Even firms with long-term experience in recruiting foreign graduates of U.S. universities are unwilling to make the next step, even as they are carefully assessing the situation. "There's too much uncertainty in getting people from overseas," noted an informant desperately looking for a product engineer. "The most important criteria is references coming from the right people. To get that from a foreign country is hard." Information costs comprise part of the barrier to overseas recruitment: companies are understandably much more secure about their assessment of the meaning of a degree from a particular U.S. institution than they are when confronted with foreign credentials. Long-distance recruiting makes it more difficult to determine the appropriate match. Though one can "get a fair idea of communications skills over the phone," other competencies were more difficult to assess, as an Indian manager with extensive Persian Gulf experience pointed out:

> You don't see how the person carries himself or manners. You don't see how they will function in the consulting field. You know they have the technical ability. But where they will fit in your team you don't know.

As noted earlier, however, globalization reduced information costs, especially for firms where the size of the international market and labor force made for a high level of interaction with professionals abroad:

> While we don't actively recruit from outside the United States, because it was difficult for us to find people with . . . knowledge, we have on occasion found people in Europe and in India and in Dublin where it was strictly by word of mouth. We heard that the person was good, knew they wanted to come, and so we brought them. For us, the channels of communication were that we're an international company with people on the road, and those people on the road had occasion to run into people who wanted to come over here.

D. Costs: Integration Issues

Foreign workers often possess the technical skills needed by high-technology firms; however, they often lack desired communications skills. Notwithstanding her disclaimer—"coming from the Anglo perspective"—an HR officer in Los Angeles was of the view that:

> any college, at least in southern California that I know of, all foreign students could stand to improve communication skills. A lot of really bright people out there, who know how to read and write English, but their verbal communication skills are poor, but it's just too important. Have you finished this? Yes, I did. Did he mean that he did . . . . tenses are important It's really, really important.

Moreover, communication skills were rated important by almost all of the respondents with whom we talked. The importance of communications skills has risen for a variety of reasons. Work organization in high technology is likely to take a more flexible form, with more impromptu meetings and a less-rigid, less-predictable schedule, necessitated by the need to produce on short production cycles. Many companies were also shifting to teams, which in turn increased the premium on communication. A hiring manager noted that communication skills are needed by employees "if they will be in front of a customer or client" and that the range of employees likely to have to go in front of customers and clients is increasing. Yet another human resource manager argued that technical people need communication skills now "because of the broad exposure to customers and industry partners, because it's now more common for junior people to be pulled into meetings they would not have been invited to in the past, because people are more likely to have to give presentations, and because there is now more writing of proposals and reports." Technical professionals were also likely to experience increased interaction across groups within firms, and between firms and their customers or suppliers ("internal and external customers"), a change which worked in the same direction. Workers without adequate fluency were likely to experience problems in environments such as these: "Communication in broken English to someone who doesn't quite understand what he's heard," worried one respondent, himself foreign-born. And organizations were also concerned about long-term career prospects: workers with inferior communication skills might make do at the technical, professional level, but might never develop the potential for promotion to management.

While the day of the "engi-nerd" is probably over, one shouldn't exaggerate the extent and significance of the shift. Even as companies looked for good communication skills, their main focus was always on technical skills. Sensitive to the over-riding importance of technical skills—"we do not hire engineers for their verbal skills"—managers were also aware of the personality factors associated with selection into computer-related professions. "What you tend to see with engineers is that they don't have the greatest communications skills.

And if they do, they end up becoming a technical sales individual because they have communication skills which are so rare, and they can communicate to a customer or a buyer in technical terms with charisma and some personality what the company has to offer." If "communication skills were a must," personnel officials were well aware that they took different forms. Though "it could be a barrier if a person cannot speak English" with sufficient clarity and fluency, "even more important could be the ability to write English because we do a lot of communication with email." Thus, techniques for finessing communication problems are available and often employed. Nonetheless, the fit between foreign workers and the way of doing business in high technology is less than perfect, indicating costs entailed in the deployment of temporary foreign workers above and beyond those associated with the H1 process, as detailed above.

While the human resource managers we interviewed generally perceived foreign-born workers' technical skills to be equal or superior to those of native-born workers, some did mention problems with adapting to the often more aggressive and increasingly team-based work environment in the United States. A company owner mentioned that some foreign-born workers "don't speak much. It's hard to find out what they don't know. Americans always have a lot of comments, so what they don't know comes out." Many of the managers mentioned that the ability to communicate in teams is becoming among the most important skills for technical workers. One manager mentioned that, for foreign workers, "the problem is not so much knowing English, but the articulation of it," and many mentioned the increasing importance of presentation skills. In some cases, we even heard of explicit company strategies of segregation into teams and even occupations by country of origin.

IV. CONCLUSION: COSTS AND BENEFITS OF AN H1B WORKFORCE

The United States maintains an extraordinarily open labor market, a factor often adduced in explanations for its recent, extraordinary record of growth. From that perspective, the H1B worker represents a distinct oddity, as the obstacles for both entering the labor market and moving within it greatly exceed the norm. By implication, therefore, utilization of H1B workers implies costs not associated with the deployment of the domestic (whether citizen or green-card) labor force. Adding the fact that the labor in question is also "foreign"—that is to say, lacking certain skills that are naturally part of the domestic worker's toolkit—the bill gets higher. As our

interviews suggest, the H1B workforce is unlikely to possess the same proficiency in English and in related communication skills enjoyed by the domestic labor force, although the degree of deficiency will vary depending on place of origin (thus, Indians have an advantage over Chinese), as well as prior U.S. experience. In a context in which firms are increasingly emphasizing team work, and in which many positions entail interaction with customers, inadequacies in communications skills and cultural differences in modes of interaction are likely to be of some import. Of course, costs cannot be assessed in the absence of benefits; but as the entire policy discussion has focused around the latter, we need to consider costs in order to understand why firms might seek to access H1B labor, as indeed they do.

We note that the costs need not be borne by employers, but can rather be shifted to workers, as would be the case if workers paid part or all of the costs entailed in the legal work involved in making the H1B application, or a later application for a green card. Still, shifting all legal costs to H1B workers would not eliminate associated bureaucratic costs, which do not seem trivial. Costs could also be reduced if H1B labor were provided at a discounted rate, or if the constraints on H1B mobility were such as to give it the characteristics of a captive labor force. However, many H1B visas are granted to exiting visa holders who sought to change jobs, suggesting that the situation lies some distance from indentured servitude, though the degree of freedom may not be quite the same as that possessed by the comparable domestic worker. Still, it is worth recalling that H1B workers comprise a highly educated group, many possessing a U.S. education, often working in areas with high densities of other immigrant professionals (of varying statuses), which suggests that they are likely to possess accurate information about prevailing conditions. In other words, the potential for exploitation is likely to be a good deal lower than in garments, restaurants, construction, or other sectors that have made a habit of hiring immigrant labor.

The costs and benefits of deploying H1B workers will also vary, depending on trajectory and type, as well as organizational characteristics. Companies that make an annual pilgrimage to MIT to recruit their best M.S. students will encounter some additional cost if they want to recruit an MIT 4.0 graduate from China whose F visa needs to be converted to H. However, the price entailed in the legal services required to arrange for that conversion is a good deal lower than the fees charged by a headhunter and/or the additional costs entailed in relocating an experienced, native-born worker along with his or her family. On the other hand, organizations engaged in college

recruiting need to have the staff and organizational capacity needed to do so in the first place. If so, they know exactly what it is that they are getting; and they are also aware that the competition is doing the same. Moreover, the highest costs are associated with the first set of adjustments; firms quickly connect with the appropriate attorneys and routinize the process as they learn how to do it.

By contrast, the same company hiring the foreign graduates of U.S. institutions may be much more reluctant to recruit directly from abroad. College visits abroad are obviously not a routine part of business; more importantly, the credentials, whether involving education or experience, are much more difficult to assess. One doesn't meet the candidate in the flesh; and most companies are savvy enough to realize that the potential for fraud in long-distance recruitment of this sort is not insubstantial.

A small, relatively new company in Silicon Valley may neither engage in foreign or college recruitment, but is not reluctant to hire the H1B worker employed across the street and eager to change jobs. The costs of verifying the applicant's work experience are essentially zero; any risks are further reduced if the applicant also holds a U.S. degree.

A larger company engages in college recruitment, recruits resident H1B workers, and occasionally hires H1B workers who apply from abroad. However, the company regularly hires consultants to work in its MIS department, a sub-unit, related to management, not product-development functions, and located in headquarters. Among the consultants is an H1B worker; after a year of work on the premises, both parties realize that a change in employment status would be mutually beneficial. Note that the company applies for a new visa, but without ever having engaged in a search for a new worker.

The main point we want to emphasize is that there are, indeed, substantial costs for employers in addition to the benefits associated with the hiring of workers on H1B visas. The consideration of the costs we have explored in this paper implies a more complex calculus for employers than is suggested in much of the existing policy debate.

Let us make one additional point: the private-seeking actions of individual firms have broad social consequences. A much larger set of employers has an interest in maintaining access to H1B workers—however arrived in the United States—than has the capacity to either participate in direct foreign recruitment of H1B workers or do so through some intermediary. Moreover, the growing H1B presence means that the costs of recruiting, using, and deploying such labor

decline as a larger number of employers gain experience in doing so. Thus, the successful turn to this new source of foreign-born labor is sure to increase the appetite for more.