On the Need for Reform of the H-1B Non-Immigrant Work Visa in Computer-Related Occupations

Norman Matloff
University of California, Davis

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The H-1B program authorizes non-immigrant visas under which skilled foreign workers may be employed in the U.S., typically in computer-related positions. Congress greatly expanded the program in 1998 and then again in 2000, in response to heavy pressure from industry, which claimed a desperate software labor shortage. After presenting an overview of the H-1B program in Parts II and III, the Article will show in Part IV that these shortage claims are not supported by the data. Part V will then show that the industry's motivation for hiring H-1Bs is primarily a desire for cheap, compliant labor. The Article then discusses the adverse impacts of the H-1B program on various segments of the American computer-related labor force in Part VI, and presents proposals for reforms in Part VII.

I. INTRODUCTION

A topic of much controversy in legislation on immigration-related issues in recent years has been the H-1B visa program.[1] This visa category, which was established in the Immigration Act of 1990 ("IMMACT90") to replace the old H-1 category, allows foreign nationals to work in the U.S. for a sponsoring employer for up to six years.[2] The law allows *dual intent*: Though the H-1B is a non-immigrant visa, the worker may pursue avenues to attain U.S. legal permanent resident ("LPR", i.e. "green card") status while holding the H-1B visa. Typically this takes the form of employer sponsorship.

The H-1B program quickly became a favorite of employers of information technology ("IT") workers, particularly computer programmers. This category of workers soon became the largest in the program.[3]

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* Professor of Computer Science, University of California, Davis; B.S. 1970, California State Polytechnic University; Ph.D. (pure mathematics) 1975, University of California, Los Angeles.

1. In 2003, a similar controversy arose concerning another work visa program, L-1. *See* Katie Hafner & Daniel Preysman, *Special Visa's Use for Tech Workers is Challenged*, N.Y. TIMES, May 30, 2003, at C1. This issue arose too late to be included in this Article, but the problems are very similar to those described for H-1B.

2. Immigration Act of 1990, Pub. L. No. 101-649, 104 Stat. 4978 (1990).

3. U.S. IMMIGRATION & NATURALIZATION SERVICE, CHARACTERISTICS OF SPECIALTY OCCUPATION WORKERS (H-1B): FISCAL YEAR 2001, at 11 (2002).

Beginning in 1997, the IT industry began to heavily lobby Congress to increase the yearly cap on the H-1B category, then at 65,000 visas per year.[4] The industry lobbyists claimed that the H-1B workers were needed to cope with a severe high-tech labor shortage.[5] Congress approved a temporary increase in the cap, to 115,000, and later in 2000, again under intense pressure from the industry, enacted another temporary increase, to 195,000.[6] The increases are due to sunset in October 2003.[7]

Those who opposed the cap increases contended that the industry's claim of a desperate labor shortage was invalid and was devised to hide the industry's real goal—to use the H-1B program as a source of cheap labor.[8] This Article will demonstrate that the H-1Bs are indeed used as cheap labor. However, this statement may engender emotionally and politically laden connotations, such as images of conspiracy or deliberate manipulation. Thus, it is important to state here at the outset what this means.

There are actually two major types of savings in labor costs which accrue to employers of H-1Bs. What I will call *Type I* savings is the one most people mean when they discuss the issue of whether H-1Bs are used for cheap labor. It takes the form of paying an H-1B less than the norm for comparable American workers, i.e. Americans of similar educational background, experience, skill sets and so on.[9]

Type II savings stems from the perception of older workers as costing more for companies to hire than younger ones.[10] In many cases, when employers exhaust the supply of young American workers, they turn to hiring younger H-1Bs in lieu of older Americans. In this manner, the H-1B program is providing employers with cheap labor.

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4.   *See*, Miranda Ewell, *Industry to Press for More Skilled Workers*, SAN JOSE MERCURY NEWS, Nov. 21, 1997, at 1C.

5.   INFORMATION TECHNOLOGY ASSOCIATION OF AMERICA (ITAA), HELP WANTED: THE IT WORKFORCE GAP AT THE DAWN OF A NEW CENTURY (1997).

6.   Carolyn Lochhead, *Bill to Boost Tech Visas Sails Through Congress: Clinton Expected to Sign Popular Measure*, S.F. CHRON., Oct. 4, 2000, at A1.

7.   Patrick Thibodeau, *A Connecticut Activist Group is Behind Several H-1B and L-1 Visa Bills in Congress*, COMPUTERWORLD, Aug. 11, 2003, *available at* http://computerworld.com/government topics/government/legislation/story/0,10801,83888,00.html.

8.   Robert Pear, *New Quota Weighted for Immigrant Technology Workers*, N.Y. TIMES, Feb. 23, 1998, at A13.

9.   Throughout this Article, the term *American* refers to workers who are either U.S. citizens (including via naturalization) or LPRs.

10.   Actually, many older programmers would be willing to take a pay cut when they cannot find programming work, but employers assume otherwise. *See* Margret Steen, *Many Older IT Workers Are Fishing for Jobs Despite Labor Shortage*, INFORWORLD, July 23, 1998, *available at* http://www.cnn.com/TECH.computing/9807/23/age.idg/.

The Type I form of cheap labor is indeed very common, but Type II is equally common, if not more so. Moreover, the magnitude of cost savings in the Type II case is often greater than for Type I.[11] Thus, both forms will be examined in this Article.[12]

The Article will show the need for reform of the program, and propose remedies. Since historically many IT employers have sponsored their H-1B workers for green cards,[13] issues of reform of this program will be discussed as well.

In Part II, the Article will present the history of the H-1B program, including legislation, changing attitudes of the executive branch of the federal government, and major changes in usage patterns. The emergence of IT fields as the principal users of the program will be chronicled, and the focus of this Article on these fields will be defined and explained. In keeping with this Article's theme of reform, this Part will also discuss the actions of the various political players in terms of reform over the history of the program.

In order to show that the primary reason that employers hire H-1Bs is for cheap labor (whether Type I or Type II), Part IV will examine the industry's stated reasons for hiring H-1Bs. It will show that none of the independent studies in academia and government have confirmed an IT labor shortage. It will also show that the industry's various other stated reasons for hiring H-1Bs, such as a desire to hire the world's "best and brightest" or to hire workers with a PhD, are also not supported by the data.

Instead, Part V will show that finding a source of cheap, compliant labor serves as the industry's main motivation for hiring H-1Bs. Again, academic and government studies will be presented as well as statements by the industry itself. This Part will also explain how the H-1B workers are *de facto* indentured servants; this, together with gaping loopholes in H-1B regulations, enables employers to attain Type I labor cost savings.

In addition to the issue of cheap labor, some employers euphemistically refer to the "remarkable loyalty" of the H-1B workers. Since an H-1B is typically in no position to seek other employment, the employer need not worry that the worker will suddenly leave the employer in the middle of a pressing project. In addition, the employer can force the H-1B to work long hours. To many employers, this "loyalty" aspect is the prime motivation for hiring H-1Bs, whether or not they are saving salary costs in doing so.[14]

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11.   *See* extensive data analyses *infra* Parts V and VII.A.

12.   Note that Type II savings can be obtained by employers who do not engage in Type I.

13.   Alexander Nguyen, *High Tech Migrant Labor*, 11 AMERICAN PROSPECT, Dec. 20, 1999.

14.   Laura A. Bischoff, *Worldwide Workforce*, DAYTON DAILY NEWS, July 11, 1999.

This Article will show that these considerations have significantly impacted American workers adversely. The desire for cheap, compliant labor is so strong that often an employer will not even consider hiring Americans. Indeed, a number of major firms have laid off American workers and replaced them with H-1Bs, often forcing the laid-off Americans to train their H-1B replacements. These issues will be detailed in Part VI. Adverse impacts on various IT worker subgroups will be discussed, including: new graduates; older workers; and workers with PhD degrees.

Part VII then will show how the current statutes and regulations are easily circumvented, and will make new proposals that would be workable and fair to both workers and employers.

II. History and Usage Trends

A. Early History of the H-1B Program

A major component of IMMACT90 concerned the immigration of foreign engineers and scientists. The National Science Foundation (NSF), predicting a coming shortage of technical professionals, had urged passage of IMMACT90, which increased the yearly cap on employer-based green cards from 40,000 to 140,000.[15] This cap increase was paired with the establishment of the H-1B program.

Prior to the enactment of IMMACT90, employers made use of the H-1 visa category, Aliens of Distinguished Merit and Ability.[16] Although originally intended as a vehicle for bringing in the world's "best and brightest," in practice the criterion used gradually devolved to simply require that the worker be in a profession that required a Bachelor's degree or higher.

IMMACT90 established a new visa category, H-1B. It was designed to: make conditions for granting the visa more precise; add some protections for the domestic workforce; and allow dual-intent status so that employers could simultaneously sponsor the worker for a green card.[17]

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15. The prediction turned out to be gravely in error, as will be seen later. *See infra* note 301.

16. *See, e.g.,* Constantine Potamianos, *The Temporary Admission of Skilled Workers to the United States under the H-1B Program: Economic boom or Domestic Work Force Scourge?,* 11 Geo. Immigr. L. J. 789, 796 (1997).

17. *Id.* at 798.

IMMACT90's provisions for protecting the domestic workforce were motivated by reports that the H-1 program had been heavily abused by employers.[18] The restrictions consisted of an annual cap of 65,000 visas and a requirement that an employer wishing to sponsor a foreign worker must file a Labor Condition Application (LCA), stating that the employer would pay the worker the prevailing wage.

Initially the Department of Labor ("DOL"), then under the Bush administration, formulated regulations to implement the bill that employers found to be burdensome. Congress thus amended IMMACT90 through the Miscellaneous and Technical Immigration and Naturalization Amendments of 1991. The net effect was to reduce U.S. worker protections.[19]

In any case, whatever illusions Congress may have had that IMMACT90 would prevent widespread abuse of H-1/H-1B were soon dispelled by the DOL, which took an activist position during Secretary of Labor Robert Reich's 1993–1997 term of office. Among those cited by DOL were big firms, including the Digital Equipment Corporation, then king of the minicomputer business.[20]

SoftPac, an organization of computer programmers which was formed to lobby against the H-1B program, ran a "sting" operation to show how easy it was to secure approval from the DOL for an obviously-invalid LCA. The DOL approved SoftPac's application for a visa for a programmer who would be paid only $5.00 per hour.[21]

Such charges triggered a spate of interest in the H-1B program in the popular press. For example, a widely-viewed television news report charged abuse by Hewlett-Packard, an industry icon, and the "body shops" to which it subcontracted work.[22]

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18.   H.R. Rep. No. 101-723, at 67 (1990).

19.   H. Rosemary Jeronomides, *The H-1B Visa Category: A Tug of War*, 7 GEO. IMMIGR. L.J. 367, 371 (1993).

20.   *See, e.g., Labor Dept. Cracking Down on Alleged H-1B LCA Violators*, 70 INTERP. REL. 1325, 1326, Oct. 8, 1993. Unfortunately, it is not clear exactly what the DOL found in its investigation. For example, in the case of Digital Equipment Corporation, the DOL ordered the firm to pay 42 H-1B programmers back wages of merely $85,035, less than $2,000 per worker. Was this because the typical worker had been at the firm only a few months? Was it because even DOL failed to assess the true prevailing-wage levels properly? Or had the DOL overreached in this case? The citation of the DEC case here is merely to illustrate the fact that concerns of abuse were being raised, rather than to offer this case as solid evidence of abuse.

21.   L.M. Sixel, *Employers Go Abroad/Programmers Claim They're Displaced by Foreign Workers*, HOUSTON CHRON., July 2, 1995, at 1. The actual LCA may be seen in Rob Sanchez, *H-1B Programmers, at $5 an Hour, available at* http://www.zazona.com/ShameH1B/Library/Archives/Softpac/5DollarProgrammers.htm.

22.   *60 Minutes* (CBS television broadcast, Oct. 3, 1993).

An audit performed by the DOL Inspector General in 1996 again reported that abuse was commonplace. For example, it found that 19 percent of the H-1Bs were not being paid even the wage their employers had promised on the LCAs, a remarkable figure in view of the fact that the LCA wages tended to be low anyway.[23]

In 1994 Reich, having failed to interest Congress in his proposals to tighten up the H-1B program, included that program in the international trade treaty, the General Agreement on Trade in Services ("GATS").[24] The treaty includes conditions on foreign labor:

> Specialty occupation aliens and their employers must be in compliance with all labour condition application requirements that are attested to by the established employer. These requirements are: . . . d) the employer has not laid off or otherwise displaced workers in the subject occupation in the previous six months and will not lay off or displace any US worker during the 90-day period following the filing of an application or the 90-day periods preceding and following the filing of any visa petition supported by the application; e) the employer has taken and is taking timely and significant steps to recruit and retain sufficient US workers in the specialty occupation; . . .[25]

Other than a minor exception added during the ACWIA 98 legislation (the H-1B dependency rule discussed in Part II.B of this Article), the H-1B program has never been in compliance with these requirements.[26]

In 1995–1996 SoftPac, along with some participation by the electrical engineering group IEEE-USA and the American Engineering Association, convinced the chairs of the Subcommittees on Immigration in both the House and Senate to draft legislation that would significantly curtail the size and scope of the H-1B program, and reform related employment-based immigration policies. However,

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23.   U.S. OFFICE OF INSPECTOR GENERAL (OIG), THE DEPARTMENT OF LABOR'S FOREIGN LABOR CERTIFICATION PROGRAMS: THE SYSTEM IS BROKEN AND NEEDS TO BE FIXED, Rep. No. 06-96-002-03-321 (May 22, 1996).

24.   AUGUSTIN FRAGOMEN, H-1B HANDBOOK, at 1–17 (1995 ed., West Group). Fragomen refers to the treaty as GATT, but GATS is actually a separate treaty developed in parallel with GATT.

25.   General Agreement on Trade in Services, Apr. 15, 1994, WTO Agreement, Annex 1B, Schedule of Specific Commitments, at I.(4)(c).

26.   Fragomen, *supra* note 24. Interestingly, Fragomen describes GATS as merely "permitting" the U.S. to impose such requirements, but this appears to be contrary to the actual GATS document.

eventually the proposed legislation was withdrawn under extremely heavy pressure from the industry.[27] The industry lobbyists made it clear that they would not accept any reform of the program whatsoever, as Senate Immigration Subcommittee Chair Alan Simpson described: "I was working with the business community . . . to address their concerns, [but] each time we resolved one, they became more creative, more novel."[28]

B. Legislation to Expand/Reform the Program

The legislative reform history of the H-1B program subsequent to its establishment in IMMACT90 reveals that attempts have been made to reform the program throughout its history, but have produced rather little, due to a very aggressive/defensive posture on the part of the industry.

In 1993, as a result of the negative *60 Minutes* exposure, Hewlett-Packard had announced that it would take action to prevent abuse of the H-1B program. A postscript to the broadcast stated, "After our encounter with Hewlett-Packard's CEO, Lewis Platt, the company decided to change its policies, to use fewer foreign programmers, and when it does, to make the body shops prove they're really paying the prevailing wage."[29] It would turn out, however, that this would be the first and last positive reaction by a firm in response to charges that it was using H-1Bs as cheap labor.

On the contrary, the industry took the offensive. Apparently treating the attempted rollback of H-1B in 1995–1996 as a wakeup call, the Information Technology Association of America (ITAA), an industry trade group, hired Harris Miller as its president.[30] Miller, with his background first as a congressional staffer on *immigration* issues and later as an immigration lobbyist, had all the right contacts.

 1. ACWIA 98—In early 1997, the ITAA began a campaign to actually *expand* the H-1B program.[31] The key element in their strategy

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    27.   73 INTERP. REL. 289–90, Mar. 11, 1996.
    28.   Rory J. O'Connor, *High-Tech Hiring Victory*, SAN JOSE MERCURY NEWS, Mar. 8, 1996, at 1C.
    29.   *60 Minutes, supra* note 22.
    30.   William Glanz, *High-tech Lobbyist Counts Washington Successes*, WASH. TIMES, Oct. 16, 2000, at D5.
    31.   Though the campaign was initiated by the ITAA, other industry groups followed suit, notably TechNet and the American Electronics Association, which were largely based in

to get Congress to enact an increase in the annual H-1B visa cap would be a massive public relations campaign to implant in the American consciousness the notion that the nation was facing a severe IT labor shortage. The ITAA released a report claiming such a labor shortage in early March.[32] At the same time, they began their offensive in Washington. The DOC then released its own "shortage report," virtually a carbon copy of the ITAA report.[33] The ITAA got the DOC to cosponsor a two-day National IT Workforce Convocation in Berkeley during January 12–13, 1998, with Secretary of Commerce, Bill Daley, as keynote speaker. Press coverage included a 3,000-word front page article in the *New York Times.*[34]

From that point onward, a steady stream of items in the print and electronic media implanted in the minds of the American populace the image of a desperate high-tech labor shortage.[35] Yet the careful observer did have access to information that cast serious doubt on the industry's "labor shortage" claims. The General Accounting Office (GAO), Congress' research arm, released a study finding "serious analytical and methodological weaknesses" in the DOC and the ITAA reports, and finding that neither study supported their claims of a labor shortage.[36] An economist with the Urban Institute, a prominent nonpartisan Washington think tank, testified to the Senate, also concluding that the data was not consistent with the industry's claim of a shortage.[37] The national

the Silicon Valley. ITAA member firms tended to be in the East Coast states, the South and the Midwest.

32. ITAA, *supra* note 5. The principal researcher of the report, Stuart Anderson, was with the libertarian Cato Institute. *See* Robert Bellinger, *Engineers' Organization Rebuts Shortage Claims,* ELECTRICAL ENGINEERING TIMES, Sept. 29, 1997. Anderson has been one of the more prolific writers in support of the H-1B program, authoring a report for Jack Kemp's Empower America, several articles for INTERNATIONAL EDUCATOR and so on. Anderson went on to become a Senate staffer, authoring the 1998 and 2000 legislation that expanded the H-1B program. *See* Stuart Anderson, *The Global Battle for Talent and People,* Immigration Policy Focus, American Immigration Law Foundation, Sept. 2003, *available at* http://www.ailf.org/ipc/ipf0903.asp.

33. U.S. DEP'T OF COMMERCE, AMERICA'S NEW DEFICIT: THE SHORTAGE OF INFORMATION TECHNOLOGY WORKERS (Sept. 29, 1997), *available at* http://www.ta.doc.gov/otpolicy/reports.htm.

34. Amy Harmon, *Software Jobs Go Begging, Threatening Technology Boom,* N.Y. TIMES, Jan. 13, 1998, at A1.

35. *See, e.g.,* William Branigan, *Hiring More Foreign Workers Gets a Push,* WASH. POST, Feb. 26, 1998, at A8.

36. William Branigan, *Lack of Tech Workers Disputed: Flaws Weaken Reports Claiming Shortage, GAO Critique Says,* WASH. POST, Mar. 23, 1998, at A2. Note that the article also reported that in response, DOC greatly downgraded its earlier statement asserting a labor shortage, now claiming only a "tight labor market."

37. *High-Tech Worker Shortages and Immigration Policy: Hearing Before the Senate Comm. on the Judiciary,* 105th Cong. 78 (Feb. 25, 1998) (statement of Robert I. Lerman, Economist, Urban Institute).

press managed to get over its earlier mesmerization by the industry, and ran numerous print articles and television news segments featuring critics of the shortage claims.[38] Even some publications, which by nature are biased in favor of industry, such as *Business Week*, raised some doubts.[39]

IEEE-USA, a 200,000-member, U.S.-based organization affiliated with the international Institute for Electrical and Electronic Engineers (IEEE), made a number of public statements criticizing the industry's claims of a labor shortage.[40] It also took a number of steps to fight the proposed H-1B expansion, including: compiling the Misfortune 500, a collection of profiles of 500 programmers and engineers who could not find work in spite of the high-tech boom; funding an American University study showing difficulties encountered by older engineers seeking work; and commissioning a Harris Poll on the proposed H-1B expansion, which found that 82 percent of Americans opposed the legislation.[41] All of this irked the IEEE parent organization and a "sister" group, the IEEE Computer Society, both of which are dominated by corporate and academic factions having vested interests in the H-1B program.[42] As will be discussed in Part II.B.2, IEEE-USA later changed its stance dramatically when a second H-1B expansion was proposed in Congress in 2000.

The AFL-CIO also raised limited objections.[43] The union did take a stance opposing the expansion of the H-1B program, but it did not actively lobby against the bill, and did not devote its massive resources, such as member letter-writing campaigns, to this issue.

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38.   *See, e.g.*, Pear, *supra* note 8.

39.   Aaron Bernstein & Steve Hamm, *Is There Really a Techie Shortage?*, BUS. WK., June 29, 1998, at 93.

40.   *High Tech Worker Shortages and Immigration Policy: Hearing Before the Senate Comm. on the Judiciary*, 105th Cong. 93 (Feb. 25, 1998) (statement of John R. Reinert, President, IEEE-USA).

41.   Press Release, The Institute of Electrical and Electronics Engineers, Inc., High-Tech Layoff, Unemployment Rates Multiply as Congress Votes on H-1B Increase (Oct. 8, 1998) (on file with author).

42.   Much of this occurred behind the scenes, but one can see the main point for instance in T.W. Williams, *IEEE-USA and the Issue of Member Choice*, IEEE COMPUTER, Feb. 1999, at 123. Williams was Chief Scientist, Synopsis Corp., and a member of the Board of Governors, IEEE Computer Society.

The Association for Computing Machinery (ACM), with an academic-industrial constituency similar to that the IEEE Computer Society, also felt strongly that computer science professional organizations should not oppose the H-1B program. *See* E-mail from Barbara Simons, ACM President, to several IEEE-USA officials and Norman Matloff, Professor of Computer Science, University of California, Davis (Aug. 23, 1998) (on file with author).

43.   *Immigration and America's Workforce for the 21st Century: Hearing Before the Subcomm. on Immigration and Claims of the House Comm. on the Judiciary*, 105th Cong. 60 (Apr. 21, 1998) (statement of David A. Smith, Director of Policy, AFL-CIO).

Furthermore, when the 2000 legislation arose, the AFL-CIO actually considered actively supporting the H-1B expansion.[44] Another union, the Communications Workers of America, expressed some concerns but officially supported both the 1998 and 2000 increases.[45]

Generally, criticism of the shortage claims was drowned in an ocean of news items proclaiming a shortage. Moreover, throughout the latter half of the 1990's, both major political parties had been anxious to curry favor with the high-tech industry, which they considered a large untapped source of campaign funding, especially in "soft money," i.e. donations to parties, which had no legal limit.[46]

In addition, academia actively supported the industry's claims of a shortage, as well as the industry's demands that Congress expand the H-1B program.[47] The universities had very strong incentives to back industry on the shortage and H-1B issues: Universities receive large donations from the industry;[48] universities hoped to get increased government funding for science and engineering programs to cope with the labor "shortage"; many university postgraduate programs are populated largely by foreign students who hope to later work as H-1Bs in the U.S.; and the universities are major employers of H-1Bs themselves.

Thus, it was easy to sell Congress on expansion of the H-1B program. Selling President Clinton was perhaps a bit harder. In the ITAA/DOC convocation in January, Commerce Secretary Daley had stated that the administration would not support expansion of

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44. *See* David Bacon, *Labor Fights for Immigrants*, THE NATION, May 21, 2001, at 15.

45. It later changed its stance in 2002 when the Bush administration proposed canceling the training programs that had been funded with H-1B user fees. *See* Lisa Vaas, *CWA Calls for Repeal of H-1B Program*, EWEEK MAGAZINE, June 28, 2002, *available at* http://www.eweek.com/article2/0,4149,3023317,00.asp.

46. *See, e.g.*, Jason Zengerle, *Silicon Smoothies*, THE NEW REPUBLIC, June 8, 1998, at 24.

47. *See, e.g.*, *The News Hour with Jim Lehrer: High Tech Workers* (PBS television broadcast, Apr. 3, 1998).

48. The web page of the Computer Science Department at the University of Washington, a leading supporter of industry's labor shortage claims, showed the following as of March 16, 2000: $1,500,000 from Ford Motor Co. in research funds; "several million dollars" in equipment from Intel; $500,000 from Boeing for an endowed faculty chair; another $500,000 chair from Microsoft; another chair from Boeing; and finally, $3,000,000 from the Bill and Melinda Gates Foundation for two endowed chairs. *See* http://www.cs.washingtion.edu/affilates/corporate (last visited Aug. 22, 2003). Department chair Ed Lazowska, who has been an outspoken supporter of the H-1B program, personally benefits financially from a cozy relationship with industry too. According to his personal web page, *at* http://www.lazowska.cs.washington.edu (last visited Aug. 22, 2003), he is "a member of the Technical Advisory Boards for Microsoft Research, Voyager Capital, Ignition, Frazier Technology Ventures, Madrona Venture Group, and Impinj, and of the Boards of Directors of Data I/O Corporation and Lguide.com."

the H-1B program.[49] Yet Clinton eventually agreed, and in October he signed ACWIA 98.[50]

As with previous legislation, ACWIA 98 contained provisions that claimed to protect U.S. workers. In particular, a notion of "H-1B dependent" employers was established, defined to be those whose workforces consisted of at least 15 percent H-1Bs. Previously, the H-1B visa did not require an employer to recruit U.S. workers before filling a position with an H-1B (nor did the old H1 program). Now ACWIA 98 held H-1B dependent employers to such a requirement.

Yet this provision in the new law was doomed from the outset. The 15-percent threshold applied to all employees, not just programmers and engineers. Most employers would have enough non-technical workers (marketing people, secretaries, janitors etc.) that even if their programming staff were, say, 50 percent H-1B, they would still not fit the definition of H-1B dependency. In addition, the industry put heavy pressure on the DOL to implement the law in a manner that further restricted the scope of the H-1B dependence provisions. It took the DOL two years to issue regulations regarding the provisions, and in the end only 50 out of 50,000 H-1B employers were declared to be H-1B dependent.[51]

Some critics of the industry's labor shortage claims pointed out that a number of programmers and engineers over age 40 had difficulty finding work in their fields, despite the apparent jobs boom.[52] Employers responded that they shunned such workers because their technical skills were out of date in this fast-changing field. The critics retorted that this was just a pretext for hiring the cheaper H-1Bs, but to address the skills issue Congress added another major provision in the new law, insisted on by Clinton and some leading Democrats. It established H-1B user fees which would fund retraining programs, with the goal of training American workers to fill jobs then being filled by H-1Bs.

This provision too was doomed from the outset. In addition to the allegations made that employers were using the skills issue merely as a pretext to avoid hiring older workers—in which case retraining would be useless—the training funds ended up being used largely to train workers for technician jobs, which are not

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49.   Miranda Ewell, *Clinton Opposes Higher Visa Cap; Focus on "Home-Grown" Talent, Commerce Chief Says*, SAN JOSE MERCURY NEWS, Jan. 13, 1998, at 1C.

50.   American Competitiveness and Workforce Investment Act of 1998, Pub. L. No. 105-277, Title IV (1998).

51.   *See* Immigration attorney Jose Latour's electronic newsletter, *available at* http://www.usvisanews.com/memo1192.html (last visited Jan. 5, 2001).

52.   Steen, *supra* note 10.

normally filled by H-1Bs anyway. Two years into the program, Sun Microsystems a major Silicon Valley firm that had been at the forefront of lobbying Congress to expand the H-1B program in 1998, stated that the training programs had not reduced—and, more tellingly, they *could* not reduce—its dependence on H-1Bs.[53] Later, the Bush administration also concluded that the program had failed to achieve this, its stated goal, and proposed canceling it.[54] Finally, ACWIA 98 responded to assertions of wage exploitation of the H-1Bs and problems of older workers in the industry by directing the National Research Council (NRC) to study these issues. Their report was released in late 2000.[55] The report confirmed the main allegations which it had been charged with investigating, finding that H-1B workers indeed tended to be paid less than comparable Americans, and that older IT workers indeed faced major obstacles in finding work in the field, even during boom times.[56]

   2. *AC 21*—In 2000, the industry lobbyists tried again, asking Congress to expand the program even further. They succeeded in October, when Congress enacted another temporary increase in the H-1B cap, to 195,000.[57] Some may find this action ironic, given the collapse of the high-tech job market that began in late 2000. It appears likely that the industry knew this collapse was coming—the NASDAQ index had started to plummet in the spring of 2000, and the major layoffs began at the end of the year. If so, presumably the industry wanted to push through this second expansion of the H-1B program at a time when it still appeared that the high-tech job market was "hot." The H-1B cap increase enacted in this legislation sunsets in October 2003.

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   53.   *See* Lisa Vaas, *Failing Grades: H-1B Fees Fail to Lessen Reliance on Imported IT Skills*, EWEEK, Sept. 18, 2000.
   54.   *See Trained Out: Money from Temporary Foreign Workers Might Get Redirected*, WALL ST. J., Feb. 19, 2002, at A1. For a somewhat more positive, though certainly mixed, view of the training funds, *see* U.S. GENERAL ACCOUNTING OFFICE, HIGH SKILL TRAINING: GRANTS FROM H-1B VISA FEES MEET SPECIFIC WORKFORCE NEEDS, BUT AT VARYING SKILL LEVELS, GAO-02-881 (2002).
   55.   NATIONAL RESEARCH COUNCIL (NRC), BUILDING A WORKFORCE FOR THE INFORMATION ECONOMY (2001). The latter date refers to actual publication; summaries of the report were released in October of 2000, *available at* http://books.nap.edu.html.building_workforce/.
   56.   *See* Parts V.C.7. and VI.B.2, *infra* (detailed analysis of the NRC findings). It is remarkable that the NRC commission was willing to make such statements, as the commission's makeup was highly biased in favor of industry; its chair was a university president who was a member of several high-tech boards, it had members from Intel and Microsoft etc. There was a small minority of pro-labor members, but they were overwhelmed by the pro-industry majority which, in addition to its numerical superiority, had tremendous resources to draw upon.
   57.   American Competitiveness in the Twenty-first Century Act of 2000, Pub. L. No. 106-313 § 102, 114 Stat. 1251 (2000).

In spite of the fall of NASDAQ, the industry had an even easier time getting the legislation passed than it had had in 1998. IEEE-USA's opposition was very much muted, due to heavy pressure from the IEEE parent group.[58] Instead of objecting on the grounds that the influx of H-1Bs adversely impacted wages and job opportunities for Americans as in 1998, the organization now said that the foreign workers should be welcomed, and given expedited green cards.[59] Proponents of the H-1B expansion derided this turnaround as insincere.[60]

The AFL-CIO, which had done only lukewarm lobbying against the H-1B increase in 1998, now in 2000 even toyed with the idea of actively *supporting* the increase, in exchange for industry's supporting the AFL-CIO's request that Congress grant amnesty to illegal aliens.[61]

The votes in favor of the measure were overwhelming, 96–1 in the Senate and a unanimous voice vote in the House.[62] Prominent members of Congress openly admitted that this was due to the industry's monetary clout. Sen. Robert Bennett (R-Utah) remarked, "Once it's clear [the visa bill] is going to get through, everybody signs up so nobody can be in the position of being accused of being against high tech. There were, in fact, a whole lot of folks against it, but because they are tapping the high-tech community for campaign contributions, they don't want to admit that in public."[63] A major supporter of pending legislation which would increase the H-1B quota, Rep. Tom Davis (R-Va.), said, "This is not a popular bill with the public. It's popular with the CEOs . . . This is a very important issue for the high-tech executives who give the money."[64] Rep.

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58.   John Judis, *Our Guest Worker Problem*, THE NEW REPUBLIC, June 19, 2000, at 21.

59.   The rationale for IEEE-USA's proposal was that, since the exploitation of H-1Bs stems from the *de facto* indentured servant status they have while a green card is pending, they should be given immediate green cards. Though their point was correct, it ignores other issues, which will be discussed in Part VII. *See* Judis, *supra* note 58, at 21, for details on IEEE-USA's development of its green card proposal. The article notes that IEEE-USA brought in an outside consultant to help "wean the organization from outright opposition to immigration." *Id.* Meanwhile, the organization dismantled its Misfortune 500 web page, which is discussed in Part II.B.1.

60.   Lakshmi Chaudhry, *Foreign Worker Debate Heats Up*, WIRED NEWS, May 15, 2000, *available at* http://www.wired.com/news/print/0,1294,36234,00.html.

61.   David Bacon, *Inn Trouble: Unions Shape New Immigrant Strategy*, L.A. WEEKLY, Jan. 16, 2001.

62.   *See Congress Clears H-1B Legislation in Surprise Move: President Clinton Expected to Sign*, 77 INTERP. REL. 1437, Oct. 9, 2000.

63.   Lochhead, *supra* note 6.

64.   *Committee To Address Bill Eliminating H-1B Cap*, NAT'L J. TECH. DAILY, May 5, 2000; Lars-Erik Nelson, *Pols Are Going Overboard On Visa Program*, N.Y. DAILY NEWS, May 3, 2000.

Davis was chair of the Republican Congressional Campaign Committee.

The "unanimous" vote in the House also occurred under conditions of impropriety. It was announced in the afternoon that no further votes would be held that day, yet a vote on the H-1B bill was held that evening, with only 40 of the 435 members of the House present, with ordinary voting rules bypassed.[65]

About a month before the vote on AC 21, the GAO released a report which was highly critical of the H-1B program.[66] Yet the entire 19,000-word discussion of the bill in the Senate consisted of praise for the bill; the GAO report was not mentioned even once.[67]

It is important to note one more interest group involved in this legislation—the H-1Bs themselves. Throughout the 1990s,[68] a high-tech employer of an H-1B would typically also sponsor him/her for a green card. As of the late 1990s, processing for LPR status was taking five or six years for most high-tech H-1Bs, leading to worries that the six-year H-1B visa period would lapse before the green card was approved. A group of H-1Bs founded an organization, the Immigrants Support Network (ISN), to lobby Congress for relief, noting that, "[t]here was high-tech industry on one side lobbying for higher numbers of temporary work visas, and unions arguing that H1-B's were taking jobs from US workers. We had no one representing us."[69] Eventually ISN retained Capitol Hill immigration insider Rick Swartz to lobby on their behalf, at a total estimated cost of $100,000.[70]

Swartz's efforts brought some results. AC 21 did improve conditions to some extent. For H-1Bs who are being sponsored for green cards, the old per-country limits, which had caused long waits for H-1Bs from India and China, were now essentially abolished. However, overall the green card process still takes about three to four years, according to immigration lawyers.

3. Post-AC 21—The job market had already begun to deteriorate by the time AC 21 was enacted in October 2000, and the downhill slide greatly accelerated in the succeeding months.[71] Nevertheless, employers used the H-1B with relish, apparently feeling that during

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65.   146 CONG. REC. H8706 (daily ed. Oct. 3, 2000); 77 INTERP. REL. 1437.

66.   U.S. GENERAL ACCOUNTING OFFICE (GAO), H-1B FOREIGN WORKERS: BETTER CONTROLS NEEDED TO HELP EMPLOYERS AND PROTECT WORKERS, GAO/HEHS-00-157 (2000).

67.   146 CONG. REC. S9643 (daily ed. Oct. 3, 2000).

68.   Though much less so after 2000.

69.   Raj Jayadev, *Look Who's Organizing—High-Level Tech Workers Form New Labor Group*, PAC. NEWS SERVICE, Aug. 15, 2001.

70.   Broadcast e-mail from ISN (Oct. 21, 1999) (on file with author).

71.   Laura Kurtzmann, *High-End Rent Rates Cool Down in Bay Area*, SAN JOSE MERCURY NEWS, Jan. 22, 2001.

a recession there was an even greater need to reduce labor costs. In spite of the recession, the number of visa applications increased by 14 percent in 2001.[72]

The number of visas granted dropped substantially in 2002.[73] However, this was not a sign of employer restraint, but rather a reflection of the dramatic drop in the number of new job openings, the worst high-tech job market in 30 years according to one university career-center director.[74] A number of major employers were accused, sometimes in court, of laying off Americans and then replacing them by H-1Bs and other foreign workers in the same jobs. These firms included Sun Microsystems, one of the most active lobbyists for ACWIA 98 and AC 21,[75] Siemens,[76] the Bank of America/Exult,[77] Netscape,[78] and Dun & Bradstreet.[79] In several of these cases, the laid-off American workers were forced (as a condition for receiving severance pay) to train their H-1B replacements.

C. Trends in Usage of the H-1B Visa

Employers latched on to the H-1B program immediately after it was implemented. Even though this was a period of recession and the tech industry was engaged in massive layoffs, the number of software H-1Bs grew ten times faster than the growth rate in jobs: The number of H-1B work visas requested by industry for computer programmers increased by 352 percent from 1990–1995, during which time the number of programming jobs increased by only 35

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72.   Rachel Konrad, *H-1B Visas Jump in 2001*, CNET NEWS, Jan. 22, 2002, *available at* http://news.com.com/2100-1017-820302.html.

73.   *See* Eryn Brown & David Kirkpatrick, *The Reverse Brain Drain*, FORTUNE MAG., Nov. 11, 2002, at 39.

74.   Margaret Quan, *EE Grads Face Grim Job Market*, ELECTRONIC ENGINEERING TIMES, Feb. 7, 2002, *available at* http://www.theworkcircuit.com/story/OEG20020206s0059.

75.   Jennifer Bjorhus, *U.S. Workers Taking H-1B Issues to Court*, SAN JOSE MERCURY NEWS, Sept. 26, 2002, at 1A.

76.   *See* Lisa Vaas, *L1s Slip Past H-1B Curbs*, eWEEK, Jan. 6, 2003, *available at* http://www.eweek.com/article2/0,3959,809079,00.asp.

77.   *Compare* Sarah Lunday & Rick Rothacker, *BofA to Send Tech Jobs Overseas*, CHARLOTTE NC OBSERVER, Mar. 6, 2002, at A1, *with* the Programmers Guild web site, *available at* http://www.programmersguild.org/Guild/h1b/howtounderpay.htm, which shows that many of the newly-hired workers were H-1Bs, rather than workers in India as reported by the OBSERVER.

78.   Bjorhus, *supra* note 75.

79.   Douglass Krouse, *Dun Workers Fear Layoffs*, [Bergen, NJ] DAILY RECORD, June 3, 2000.

percent.[80] Again, this was in a period in which no one claimed a shortage of workers, so the dramatic growth in H-1Bs would seem at odds with the notion that the H-1B program is supposed to be a remedy for shortages. Yet employers, apparently felt a need to save on labor costs during a recession, and thus found the H-1Bs attractive.

In recent years, the largest job category in which H-1Bs are employed is the Systems Analysis and Programming category.[81] Among all H-1B visas issued for fiscal year 2001, for instance, 52.1 percent were in that category.[82] Contrary to the impression readers sometimes got from press coverage of the H-1B issue, comparatively few of the H-1Bs are engineers.[83] The next-largest occupation category, Electrical/Electronics Engineering Occupations, comprised only 4.7 percent.[84]

Industry lobbyists make claims along the lines of "Only 5 percent of our workers are H-1Bs," but this is highly misleading. First of all, they mean the word "workers" to include non-technical staff such as secretaries, marketers, janitors and so on. Second, they are not counting all the H-1B workers at their firms who are subcontracted by agencies.

In fact, the Department of Commerce found in 2000 that H-1Bs accounted for 28 percent of all IT hires requiring at least a Bachelor's degree;[85] the percentage has grown much larger since then.

Even more importantly the industry lobbyists fail to disclose that many more of their technical staff originally started as H-1Bs but later obtained green cards via employer sponsorship. About one-third of Silicon Valley programmers and engineers were foreign-born as of 1990; the proportion grew to 54 percent by the year 2000.[86] The reasons for the increase include the 352 percent increase in H-1B visas during 1990–1995, and the Chinese Student

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80.   NATIONAL SOFTWARE ALLIANCE, SOFTWARE WORKERS FOR THE NEW MILLENNIUM (1998).

81.   This was probably the case in the earlier years as well, but data are not available for that period.

82.   INS, *supra* note 3, at 11.

83.   The situation is confused by the fact that a common modern title for computer programmers is Software Engineer. But it is just a title, and does not connote engineering work in the usual sense. See Part III, *infra* below for elaboration on this point.

84.   INS, *supra* note 3.

85.   U.S. DEP'T OF COMMERCE (DOC), DIGITAL ECONOMY 2000, at 51 (2000).

86.   This is from my analysis of the Public Use Microdata Sets (PUMS), 1990 and 2000 censuses, respectively, for workers who had titles of Programmer, Computer Scientist or Electrical Engineer (and in 2000, Software Engineer, a new title added to the census that year), and who lived in Santa Clara, Alameda and San Mateo Counties. Based on my observations, the vast majority of those in the 1990 census, and most of the ones in 2000, gained U.S. residency via employer sponsorship.

Protection Act (CSPA) of 1992, which gave green cards to an estimated 100,000 Chinese nationals; many of the recipients were in technology areas and would have been sponsored for H-1B and green card status if not for the CSPA.

Ethnic Chinese comprised 76 percent of the immigrant programmers and engineers in Silicon Valley in the 1990 census. However, during the 1990s, the dominant H-1B country of origin nationwide became India. In 1999, 48 percent of the H-1Bs were from India, with China coming in a distant second at 9 percent.[87] For the computer-related H-1Bs, the dominance of India is even more pronounced, with the Indians outnumbering the Chinese by more than an 8-to-1 ratio.[88]

TABLE 1

PERCENTAGE OF COMPUTER-RELATED

H-1Bs, BY NATIONALITY

India	64.8%
China	8.2%
Philippines	2.3%
Canada	2.0%
Pakistan	1.9%
United Kingdom	1.8%
Russia	1.7%
Taiwan	1.4%

III. PRIMARY FOCUS ON COMPUTER PROGRAMMERS

The dominant job category for H-1Bs consists of computer-related occupations. However, our focus is narrower than this. Since by law H-1Bs must be in jobs which are normally performed by workers having at least a Bachelor's degree in a relevant field, H-1Bs should not be in jobs such as data entry clerks, network technicians, and so on. Instead, the vast majority of H-1Bs in high-tech positions are computer programmers, and hence our focus will be in this type of job.

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87.   GAO, *supra* note 66.
88.   Letter from Michael Hoefer, U.S. Immigration & Naturalization Service, to Norman Matloff, Professor of Computer Science, University of California, Davis (July 9, 2001) (on file with author).

It important to note that among employers that are in the software or hardware vending business, programmers typically have the title Software Engineer rather than Programmer. The title Software Engineer originally arose when hardware vendors found themselves assigning many engineers to software development jobs. In other words, they were engineers who were employed in software projects, hence the title.[89] However, they were typically not doing "engineering" in the usual connotation of the word, i.e. work involving the use of mathematics, physics and so on.[90] Later, the software vendors took to using the title as well. And it is not just a matter of job titles. One almost never hears the title *Programmer* in Silicon Valley, for example; they are simply referred to as engineers. Today many, probably most, workers with a Software Engineer title do not have degrees in engineering.[91]

And as mentioned above, almost all workers with a Software Engineer title, regardless of educational background, are not doing "engineering" work. The titles Software Engineer and Programmer should thus be considered synonymous, with the only difference being custom within a given firm. Banks, insurance companies and the like still tend to use the title Programmer or System Analyst, while the software and hardware vendors use Software Engineer.[92]

Workers who do "real" engineering, for instance electrical engineering, comprise only a small percentage of H-1Bs. This is contrary to public impression, which stemmed largely from lobbying for H-1B expansion by the American Electronics Association.[93]

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89.   Similarly, engineers working in the sales area are often called Sales Engineers.

90.   JESSE LIBERTY, THE COMPLETE IDIOT'S GUIDE TO A CAREER IN COMPUTER PRO-GRAMMING 9 (1999), notes that although today's breed of programmers call themselves software engineers, "I can't quite bring myself to use that term. Engineers build bridges and power plants. We're just writing code. But, I'm showing my age." *Id.* Even the title Computer Engineer, which sounds like the job involves design of hardware, is often held by workers whose sole function is to write software.

91.   Nor do they necessarily have degrees in computer science either, as will be discussed later. Lerman, *supra* note 37, found that only 31 percent of programmers had degrees in computer science, and only 10 percent in engineering.

92.   *See, e.g.,* LIBERTY, *supra* note 90, at 7. Jesse Liberty, a consultant and author, warns readers not to read anything into job title in the software development field: "Some companies distinguish between programmers, analysts, architects. . . . Others call all these people software engineers." *Id.*

When the title Software Engineer first came into common usage, it was felt that this title implied a greater degree of responsibility, under which the programmer did not only the coding of the software but also the design. In earlier times, a System Analyst might work on the "big picture" design of the software, and then hand this design to a Programmer for the actual coding. However, today most programmers, regardless of title, do both design and coding.

93.   *Immigration and America's Workforce for the 21st Century: Hearing Before the Subcommittee on Immigration and Claims of the House Comm. on the Judiciary,* 105th Cong. 163 (Apr. 21, 1998)

However, when considering expansion of the H-1B program, Congress seemed to understand that the issue was really computer programming, not engineering. For example, as part of the 1998 legislation to increase the H-1B cap, Congress commissioned a study to assess claims of age discrimination (caused largely by the influx of H-1Bs) and focused the study on IT.[94]

This Note will use the word *industry* to mean all employers of software developers, not just those in the high-tech field. This includes not only software vendors, such as Microsoft, but also employers such as banks, who develop software only for their own internal use. Similarly, this analysis is for the nation as a whole, not just Silicon Valley.

IV. THE INDUSTRY'S CLAIMS TO NEED H-1B WORKERS

The industry has claimed a need to hire H-1B workers on several grounds. This Note examines those grounds in turn, concluding that none of them explain the mass hiring of H-1Bs. It then argues instead in Part V that the central issue is money, i.e. that employers hire H-1Bs primarily to attain either Type I or Type II reductions in labor costs.

A. General Investigations of a Possible Worker Shortage

1. The ITAA Reports—The main evidence that the industry has offered for its shortage claim has consisted of the Information Technology Association of America (ITAA) employer surveys concerning numbers of unfilled positions.[95] The critics of the H-1B program counter that the employers have contrived this "shortage" in order to maneuver Congress into providing the industry with cheap labor in the form of H-1Bs, and thus employer surveys alone cannot be taken as impartial evidence of a shortage. Moreover, the

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(prepared statement of Michaela D. Platzer, Vice President, Research and Policy Analysis, AEA), *available at* http://www.govtech.net/magazine/gt/2000/dec/34.phtml.

94.   *See* NRC, *supra* note 55.

95.   *See, e.g.,* ITAA, *supra* note 5.

GAO later released a report strongly criticizing the ITAA's research methodology.[96]

The GAO cited a number of flaws in the ITAA study. For example, the ITAA/VPI survey counts a position as "open" even if it is currently filled by outside consultants.[97] The fact that many programmers now prefer to work as consultants ("contractors") instead of as salaried employees does not mean there is have a shortage of programmers.

Interestingly, even the ITAA survey's director, Linda Leffel of the Virginia Polytechnic Institute and State University, noted in a side comment in the study that "even if 346,000 qualified applicants [ITAA's estimate of the number of unfilled positions at the time] . . . appeared today, in all probability immediate positions would not be available . . . to translate this number to an absolute would be misleading."[98] For example, many jobs are open just to "test the waters". There may be, say, four job ads placed when the firm intends only to hire two workers. The four jobs may be under four different managers, who are "competing" with each other for two job slots.[99] Subsequent ITAA surveys suffered from similar problems.

No analysis, other than those sponsored by industry, has confirmed a shortage. Following is an overview of the findings of the major studies, in chronological order.

2. *The Lerman Analyses and Similar Studies*—In 1998, economist Robert Lerman presented Senate testimony in which he argued that available data did not indicate a shortage, but in fact, counter-indicated it.[100]

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96.   U.S. GENERAL ACCOUNTING OFFICE, INFORMATION TECHNOLOGY: ASSESSMENT OF THE DEPARTMENT OF COMMERCE'S REPORT ON WORKFORCE DEMAND AND SUPPLY, GAO/HEHS-98-106R (1998).

97.   *Id.*

98.   ITAA, *supra* note 5.

99.   *See, e.g.,* Margaret Steen, *Thinking Globally,* INFOWORLD, Nov. 2, 1998, *available at* http://inforworld.com/cgi-bin/displayArchive.pl?/98/44/e06-44.73.htm:

> Logic suggests that if a company has posted a want ad, it wants to fill that position. That is not always the case. Some companies use ads as a kind of public relations stunt to showcase themselves as up-and-coming. One company even placed a want ad during a hiring freeze just to generate publicity. Some larger companies have an ongoing need for employees and use the ads to generate resumes for unspecified future positions.

Id.

100.   Lerman, *supra* note 37. *See also* BURT BARNOW ET AL., URBAN INSTITUTE, FINAL REPORT TO THE OFFICE OF THE ASSISTANT SECRETARY FOR POLICY, U.S. DEPT. OF LABOR (1998); CLAIR BROWN ET AL., DEP'T OF ECONOMICS, U.C. BERKELEY, THE PERCEIVED SHORTAGE OF HIGH-TECH WORKERS (1998); THOMAS ESPENSHADE, HIGH-END IMMIGRANTS AND THE

Lerman, Professor of Economics at American University and Director of the Human Policy Resource Policy Center of the Urban Institute, began by pointing out various methodological problems with the ITAA report.[101] He then discussed which effects should be visible in the data if there were a shortage, and noted that the effects were largely absent. He also pointed out that the ITAA's employment and wage figures were inconsistent with most government and private data. Lerman's main argument was that wages in the IT field were not rising as quickly as they would if there were a shortage.[102] He stated that, except for the period 1996–1997, both government and private data showed that "real wages have been essentially flat since 1988."[103]

Concerning the ITAA's claim that the yearly number of computer science graduates was insufficient for the industry's needs, Lerman noted that only a minority of programmers have computer science degrees anyway.[104] Citing PhD shortages which had been projected in the late 1980s but then failed to materialize, he warned that incorrect projections can lead to unemployment and disincentives for students to pursue the given fields of study.[105]

3. The Veneri Paper—A paper by Bureau of Labor Statistics researcher Carolyn Veneri also stated that the data does not support the industry's claim of a labor shortage.[106] Her analysis is again similar to that of Lerman, but another point she brought up was quite important. The ITAA lobbying group has often cited low unemployment rates among IT workers as indicative of an IT labor shortage. But Veneri notes:

> A major drawback in using . . . unemployment rates in analyses
> of shortages is that the unemployment rate is calculated based

SHORTAGE OF SKILLED LABOR (Office of Population Research, Working Paper No. 99-5, June 1999).

101.   Lerman, *supra* note 37.

102.   Wages for IT workers were rising at generally single-digit annual percentage rates, which were typical for most professions at the time. Some professions had rates of approximately double those of IT. For example, surveyors and dieticians saw their salaries increase far more than programmers in 1997, beating inflation by 20 percent and 17 percent, respectively; *See* Bernstein & Hamm, *supra* note 39.

103.   He postulates that the exceptional period may be due to short-term hiring in 1997 for the upcoming "Year 2000 Problem," in which old software written to assume that the year field in a date would begin with "19" might fail to operate in the year 2000. Lerman, *supra* note 37.

104.   Lerman, *supra* note 37.

105.   *Id.*

106.   Carol Veneri, *Can Occupational Labor Shortages Be Identified Using Available Data?*, MONTHLY LAB. REV., Mar. 1999, at 15.

on a person's last job, rather than the longest job held or oc-
cupation in which he or she trained and is actually looking for
work. This means an individual with experience as a computer
programmer who is seeking a programming job, but who last
worked as a cashier, is classified as an unemployed cashier, not
an unemployed programmer . . .

. . . the labor market conditions for this period [1992–1997]
indicate that neither the occupational group consisting of
computer systems analysts, engineers, and scientists nor the
computer programmer occupation has exhibited both higher
than average employment growth and higher than average
growth in wages.[107]

4. The DOC Reverses its Position—In 1999 the DOC reversed its
earlier position and stated that, "due to the limitations of available
data, there is no way to establish conclusively whether there is, or is
not, an overall IT worker shortage."[108] The DOC reached this con-
clusion after analyses of wage-growth data. These analyses were
quite extensive, and apparently formed the foundation of the NRC
study, to be discussed below.

5. The Computing Research Association's View—The Computing
Research Association (CRA), a consortium of university computer
science departments and industrial leaders, released a report in
1999.[109] One contribution of this study was to show some additional
problems with analyses of unemployment rates. The authors make
the following observations in Chapter 4:

The IT unemployment rates are about three times as low as
overall unemployment rates in the United States suggesting a
shortage/tightness. However, to properly interpret these
numbers they should be seen in comparison with some other
statistics. First, the IT unemployment rates have been consis-
tently low, in both absolute terms and in relationship to
national unemployment rates, since 1988; however, the claims
for an IT worker shortage have only been made in the past

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107. *Id.* at 18–19. Or better yet, if the programmer is *currently* employed as a cashier,
he/she is counted as an employed cashier rather than as an unemployed programmer. This
type of stark transition is quite common. The author knows of former programmers who
worked as box packers, security guards, school bus drivers, and the like.

108. CAROL ANN MEARES & JOHN F. SARGENT, U.S. DEP'T OF COMMERCE, THE DIGITAL
WORKFORCE: BUILDING INFOTECH SKILLS AT THE SPEED OF INNOVATION vii (1999), *available at*
http://www.ta.doc.gov/reports/itsw/execsumm.htm.

109. PETER FREEMAN ET AL., COMPUTING RESEARCH ASSOCIATION, THE SUPPLY OF IN-
FORMATION TECHNOLOGY WORKERS IN THE UNITED STATES (1999).

several years. Why were they not made in the late 1980s or early or mid-1990s? Second, it may be unfair to compare IT unemployment rates with national unemployment rates, in that professional unemployment rates are almost always significantly lower. The overall unemployment rate for all specialty professions is only slightly above two percent not that much different from the IT worker unemployment rates. But it is hardly credible that there is a shortage of all professional workers. Thus, while unemployment rates may suggest a shortage/tightness in the IT labor market, as an indicator they are not entirely unproblematic.[110]

As with other studies, the CRA authors also found that available data did not support the industry's claims of a shortage. However, they went further than did the other studies in speculating that a shortage may have existed:

The report evaluates the question of whether there is a shortage of IT workers in the United States. The study group determined that the data are inadequate to ascertain what mismatch there is, if any, between national supply and demand. Therefore the report makes use of a variety of other quantitative and qualitative kinds of evidence ... The preponderance of evidence suggests that there is a shortage of IT workers, or at least a tight labor market. None of this evidence has the certainty of a direct count of supply and demand, and without this kind of direct count it is impossible to distinguish an actual shortage from a mere tightness in the labor market. Moreover, there are credible reasons for questioning the evidentiary value of virtually any piece of evidence that is available.[111]

    6. *The IT Workforce Data Project*—The IT Workforce Data Project, a four-part series on the IT labor force, included an analysis of the industry's shortage claims.[112] They too found that one could not conclude from the data that there was a shortage:

In summary, none of the possible signs of an inadequate supply of IT workers provides unambiguous evidence that there

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110.   *Id.* at 58.
111.   *Id.* at 10.
112.   Richard Ellis & B. Lindsay Lowell, *Assessing the Demand for Information Technology Workers*, IT WORKFORCE DATA PROJECT, Nov. 1999, at Part IV.

are not enough people in the field, and several indicators—
rising numbers of experienced unemployed workers, the "flat"
compensation results reported by COMPUTERWORLD, increas-
ing enrollments in computer science—suggest that if
anything, pressures of demand on the available supply may
have eased during the past year.[113]

The authors also noted that two ITAA employer surveys, in 1997
and 1998, had each found a 10 percent vacancy rate, which the
ITAA had taken to be evidence of a shortage. After recalling that
previous analyses had questioned this interpretation of the vacancy
rate, the authors also point out that for a field which is growing at a
10 percent annual rate, a vacancy rate of 10 percent merely
indicates a lag time of one year for the marketplace to adjust:
"Since 1995, the number of core IT jobs (which precisely match the
positions defined by ITAA) has grown 10 percent a year—that is,
exactly at the level that industry vacancy figures suggest should be
met. Where then is the problem [claimed by ITAA]?"[114]

Another important point made by the authors concerns stock
options. After the work of Lerman and others pointed out that the
modest rates of wage growth in IT salaries did not indicate a short-
age, industry lobbyists claimed that this was due to compensation
growth in the form of stock options.[115] The authors give a rather
thorough analysis of stock options held by IEEE members, and
conclude that the overall effect on compensation, while dramatic in
some individual cases, is minor overall.[116] Among those who held
stock options, the median value went from $7,000 in 1996 to
$10,000 in 1998. Given an average salary of $67,400 for IEEE mem-
bers in 1997,[117] that would mean that stock options added only
about 2 percent to yearly growth in total compensation. In other
words, the growth rates of wages, which had been found to be
around 7 or 8 percent in the studies reported here, might corre-
spond to growth rates in total compensation of 9 or 10 percent, still
not high enough to indicate a shortage.

    7. *The Congressionally Commissioned NRC Report*—The National
Research Council study commissioned by Congress in ACWIA 98

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113.   *Id.* at 4.

114.   *Id.* at 3.

115.   *Immigration and America's Workforce for the 21st Century: Hearing Before the Subcomm. on
Immigration and Claims of the House Judiciary Comm.*, 105 Cong. 64 (Apr. 21, 1998) (testimony
of Harris N. Miller, President, ITAA).

116.   Ellis & Lowell, *supra* note 112, at 2.

117.   Robert Bellinger, *Engineering Salaries Take a Significant Hike—Finally*, ELECTRICAL
ENGINEERING TIMES, Sept. 1998, at 38.

was released in October 2000, just after AC 21 was enacted. As with the CRA report, the NRC commission had a very strongly pro-industry composition. And similarly to the CRA case, the NRC commission came closer to—though stopped far short of—concluding that a shortage existed:[118]

> The committee believes that today's IT labor market is tight and likely to remain so for the immediate future, barring dramatic change ... the committee has chosen the term "tightness" rather than "shortage" for several reasons. First, there is no universally accepted definition of "shortage." Second, the use of the term "shortage" can imply a binary condition—either there is or is not a shortage. But the term "tightness" can encompass "shortage" as its limiting case—the condition in which employers find it impossible to find qualified workers no matter what they pay or how long they wait–and still account for the continuum nature of the phenomenon. Third, the committee feels that "tightness" is a broader and more encompassing term that does better justice to the complexity of the issue.

    8. The Wharton School Analysis—A University of Pennsylvania study consisted of a critical analysis of the research done to date on the claimed IT labor shortage.[119]Study author Peter Cappelli, a professor at the Wharton School of Management, expressed general puzzlement at the lack of good indicators in the data of a shortage. He critically reviewed several of the studies mentioned here, and noted that none of them confirmed the industry's claim of a shortage. As he stated in a companion article,

> Dozens of studies have analyzed the state of the labor market for IT workers, and the results are easy to summarize. Researchers who study labor markets and representatives of IT employers disagree almost completely as to whether there is a shortage of IT workers. The researchers uniformly believe that there isn't a shortage while the representatives vociferously believe that there is.[120]

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    118.   NRC, *supra* note 55, at 109.

    119.   Peter Cappelli, *Is There a Shortage of Information Technology Workers?*, Report to McKinsey and Company, June 2000.

    120.   Peter Cappelli, *The War of Words About The IT Labor Market*, PURPLE SQUIRREL, Sept. 2000, *available at* http://purplesquirrel.com/articles/sept.cappelli.shtml.

However, he assumed that the industry's claim is made in good faith, and attempted to resolve the apparent contradiction:

> Finally, market adjustments may be interpreted differently by individual employers than by the market as a whole. For example, an employer may find that it cannot hire the workers it needs because it cannot afford to pay the new, higher wages that scarcity has produced. From the perspective of an individual employer, this situation looks like a shortage: It can no longer find workers at the wages they have been paying. It is also a crisis for them. From the perspective of the economist and perhaps even of the industry, there is no shortage, just higher wages.[121]

In the companion article, Cappelli gave an analogy: "There is no shortage of diamonds, for example, because even though they are very expensive, you can buy all you want at the going price."[122] Cappelli was also quite critical of what he regarded to be rampant mismanagement on the part of the employers, ascribing much of the employers' perception of a shortage to mistakes made by the employers.[123]

9. Issues of Potential Bias—Since the shortage and H-1B issues are highly political and because the industry leveraged its requests to Congress for higher H-1B caps by asserting a labor shortage—this Article comments on potential biases of the studies cited, due to vested interests of the authors.[124]

Lerman, Brown and Espenshade, who did not find a labor shortage, have no apparent vested interests in such a finding. The same holds for Veneri.[125]

The DOC generally considers industry to comprise its major clientele, and it had produced its 1997 report in very close cooperation with the ITAA industry trade group. It had concluded in that report that there was a labor shortage. So, for the DOC to recant that view and state in 1999 that the data did not confirm a shortage would seem to indicate that the DOC's vested interests in

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121.   *Id.*
122.   *Id.*
123.   *Id.*
124.   The phrase *vested interests* is key here. I am only listing potential sources of bias due to financial or employment attributes of the authors.
125.   Veneri works for the DOL, which under Secretary Reich had had a history of criticism of the H-1B program. But this was not the case under Secretary Alexis Herman, who headed the department when Veneri conducted this research.

maintaining close ties to business did not affect its 1999 conclusions.

Ellis and Lowell also concluded that the data did not support industry's claims of a shortage. Ellis is an engineer who had previously been critical of the H-1B program, and thus had incentives to be skeptical of the industry's shortage claims. However, his co-author, Lowell of the Institute for the Study of International Migration at Georgetown University, is regarded as neutral among immigration analysts.[126] Moreover, Lowell is the author with background in statistical analyses. Thus presumably Lowell's participation limited the potential for bias.

The case of the CRA is quite different. The 21-member study group that produced the CRA report included members from Intel, Microsoft, IBM, and Sun Microsystems, all of which have heavily lobbied Congress for increased H-1B caps. Another member, Mark Regets, had also written articles supporting the H-1B and other foreign-worker programs, and was from the National Science Foundation, an organization which played a major role in establishing the H-1B program.[127] The remaining members of the CRA group were mostly academics. As mentioned in note 48, academia has actively supported the industry's claims of a labor shortage and a need for more H-1Bs. To illustrate how beholden academics tend to be to industry, Ed Lazowska, the academic cited in note 48, was Chair of the CRA at the time the study was conducted. Thus the membership of the committee was overwhelmingly pro-industry.

The case of the National Research Council commission was similar. The commission included many industry members, including representatives from Intel and Microsoft.[128] The commission's Chair, Alan Merten, is president of George Mason University. Not only did that give him strong incentives to toe the industry line, but he also sits on the boards of several high-tech firms.[129] At least one

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126. In an appearance on the NPR radio show TALK OF THE NATION (Sept. 26, 2000) on the shortage and H-1B issues, Lowell was the "middle ground" guest, sandwiched between Harris Miller of the ITAA and John Miano of the Programmers Guild, a group highly critical of the H-1B program.

127. One of the study's principal authors, Freeman, later went on to become an Associate Director in the NSF. Regets, in his NSF capacity, had previously done statistical analyses for pro-H-1B writer Stuart Anderson (*See* Anderson, *supra* note 32; Anderson, *infra* note 204), and was the NSF liaison to the NRC commission. Regets appointed the commission chair, Alan Merten.

128. Moreover, both of these members, one an HR executive and the other a lawyer, had been involved in the lobbying process during the congressional debate on ACWIA 98.

129. *See, e.g., Who's On First,* WASH. TECH., Aug. 29, 1996, *available at* http://www.washingtiontechnology.com/news/18_6/itcrowd/20992-1.html. See also BTG press release, Feb. 2, 1998, *available at* http://www.btg.com/investor/news/9804.htm.

of those filed a Labor Condition Application to hire H-1Bs at be-
low-market rates.[130] Though the commission did have two or three
members with a background less favorable to industry, they were
not only vastly outnumbered but also outgunned—they had no
time or resources to devote to the project, unlike the situation with
the industry representatives.[131]

Thus, both the CRA and NRC groups had strong incentives to
come up with conclusions favorable to industry. Thus the fact that
neither of them was able to conclude there is a labor shortage is
significant. They did, however, take more liberties in interpretation
than did the sponsors of the other studies. For example, Lazowska,
the CRA Chair, later cited both the CRA and NRC reports as con-
firming a shortage.[132] CRA's Executive Summary stated that though
the data could not confirm a shortage, "the preponderance of evi-
dence suggests that there is a shortage of IT workers"—phrasing
that does not appear in the body of the report.[133] Similarly, the
phrasing in the Executive Summary of the NRC report, while cau-
tious, leaves enough room for the reader to conclude there is a
shortage, especially since the report concludes that the H-1B pro-
gram was necessary for growth, a finding which would not make
much sense in the absence of a shortage. Yet none of the data in
NRC's Chapter 3, which assesses the industry's shortage claim, justi-
fies the more favorable pro-industry "spin"; that chapter merely
notes that the wage-growth data do not indicate a shortage, while
offering speculation as to why the data might be misleading.

Finally, there is the Cappelli analysis, which is not favorable to in-
dustry. Not only does he basically side with Lerman and the others
who concluded that the data do not indicate a shortage, Cappelli
also blames the employers themselves for poor management prac-
tices which he says led to a perception on their part of a shortage.
Given that he too is closely tied to business—his main paper was
commissioned by a private consulting firm—arguably these strong
statements are of even more significance than the DOC reversal

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130. A Freedom of Information Act request revealed that BTG had submitted an LCA
for a Computer Engineer at a salary of only $30,000, Project Engineers at $37,000, and Pro-
grammer Analysts at $43,000, all far below the median salaries for these professions. *See*
Robert Sanchez, LCA database, *available at* http://www.zazona.com for the BTG entry.

131. Personal statement made to me by an NRC Commission member at the NRC public
hearing, Santa Clara, California, Sept. 23, 1999. It should also be noted that the NRC is funded
by industry. The NRC unit responsible for this study, the Computer Science and Telecommuni-
cations Board, lists as its sponsors Cisco Systems, Sun Microsystems, Hewlett-Packard, Intel,
Microsoft, Texas Instruments, and Time-Warner Cable. With the exception of Time-Warner, all
of these firms have been in the forefront of lobbying for increases in the H-1B program.

132. Brandon Stahl, *Hey Buddy, Can You Spare a Job Offer?*, GRADUATING ENGINEER, Sept.
2001, *available at* http://www.graduatingengineer.com/articles/feature/09-04-01a.html.

133. FREEMAN ET AL., *supra* note 109.

mentioned in Part IV.A.4. Thus, a fairly broad consensus exists that the data do not confirm a labor shortage. Moreover, Cappelli makes a key point when he flatly states that the perceived "shortage" may largely reflect a shortage of cheap labor. This point is often made in articles in the press, such as the following quote of Pete Georgiadis, founder and CEO of eBlast Ventures: "If you're willing to pay market rate, you can find people. The issue is if you're budget-constrained, you can't get the people you want."[134] This then also goes to the age issue. As the IT director at a large law firm put it, "I'd love to have somebody with 20 years of experience, but unfortunately I'm only paying for three or four."[135]This point made by Cappelli is of signal importance and this Article will refer to it as the Cappelli Principle.

10. The Matloff Analyses—Further evidence against the industry claims of a labor shortage is seen in the employers' very low hiring and interview rates. The employers claim a "desperate" labor shortage, but in fact their extreme pickiness in hiring shows they are not desperate at all. They are flooded with resume's but hire only a small percentage of the applicants.

The situation is typified by the fussy John Otroba of American Management Systems, who

> *. . . has no shortage of incoming re'sume's.* When he logs onto his office computer every day, he has at least 50 in his electronic mailbox . . . But only about one in 12 resume's leads him to pick up the telephone to call the job seeker. Some don't pass that screening step. Of those who come in for an interview, fewer than a quarter are offered jobs.[136]

Table 2 shows typical hiring rates, as percentages of the number of applicants:[137]

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134. Francine Knowles & Shu Shin Luh, *So Many IT Jobs, So Few Takers*, CHI. SUN-TIMES, Sept. 28, 2000, at 54.

135. Steen, *supra* note 10.

136. Rajiv Chandrasekaran, *A Seller's Market for Tech Workers*, WASH. POST, Nov. 30, 1997, at A1 (emphasis added). *See generally*, Barb Cole-Gomolski, *Stream of Applicants Belies Labor Shortage*, COMPUTERWORLD, Mar. 22, 1999, at 36; Thomas York, *Why Are Employers So Picky?*, INFOWORLD, Nov. 22, 1999, at 77.

137. Most of these data are from my interviews of HR staffers and hiring managers, but a few are from the press, as follows. Microsoft: unsigned Associated Press article, TACOMA NEWS TRIB., May 13, 1997; American Management Systems: Chandrasekaran, *supra* note 136; Qualcomm: Marcus Stern, *Some Can't Find Work Despite Computer Skills: Yet Industry Says It Must Hire Foreigners*, SAN DIEGO UNION-TRIB., Mar. 7, 1998; Red Hat: Dean Foust, *The Linux Missionary Who's Taking on Microsoft*, BUSINESS WEEK, June 30, 1999; Raab: Christine Willard, *For Credit-Card Services Company, Going It Alone Meant Filling Key IT Positions—Fast,*

TABLE 2
PERCENT OF SOFTWARE APPLICANTS HIRED

American Management Systems	2%
Broderbund Software	1%
Cisco	5%
Cohesive	2%
Datascan	5%
Deltanet	4%
Ecbridges	2%
Flashpoint Technology	2 to 5%
R.D. Raab	1%
H.L. Yoh	4%
Inktomi	less than 5%
Microsoft	2%
Net Perceptions	2%
New England firm	1%
Qualcomm	4.5%
Radiant Systems	under 1%
Red Hat Linux	under 1%
Tangis	under 1%

Some industry lobbyists have attempted to interpret these low rates as indicating other phenomena, not employer pickiness. They have postulated that the rates are low because an applicant gets multiple offers but can only accept one, or that many resumes are casually submitted via e-mail by programmers who may not really be in the job market but are merely "testing the waters."[138]

But this argument is refuted by examining offer rates, meaning the proportion of those made offers among those who are interviewed (in person, not just on the telephone). Table 3 shows offer rates.[139] The data here again show that employers are very picky, rejecting most of even the applicants they invite for in-house interviews. This refutes, for instance, the industry lobbyists' argument that the low hiring rates do not show pickiness but rather reflect the fact that a worker may receive multiple offers. The lobbyists' argument that the low hiring rates reflect workers "testing

COMPUTERWORLD, Dec. 6, 1999, at 46; Cisco: Carrie Kirby, *No Shortage of Experience: Some Seasoned Technology Workers Say They've Been Unfairly Passed over by Silicon Valley Companies Looking to Fill Jobs*, S.F. CHRON., May 19, 2000, at B1. It should be emphasized that the rates given to me in interviews are for programming and engineering jobs, not for, say, marketing.

138.   *See, e.g.*, NRC, *supra* note 55, at 99.

139.   *See supra* note 137 regarding most of these. *See also* Aspect: Miranda Ewell, *Aspect Telecommunications Is on the Hiring Line*, SAN JOSE MERCURY NEWS, July 19, 1998; Tim Mensch, letter to the editor, TECH WEEK, July 12, 1999.

the waters," rather than employer pickiness, is refuted for the same reason.

Moreover, the lobbyists' dismissal of the hire/offer rates as evidence of employer pickiness are refuted by the employers themselves. Indeed, when asked about my citing of a low 2 percent hiring rate, Microsoft admitted that it is "very, very selective."[140]

TABLE 3
PERCENT OF INTERVIEWEES MADE OFFERS

American Management Systems	under 25%
Aspect Technologies	20%
Broderbund	30%
City of San Jose (civil service)	10%
Cohesive	20%
DataScan	12%
Deltanet	possibly as much as 40%
ECbridges	20%
ESP	10%
Flashpoint Technology	25 to 30%
High-Tech Job Fairs	as few as 6%
Inktomi	50%
Madison, WI recruiter	20%
Mensch, Tim	5%
Microsoft	25%
Net Perceptions	50%
New England firm	25 to 30%
Quintet	under 5%
Radiant Systems	under 15%

B. Claims of a Skills Shortage

1. Applicant Screening on Skill Sets—When the industry lobbyists started their first push for expansion of the H-1B program in 1997, they attributed the claimed labor shortage to an insufficient number of students in college computer science curricula.[141] Yet when confronted with evidence such as we saw earlier that there is no shortage of programmers and engineers, i.e. no shortage of

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140.   Aaron Zitner, *More Visas for Workers are Sought; U.S. Firms Say Foreigners Needed to Fill Jobs*, BOSTON GLOBE, Mar. 8, 1998, at A1.

141.   ITAA, *supra* note 32.

"bodies," the industry changed their story. They have replied that it is not a shortage of such workers in general, but rather a shortage of workers with very specific skill sets. During the debate on ACWIA 98, for instance, the "skill *de jour*" was Java, a new programming language, and it was claimed that even though there may be lots of programmers in the U.S., there was a shortage of Java programmers. Other skills often cited by the industry as being in short supply were the SAP database language, the UNIX operating system, and various others.

So, is there really an IT skills shortage, if not an IT worker shortage? This article will demonstrate that although the skills issue is indeed central to the shortage/H-1B debate in a certain sense, it is not in the sense the industry means. Instead, it will be shown that the employers, and especially their lobbyists, tend to use the skills issue as a pretext for shunning older workers and/or hiring H-1Bs.

The skills issue is central in the following sense. The reason that employers cite to rejecting the vast majority of their applicants for programming positions, without even a phone interview, is lack of work experience in a specific programming language or other skill. This was stated by all of the HR staffers interviewed for Tables 2 and 3, and has been acknowledged publicly as well.[142] But the reasons for performing this stringent screening for specific skills are not what they might seem to be at first glance, and the evidence shows that the real issue is money, not a skill shortage.

   2. The Cappelli Principle Again—Employer pickiness extends far beyond merely requiring certain skill sets. Table 3 shows the percentage of interviewees to whom a job offer is extended. Bear in mind that this table shows the percentages of offers extended to those applicants who *do* have the specified skills, because those who are interviewed have already been prescreened according to skills criteria, i.e. the employer will have chosen the applicant's resume because of specific skills listed. Moreover, before inviting the applicant for an in-house interview, the hiring manager will have typically performed a mini-interview with the applicant by telephone, in order to verify that the person does indeed have the skills. Yet we see that even among those applicants who pass these screening procedures, employers still extend job offers to only a fraction of them. In other words, contrary to the employers' claim that it is really a skills shortage, rather than a worker shortage—a claim added only later in the debate—the data in Table 3 show that

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142. *See, e.g., The High-Tech Worker Shortage and U.S. Immigration Policy: Hearing Before the Senate Comm. on the Judiciary,* 105th Cong. 49, 51 (Feb. 25, 1998) (statement of Kenneth M. Alvarez, Vice President, Human Resources, Sun Microsystems).

there seem to be plenty of workers available who meet the employers' stated criteria.

This brings us back to the Cappelli Principle. Workers are available, but not always at a price employers are willing to pay. This is especially important relative to the skills issue, since employers have to pay a premium for the hot skills. Ironically, by insisting on specific skills, the employers drive up prices of those skills, even though they are trying to save on labor costs. Table 4 shows the premiums they were paying for some of the hotter skills during the time of the first push for expanding the H-1B program.[143]

TABLE 4
SALARY PREMIUMS FOR SPECIFIC SOFTWARE SKILLS

Oracle DBMS tool	24%
SAP	24%
HP UNIX	20%
Visual C++	20%
Java	16%

This is illustrated in another interesting way, in the case in which workers lack the given skills. The employers could hire programmers who lack the given skill and allow them to learn it quickly on the job (more on this below), but they do not want to pay the premium salary associated with programmers who have the skill. If they train a programmer in the skill, then the newly-enfranchised programmer may demand a higher salary, threatening to leave for another employer if the demand is not granted. Thus the employers claim a "shortage," when in fact it is once again simply a matter of a shortage of cheap workers.

Consider the following discussion in an employer-oriented magazine:

The problem companies face with training [in a new skill] is that as soon as old technology programmers are trained in particularly popular software, they become very valuable and become the targets of headhunters. Companies either prolong their agony by refusing to train—thus continuing the

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143. *Skills Survey: Part 2,* COMPUTERWORLD, Nov. 16, 1998, *available at* http://www. computerworld.com/news/1998/story/0,11280,44949,00.html.

shortage—or they train and watch some of their newly trained employees leave.[144]

The key point in that passage is that those employers are not willing to match the salaries paid by those competing employers. In other words, the real issue is money, not a problem of a lack of workers with given skills. The workers could easily acquire the skills, but this often prices them beyond what the employers are willing to pay.

Most tellingly, even the ITAA report, the main foundation for Congress' expansion of the H-1B program, included a similar comment about training having a backfire effect from the employer's point of view:

> Training employees in IT would seem to be a win-win for both worker and employer. And often that is the case. However, extensive training creates other issues. "You take a $45,000 asset, spend some time and money training him, and suddenly he's turned into an $80,000 asset," says Mary Kay Cosmetics CIO Trey Bradley. That can lead to another problem. New graduates trained in cutting edge technologies become highly marketable individuals and, therefore, are attractive to other employers.[145]

· Again, it is clear that Bradley is not willing to pay the salaries paid by other firms. The main issue is money, not skills.

3. An Incentive/Pretext to Hire H-1Bs—Moreover, employers in such a situation then often turn to hiring H-1Bs who, due to their *de facto* indentured servant situation, cannot "jump ship" after acquiring a hot skill. Or, often the H-1B has the skill at the time of the hire, in which case the employer can avoid the salary premium for the skill via Type I savings. The following is an example, notable in that the CEO of the firm involved testified to Congress in support of the H-1B program.

John Harrison, CEO of Ecutel of Alexandria, VA, issued a press release, discussing his testimony to the House Science Committee.[146] He expressed the usual claims made by the industry lobbyists concerning inability to find American workers:

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144. John Wentworth, *Stop-gap Measures for the IT Staffing Crunch*, WORKFORCE MAG., May 1999, at 58.

145. ITAA, *supra* note 32.

146. PRNEWSIRE, Mar. 17, 1999. The testimony is *available at* http://www.house.gov/science/harrison_031799.htm.

Something is wrong when you put an ad in the Washington Post for a software engineer and the only qualified applicants you receive are from non-U.S. Citizens," said John Harrison, CEO and co-founder of Ecutel, one of the nation's most promising high-tech companies.

In testimony before the House Science Committee today, Harrison told of the extraordinary cost and difficulty he has experienced trying to keep his company staffed with engineers. Harrison asked our nation's lawmakers to proceed on a two-pronged approach—dramatically stepped up math and science education for today's students, and for the short-term, eased immigration laws . . .[147]

Ecutel's Web site said that the firm was seeking people with the following skills:

Intermediate and Senior Engineer Positions Looking for several energetic and self-motivated Software Engineers with at least 5 years of experience or familiarity in 2 or more of the following: C/C++, TCP/IP, Mobile IP, IPSec, Device Driver, Internet RFC, Mobile Computing, GUI, RDBMS, Networking, Security, Web Development, Microsoft/Unix OSes, general Internet communication protocols.

However, Bill Halchin had ten or more years of work experience in six of the skills this ad expressed interest in, considerably more than the threshold of two stated by the ad itself. Yet he was not even called for an interview when he applied to the firm, even after two follow-up e-mail messages to Harrison.[148] A subsequent inquiry under the Freedom of Information Act (FOIA) showed that Harrison was paying many of his H-1B programmers only $35,000 per year, far below the market rate.[149]

4. Upping the Ante—Skill sets specified by employers change extremely rapidly. Cappelli noted, for instance, that "SAP programmers were in first place in the salary rankings of IT professionals in 1998 but fell to sixth place 18 months later as demand for their skills fell relative to others."[150] In other words, any shortages in

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147. *Id.*
148. Letter from Bill Halchin to Norman Matloff, Professor of Computer Science, University of California, Davis (Mar. 29, 1999) (on file with author).
149. Robert Sanchez, LCA database, *available at* http://www.zazona.com, *supra* note 130.
150. Cappelli, *supra* note 120.

specific skills are rapidly addressed by marketplace response.[151] Yet the employers keep "upping the ante," demanding that applicants match longer and longer lists of requirements. For example, an employer who required experience in the Java language in 1998 might insist on Java *and* XML in 2000, and then in 2002 demand Java *and* XML *and* experience in real estate applications. Or, whereas SAP had been sufficient in 1998 to handsomely reward those few programmers with work experience in this software, by 1999 employers had added some other qualifications to the requirements, noted an executive of an IT compensation consulting company:

> It's one thing to say that you have a year of SAP [experience], and it's another thing to say that you have a year of SAP [experience] working with one company on one project, and you actually saw the project through to completion," Foote says. "For many candidates, there's an experience factor that's missing.[152]

Note also that for any given technical skill, the employer will insist that an applicant have work experience in that skill, as opposed to mere coursework or self-study.[153] The only good strategy a worker can use to keep up with changes in technology is to hope his employer allows him to work on some projects using newer skills, thus acquiring work experience in those skills. Some employers will agree to this, while others will not. We saw earlier, for instance, that employers fear that "enfranchising" their programmers with new skills would make them either too costly or a flight risk.

    5. *A Self-Perpetuating Process*—As noted earlier, this obsessive skills screening by employers is often a pretext to shun older American workers while hiring H-1Bs. It also is a mechanism used by HR to cope with the mountain of resumes they receive. Basically, they need some way to cut the mountain down to manageable size.

    In any case, it sets in motion a self-perpetuating process: As more and more programmers gain work experience in a given skill set, the employers demand even longer lists of requirements, and shout

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    151. The industry also claimed that it could not wait months for the marketplace to adjust, due to extremely short product cycles. But this is absurd in light of the time taken to hire a programmer with the given skill sets. An industry-sponsored study in Silicon Valley found the mean time to fill a job was 3.7 months. *See* Joint Venture's Workforce Study, 6–7 (1999) (on file with author).

    152. York, *supra* note 136.

    153. Again, this was stated by all of the HR staffers interviewed for Table 2. *See also* Steen, *supra* note 135.

even louder that there is a "labor shortage." In other words, whether sincerely or not, the employers have defined the term *shortage* in such a manner that a shortage is guaranteed to occur.

6. *Talent, Not Skill Sets, Is What Counts*—The industry's highly stringent screening on skill sets is not in their own best interests. What counts is general programming talent—hiring smart programmers—not experience with specific software technologies. Studies show a dramatic 10-to-1 variation favoring talent in programmer productivity, by virtually any criterion: time to finish a product, number of errors, and so on.[154]

TABLE 5
PROGRAMMING PRODUCTIVITY FACTORS

Personnel/Team Capability	4.18
Product Complexity	2.36
Modern Programming Practices	1.92
Required Reliability	1.87
Requirements Volatility	1.78
Timing Constraint	1.66
Software Tools	1.65
Applications Experience	1.57
Storage Constraint	1.56
Virtual Machine Volatility	1.49
Turnaround Time	1.47
Virtual Machine Experience	1.34
Data Base	1.23
Schedule Constraint	1.23
Language Experience	1.20

In other words, raw analytical talent, not paper credentials, is what really counts. Another study[155] found that the factor Personnel Capability, i.e. general talent and energy of the programmers, counted for a score of 4.18 in a productivity prediction equation. This was by far the largest factor; the next largest was Product Complexity, with a score of only 2.36. The factor (Programming)

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154.   *See* TOM DEMARCO & TIMOTHY LISTER, PEOPLEWARE: PRODUCTIVE PROJECTS AND TEAMS 44 (1987). Some studies have found even more dramatic variations, such as the 20-to-1 figure found in P. Lutz, *Comparing Java vs. C/C++ Efficiency Differences to Interpersonal Differences*, COMMUNICATIONS OF THE ACM, Oct. 1999, at 109.

155.   Barry Boehm & Philip Papaccio, *Understanding and Controlling Software Costs*, 14 IEEE TRANSACTIONS ON SOFTWARE ENGINEERING 1462 (1988).

Language Experience, i.e. experience with a specific software skill, had the smallest score among the 15 factors studied, with a score of only 1.20, as seen in Table 5. Another analyst comments,[156] "The relatively small impact of language knowledge is an important fact which is not intuitively obvious. Judging by the advertisements for programmers it would seem that data processing managers tend to overemphasize specific language experience . . ."

Bill Gates has described Microsoft hiring criteria as follows: "We're not looking for any specific knowledge because things change so fast, and it's easy to learn stuff. You've got to have an excitement about software, a certain intelligence . . . It's not the specific knowledge that counts."[157] Jim McCarthy, one of Gates' software development managers at Microsoft, points out,

> The biggest mistake I see managers make as they hire people for software development teams is that they overvalue a particular technical skill. To verify this tendency, all you have to do is look at the want ads: 'Wanted: foobar programmers. Experience with whatsit required.' Obviously, conversance with a given technology is a wonderful attribute in a candidate, but in the final analysis it's an extra, not mandatory. After all, most software development technologies have a half-life of about one year.[158]

Moreover, as the McCarthy quote above points out, any competent programmer can become productive in a new programming language quickly. Even recruiters have complained that this fact is ignored by HR people.[159] Experimental data also supports "conventional wisdom" in this regard. Table 6 shows percentages of full productivity in a given programming language as a function of time.[160]

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    156. DAVID T. FISHER, MYTHS AND METHODS: A GUIDE TO SOFTWARE PRODUCTIVITY 5 (1991).

    157. Interview with Bill Gates, CEO, Microsoft, *in* Hal Lancaster, *Managing Your Career*, WALL ST. J., Nov. 8, 1994, at B1.

    158. JIM MCCARTHY, DYNAMICS OF SOFTWARE DEVELOPMENT 168 (1995). Ironically, Microsoft has grown so large that Gates' and McCarthy's philosophies don't reach down to the shop floor, and Microsoft managers are now just as obsessed with skills as the rest of the industry. *See, e.g.*, Microsoft's employment web page, *at* http://www.microsoft.com/careers/default.asp (last visited Sept. 15, 2003).

    159. *See, e.g.*, James Lardner, *Too Old to Write Code?*, U.S. NEWS & WORLD REP., Mar. 16, 1998, at 39–40. Silicon Valley employment agent Andrew Gaynor stated that shortsighted employers who are insisting on a given skill will let a job go unfilled for months, when in fact an experienced programmer without the skill could easily come up to speed in a few weeks.

    160. NRC, *supra* note 55, at 59.

TABLE 6
PERCENTAGE PRODUCTIVITY VS. LENGTH
OF EXPERIENCE IN LANGUAGE

| 1 month	83%
4 months	88%
1 year	100%

*C. Claims of a Shortage of Bachelor's Degree
Holders in Computer Science*

1. University CS Enrollment Figures—The ITAA industry lobbying group claimed throughout 1997 that computer science enrollments in universities were declining and called on the federal government to fund programs to attract more college students to the field. This, they said, caused the claimed IT labor shortage and the industry's need to hire H-1Bs.

Specifically, the ITAA report listed declining numbers of computer science Bachelor's degrees from the late 1980s to 1994. But new computer science enrollment reversed its declining trend in 1995, increasing by 5 percent in 1995–1996, and by a whopping 40 percent nationwide in 1996–1997, and then by another 39 percent in 1997–1998, as seen in Figure 1.[161]

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161. COMPUTING RESEARCH NEWS, Mar. 1997 and Mar. 1998. Actually, the ITAA had been given the information on the large 1996–1997 increase by a CRA official when ITAA distributed a preliminary draft of their report at a roundtable discussion organized by the Stanford Computer Industry Project on February 19, 1997. Though ITAA stated at the time that they were soliciting comments and suggestions for improving their report, they withheld this information about the sharp increase in computer science enrollment in the final version of their report.

FIGURE 1
NEW CS ENROLLMENT
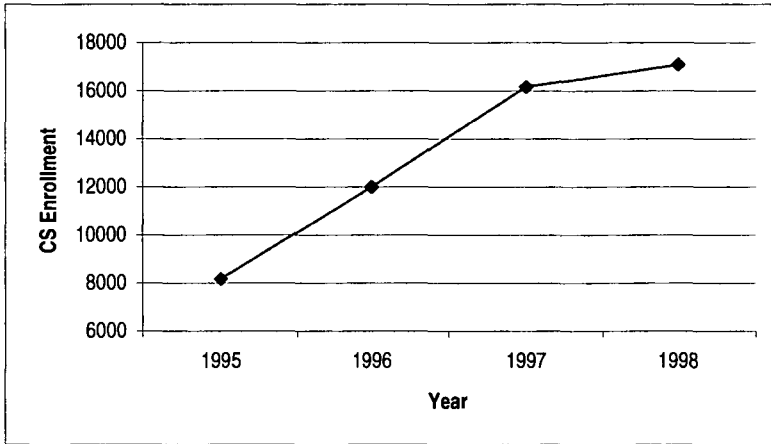
Contrary to the industry lobbyists' claims, enrollments in computer science have risen and fallen in almost exact correlation with the job market in the field. Enrollments soared in the mid-1980s and late 1990s, the boom times. They fell in the early 90s during the tech slowdown, and began to fall again around 2001 or 2002.[162]

Eventually, even the ITAA began to concede that the poor tech job market was the main factor underlying the decline in computer science enrollment during the early 1990s. ITAA president Harris Miller remarked:

> The cutbacks in aerospace and defense sent a signal to the job market that engineers and math and science degrees were not going to be as much in demand in the 1990s as they were, in fact, going to be . . . . Students were seeing the end of the Cold War, corporate restructuring, and layoffs. To tell them that they should focus on a computer science degree rather than a business or law school degree was not an easy sell.[163]

Also in the same article was the following:

> Nate Viall, an IT market researcher at Nate Viall and Associates, in Des Moines, Iowa, says the late-1980s recession began with big layoffs in 1989 at Digital Equipment, followed by cuts

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162.   *See* Sean Cavanagh, *Computer Science Attracting Fewer Applicants*, EDUC. WK., May 1, 2002, at 5; Ellen McCarthy, *Tech's Major Decline: College Students Turning Away From Bits and Bytes*, WASH. POST, Aug. 27, 2002, at E1.

163.   Steve Alexander, *Origins of a Shortfall*, INFOWORLD, Feb. 8, 1999, at 93.

at IBM. That was followed by the corporate 'merger mania' of the early 1990s, which also resulted in thousands of IT workers losing their jobs, he says.

'All through the 1990s to about 1995, there were few months when there was not some news headline about IT layoffs,' Viall says.[164]

Therefore, contrary to ITAA's assertion that students do not want to study computers due to claimed "nerd" images of the field, or lack the proper background, computer science enrollment has responded quite well to labor markets demands, rising and falling with the demand.

2. Slow Growth in CS Starting Salaries—As discussed in Part IV.A, the independent studies which investigated the industry's claim of a labor shortage did extensive analyses of salaries. One can take a similar approach to the assertions of the industry lobbyists that new computer science (CS) graduates are in short supply. It turns out that during the boom years, starting salaries for CS graduates were not rising any faster than those of graduates in fields wherein no labor shortage was claimed. On the contrary, salary growth was higher in fields such as business, as seen in Table 7.[165] The only fields with slower wage growth than CS were teaching and chemistry.

TABLE 7
INCREASE IN STARTING SALARIES, 1995–1999, BY MAJOR

Business Administration	30%
Accounting	25%
Math/Statistics	24%
Sales/Marketing	23%
Computer Science	20%

Indeed, the Economic Policy Institute (EPI) also found that wages offered to new CS graduates correlated well with those of new business graduates,[166] again despite no claimed shortage of business majors.[167]
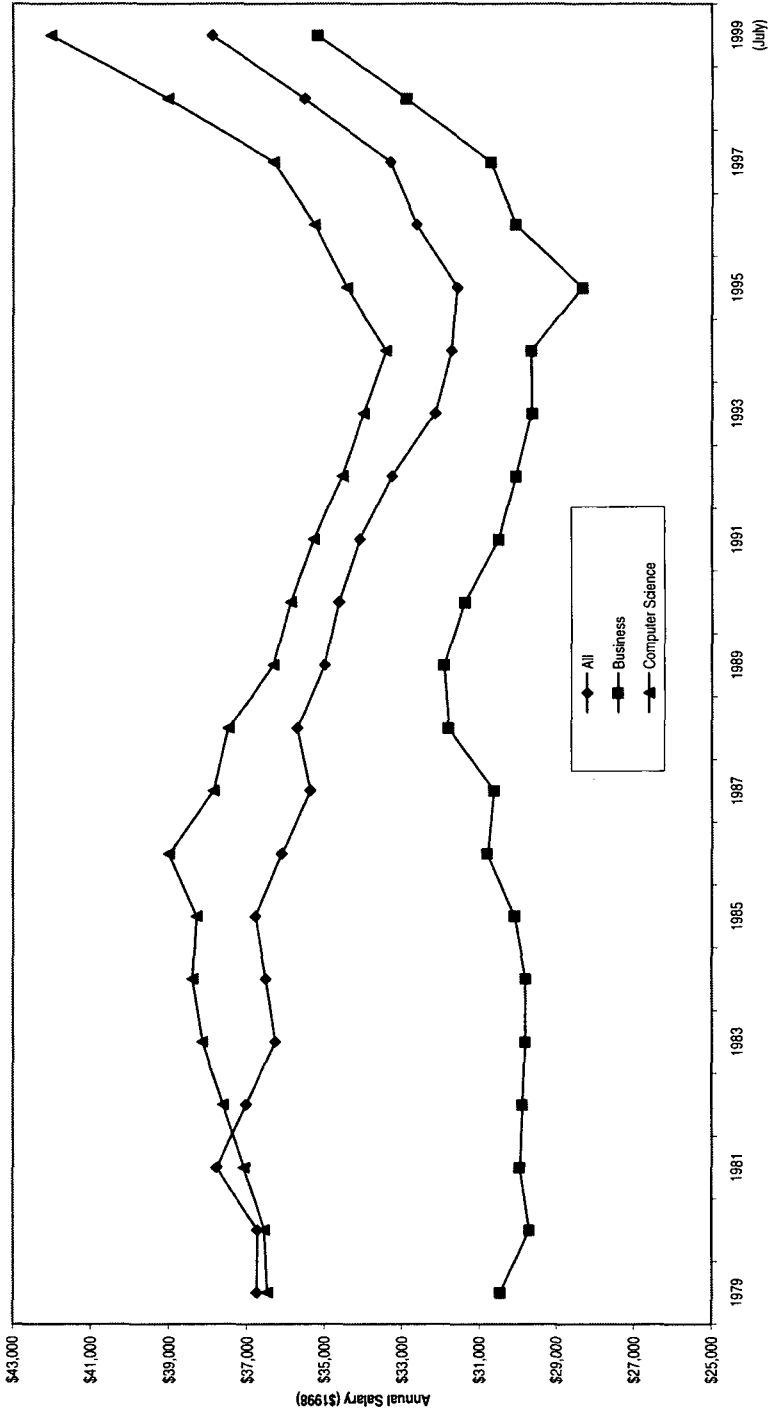
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164. *Id.*
165. Barbara Kantrowitz & Pat Wingert, *Teachers Wanted*, NEWSWEEK, Oct. 2, 2000, at 37.
166. LAWRENCE MISHEL ET AL., THE STATE OF WORKING AMERICA, 2000–2001 (2001).
167. See Figure 2.

FIGURE 2

WAGE OFFERS TO NEW COLLEGE GRADUATES BY MAJOR, 1979–1999

The industry correctly points out that computer science enroll-
ment, though increasing very sharply in the late 1990s, still did not
match the 1980s peak. However, even the levels of the late 1990s
were too high, in the sense that industry was hiring fewer than half
of computer science graduates into programming jobs, shunting
the rest into semitechnical/nontechnical positions such as cus-
tomer support.

   3. Non-CS Majors—Notably, the numbers of computer science
graduates are only of limited usefulness in assessing the labor-
market supply of programmers, since most programmers do not
have CS degrees. Dr. Robert Lerman of American University and
the Urban Institute found that

   Data from a National Science Foundation study reveals that of
   the 1.2 million college graduates employed in 1993 in several
   information technology fields (computer sciences and opera-
   tions researchers, computer programmers, computer science
   professors, software engineers, and hardware engineers), only
   about 31% had degrees in computer science. The largest
   other majors were business degrees (19%), engineering de-
   grees (10%), math (9%), and a variety of social science
   degrees (8%).[168]

Even the ITAA survey found than less that 20 percent of the IT
hiring managers mentioned a college degree as being an important
qualification.[169] Furthermore, large numbers of non-computer sci-
ence majors take at least mid-level courses in computer science.[170]

D. Claims of a Shortage of PhD and Master's Degree Holders

   The industry lobbyists often imply that a large fraction of their
H-1B workers are hired from U.S. universities where the workers
had been studying for PhDs. For example, Daryl Hatano of the
Semiconductor Industry Association testified to Congress, "Non-
U.S. citizens now represent over half of the Ph.D.s graduating from

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   168. Lerman, *supra* note 37.
   169. See NRC, *supra* note 55, at 231, though it should be noted that the NRC disagreed
with the managers' belief that a CS degree was not important, citing the opinion of a com-
puter science academic.
   170. CLIFFORD ADELMAN, U.S. DEP'T OF EDUCATION, LEADING, CONCURRENT OR LAG-
GING: THE KNOWLEDGE CONTENT OF COMPUTER SCIENCE IN HIGHER EDUCATION AND THE
LABOR MARKET (1997).

U.S. universities in semiconductor fields . . . To have access to the foreign talent graduating from America's universities, U.S. companies must apply for H-1B visas for their foreign professional workers."[171] The American Electronics Association argued that "nearly half of all Ph.D.'s graduating from American universities in the technical fields of computer engineering and electrical and electronic engineering are awarded to foreign nationals. Given this heavy investment in education, supported by U.S. dollars, it is in the national interest to retain this talent [using the H-1B program]."[172] Jenny Verderi, Intel's Manager of Education and Workforce Policy, said,[173] "We are not able to find enough qualified U.S. workers in certain disciplines year after year, particularly in the science and engineering areas . . . there has been a shortage in the areas that we hire at for quite some time—and that's primarily Master's and Ph.D. design engineers."

The lobbyists' figures about percentages of foreign students in U.S. postgraduate programs are indeed correct.[174] But the implication that the lobbyists are making for H-1Bs is not correct. On the contrary, the overall proportion of H-1B's who transitioned from U.S. universities is only about 20 percent.[175]

About 7.6 percent of workers in the general H-1B population have a PhD.[176] That figure is already much smaller than the implications made by the industry lobbyists, but in fact for computer-related H-1Bs the figure is even smaller.[177] This is due largely to the fact that most of the PhD H-1Bs are in non-computer areas, working as university postdoctoral research assistants in biology,

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171. *Immigration and America's Workforce for the 21st Century: Hearing Before the Subcomm. on Immigration and Claims of the House Comm. on the Judiciary*, 105th Cong. 99, 101–102 (1998) (prepared statement of Daryl Hatano, Vice President for International Trade & Government Affairs, Semiconductor Industry Association).

172. MICHAEL PLATZER, AMERICA'S HIGH-TECH WORKFORCE (American Electronics Association, updated June 1998). *See also* Platzer's testimony before the House Subcommittee on Immigration, *supra* note 93.

173. Jim McKay, *The H-1B Visa Debate*, GOV. TECH. MAG., Dec. 2000.

174. Some newspaper reports have erroneously stated that large numbers of U.S. *undergraduates* in computer science are foreign students. This is incorrect; only 6 percent of the computer science Bachelor's degrees nationwide are awarded to foreign students. *See* COMPUTING RESEARCH NEWS, Mar. 1998, published by the Computing Research Association. The CRA data are only for major universities. However, see also the testimony by pro-H-1B Alison Cleveland of the U.S. Chamber of Commerce before the House Committee on Judiciary, on August 5, 1999. Cleveland cited a figure of 2,165 "aliens" out of 24,098 Bachelor's degrees granted in computer science, and 4,756 aliens out of 62,114 Bachelor's degrees in engineering. Note that even these numbers are higher than the true figures, since they include all aliens, including green card holders, not just foreign students.

175. The Education Connection, REGIONAL REVIEW, Quarter 4 2000/Quarter 1 2001, *available at* http://www.bos.frb.org/economic/nerr/rr2001/q1/educonn.htm.

176. INS, *supra* note 82.

177. Note the qualifier computer-related here.

chemistry and physics. For example, in the year 2000, there were 14,778 science "postdocs" on temporary visas.[178] The number of yearly H-1B visas granted around that time was 115,000,[179] and 7.6 percent of this is 8,740. Even accounting for the fact that many foreign postdocs hold J-1 visas rather than H-1B, it is clear that the vast majority of PhD H-1Bs are university researchers in the physical and biological sciences, not computer scientists or engineers working in industry.

In order to find the PhD rate among computer-related H-1Bs, this author consulted Michael Hoefer of the INS. His data show that only 1.6 percent of the computer-related H-1Bs in 1999/2000 had a PhD.[180] The situation with Master's degrees is more complicated. Back in the 1980s,[181] the typical foreign-national programmer or engineer was indeed hired off of an American university campus, with a Master's, particularly in the computer science area.[182] In those days students were mainly from Taiwan and China. They were typically from non-computer related fields such as economics, and would get a quick Master's in computer science at a U.S. school. Afterwards, they were hired by U.S. employers. As a result, as of 1990, 56.4 percent of recent-immigrant programmers and engineers in California had Master's degrees.[183]

However, the situation changed radically during in the 1990s. The dominant ethnicity of the computer-related H-1Bs changed during that time from Chinese to Indian.[184] This was a result of aggressive marketing campaigns by Indian firms such as Tata Consultancy Services. This change was accompanied by a change in education level; the Indian firms were hiring directly from India, rather than from the U.S. university graduate programs.

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178. NATIONAL SCIENCE FOUNDATION, GRADUATE STUDENTS AND POSTDOCTORATES IN SCIENCE AND ENGINEERING: FALL 2000 (2002).

179. Carrie Johnson, *117,000 Visas Issued in Expanded H1-B Plan*, WASH. POST, June 8, 2001, at E10.

180. Hoefer, *supra* note 88. This 1.6% figure includes those with PhDs in other fields. My own analysis, along the lines for Master's degrees below, yields a figure of 0.6%, i.e. fewer than 1% of computer-related H-1Bs have PhDs in computer science. This number is more meaningful; *See infra* note 188.

181. During which time the author served as faculty Graduate Admissions Coordinator in the UC Davis Computer Science Department.

182. This, and the counter trend in recent years, are discussed in HAROLD SALZMAN, THE INFORMATION TECHNOLOGY INDUSTRIES AND WORKFORCES 37ff (Center for Industrial Competitiveness, Univ. of Mass., Lowell, 2000).

183. *See* PUMS, *supra* note 86. The term *recent* here means those who immigrated eight or fewer years earlier.

184. Hoefer, *supra* note 88.

As a result, the percentage of Master's degrees in the computer-related population plummeted. In 1997 there were 10,098 Master's degrees in computer science awarded in the U.S.[185] About 45 percent of Master's degrees are awarded to foreign students, so about 4,500 such degrees were earned by foreign students.[186] Presumably the number would be similar in 1998. In that year, approximately 76,000 H-1B visas were issued for computer-related occupations.[187] Accounting for the fact that the INS figures are for 14 months rather than a year, we have a figure of about 65,000 visas issued to computer-related H-1Bs per year. Putting all this together, we get a rough estimate that about 7 percent of computer-related H-1Bs have Master's degrees in computer science from U.S. schools.[188]

Intel's claim quoted above, that most of its H-1B workers are design engineers with Master's and PhD degrees, does not seem to jibe with the data either. The Labor Condition Applications ("LCAs") do not show education level, but even assuming all of the design engineers have a postgraduate degree and giving a generous interpretation of job titles in LCAs submitted by Intel,[189] the data show that only 73 of the 218 LCAs Intel submitted in the year 2000 were for design engineers.[190]

Furthermore, the vast majority covered by that minority of 73 LCAs would have only a Master's degree, not a PhD, according to what I was told by Intel recruiters. On October 13, 1999, a team of Intel engineers recruiting for new graduates visiting my department at UC Davis. I mentioned that I had a couple of PhDs in electrical engineering I could refer to them, one a new graduate and the other a 1992 graduate. One of the recruiters replied, "No, Intel is not very interested in PhDs." The other added that a PhD would not have enough to challenge him or her at Intel, except in the rare case of very highly specialized research areas. Even at the firm

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185. Frank B. Morgan, *Degrees and Other Awards Conferred by Title VI at Eligible Degree Granting Institutions: 1996–97*, EDUC. STAT. Q., Spring 2000, at 110.

186. Freeman, *supra* note 109.

187. U.S. IMMIGRATION & NATURALIZATION SERVICE, CHARACTERISTICS OF SPECIALTY OCCUPATION WORKERS (H-1B): MAY 1998 TO JULY 1999, at 2 (2000).

188. Hoefer's data, *supra* note 88, shows that 29.8 percent of the computer-related H-1Bs have a Master's degree. However, this includes Master's in all fields, not just computer science. Just as most programmers have a Bachelor's degree in non-CS fields (discussed in Part IV.C.3), the same is true to a large extent at the Master's level. However, since the claim made by the industry lobbyists is that the H-1Bs have advanced training due to postgraduate work, Master's degrees from another field should not be counted here.

189. U.S. Dep't of Labor, LCA Database, available *at* http://edc.dws.state.ut.us/casesearch.asp (last visited Dec. 23, 2002). The data here are for the year 2000; a similar pattern was observed for the year 1998. *See* Sanchez, *supra* note 149.

190. Note that each LCA can be submitted for multiple positions in the given job category.

which first developed the Internet, Bolt Beranek and Newman Inc., only 4 percent of the staff have a PhD.[191] In other words, the computer industry's claim that their hiring of H-1Bs is mainly at the PhD level is simply false, and the data do not support such a claim at the Master's level either.

It should be noted that the industry's implied claim that the H-1Bs who do have postgraduate degrees are somehow of higher ability is also incorrect, particularly for software. There is very little correlation between having a PhD or a Master's and doing outstanding work in the field. Even lack of a Bachelor's degree is no obstacle. None of Bill Gates, Larry Ellison and Steve Jobs, founders of Microsoft, Oracle and Apple, respectively, even has a Bachelor's degree.[192] Linus Torvalds developed the Linux operating system while he was an undergraduate.[193] Marc Andreessen developed MOSAIC, which he later refined into the Netscape Web browser, when he was an undergraduate as well. Tim Berners-Lee, the inventor of the Web, has only a Bachelor's degree, and it is not in computer science.[194]

E. Claims That H-1Bs Are "the Best and the Brightest"

Clearly, the nation benefits by bringing in "the best and the brightest" high-tech workers worldwide.[195] However, contrary to the claims of industry lobbyists that the H-1Bs tend to be "the best and the brightest," workers of extraordinary talent comprise only a small fraction of the overall population of H-1B workers in computer-related fields.

One can see this directly by considering H-1B salaries, say for 1999–2000.[196] The INS gives data separately for two H-1B

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191. BBN web page, *available at* http://www.20minutesfromhome.com/twminpages/BOLTBERANEK.html (last visited Dec. 23, 2002).

192. *See* College Dropout Alumni Association web page, *available at* http://www.geocities.com/CollegePark/7734/cdoaa.html.

193. Charles Mann, *Living with Linux*, ATLANTIC MONTHLY, Aug. 1999, at 80.

194. BBC, Oxford Features, Tim Berners-Lee, *The Future of the Web*, *available at* http://www.bbc.co.uk/oxford.features/2002/07/berners_lee.html (on file with author).

195. The author has been active in helping a number of extremely bright foreign students find jobs with Silicon Valley employers, and has strongly supported making offers to many outstanding foreign applicants for faculty positions in our Computer Science Department at UC Davis.

196. U.S. IMMIGRATION & NATURALIZATION SERVICE, CHARACTERISTICS OF SPECIALTY OCCUPATION WORKERS (H-1B): FISCAL YEAR 2000, at 3 (2002). Note that these figures give actual salaries, not prevailing wage levels.

subgroups, those who are first-time recipients and those who are renewing their visa. The latter group is paid more, so let us give the industry the benefit of the doubt here by using this group as our basis. The 25th, 50th and 75th percentile salary levels for computer-related H-1Bs were $44,000, $50,000 and $57,000, respectively.[197] Fitting a normal distribution to this, we find that 99 percent of computer-related H-1Bs made less than about $79,400. This is far below the $100,000 or more that "genius" workers in the computer field make; even the 90th percentile, arguably not "genius" level, for salaries for software applications engineers in 2001 was $109,170.[198]

The industry lobbyists say that the H-1Bs are needed to retain the industry's technological edge, but the fact is that the vast majority of technological advances in the computer field have been made by U.S. natives. This can be seen in rough form, for example, in the awards given by the Association for Computing Machinery (ACM). Of 54 recipients of the ACM System Software Award through 2001 (this is the award most closely associated with innovation in practice), only two have been foreign-born.[199]

As already noted, only about 1 percent of computer-related H-1Bs have a PhD, but some comments on the quality of this small H-1B category are of interest. Given the fact that so many PhD students in computer science are foreign students, it is not surprising that immigrants have fared much better in another ACM award category, the Doctoral Dissertation Award. Here 20 of 51 recipients of the award have been foreign students.[200] This is a rate comparable to (though somewhat lower than) the foreign students' representation in the PhD student population, thus again countering the industry lobbyists' claim that the H-1B are especially talented.

Moreover, the industry's citing of the high proportions of foreign students in U.S. PhD programs ignores the fact that the distribution is not uniform. The foreign students are disproportionately

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197. *Id.*
198. BUREAU OF LABOR STATISTICS, 2001 NATIONAL OCCUPATIONAL EMPLOYMENT AND WAGE ESTIMATES, *available at* http://www.bls.gov/oes/2001/oes151031.htm (last visited Dec. 24, 2002).
199. ACM, *available at* http://www.acm.org./awards.ssaward.html.
200. Of the 20 foreign recipients, nine have been from India, commensurate with the large number of international students from India. The remainder consists of four from Israel, and one each from China (another large source of international students in CS), Germany, Greece, Hong Kong, Norway, Spain and Sweden.

enrolled in the academically weaker universities, as seen in Table 9.[201]

TABLE 9
FOREIGN-STUDENT ENROLLMENTS IN
PH.D. ENGINEERING PROGRAMS

DEPARTMENT QUALITY	% FOREIGN-BORN
Highest Quarter	37.2%
Second Quarter	44.5%
Third Quarter	47.5%
Lowest Quarter	50.6%

Contrary to the "best and brightest" image, the U.S. State Department has found a considerable amount of fraud in terms of the H-1Bs' credentials. Officials found a 21 percent fraud rate in an audit in 2000, and stated that they believed the actual rate was much higher.[202]

F. Conclusions

The industry has offered a number of reasons for their mass hiring of H-1Bs. Yet none of these reasons withstands close scrutiny.

No major study, other than those associated with the industry, has confirmed a labor shortage, even during the boom years of the late 1990s. Even the two studies (CRA and NRC) performed by strongly pro-industry commissions suggested only a tight labor market. The study by business professor Peter Cappelli, prepared as private advice for a business client and thus arguably the most accurate, found that the employers' perceived "shortage" was a shortage of cheap labor, not a shortage of workers.

The industry's claims that H-1Bs are needed because "Johnny can't do computer science" or "Johnny doesn't want a PhD" are flatly contradicted by the data, as are the claims that "Johnny" simply isn't very good at programming even if he does study computer science.

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201. *See* DAVID S. NORTH, SOOTHING THE ESTABLISHMENT: THE IMPACT OF FOREIGN-BORN SCIENTISTS AND ENGINEERS ON AMERICA 48 (1995).

202. David Lazarus, *A Question of Fraud,* S.F. CHRON., Sept. 21, 2000, at A1.

The issue of skills—i.e. the employers' occasional claim that they hire H-1Bs simply because American programmers do not have the latest software skills—is somewhat more difficult for "non-techies" to evaluate. Many non-technical people perceive computer work as being extremely difficult and arcane, and thus might find the industry's claim here regarding skills as more plausible. Yet the quotes from Microsoft's Gates and McCarthy above show clearly that good generic programming ability, not skills in particular programming languages, is what counts. Moreover, my examples of the major advances in the industry made by people who had little or no formal training in computer science at the time they made these advances (the Netscape Web browser, the Linux operating system, entire firms such as Microsoft, Oracle and Apple, etc.) again shows clearly that what matters most is general programming talent, not specific skill sets. Furthermore, as was shown, employers reject even the applicants who do have the desired skill sets, simply because the employers do not want to pay the market price for those skills.

In other words, it really is a matter of money, after all, not shortage of workers. Employers want cheap labor, and as Part V will demonstrate, that desire is fulfilled by the H-1B program.

V. H-1Bs As a Source of Cheap Labor

As shown in Part IV, the industry's stated reasons for hiring so many H-1B workers are not supported by the data. Instead, the central attraction of H-1Bs for employers is as a means of reducing labor costs.

To show the cheap-labor nature of H-1B hiring, it is first important to lay the foundation by citing the source of the H-1Bs' exploitability. Part V.A will explain why most H-1Bs are *de facto* indentured servants. It will then present a variety of quantitative looks at the use of H-1Bs as cheap labor, and then turn to comments from the industry itself. Finally, Part V.E will show how Type I savings may be demonstrated without any data at all, simply by appealing to fundamental economic principles.

A. De Facto Indentured Servitude of the H-1Bs

The industry lobbyists have argued that the H-1Bs are not exploited, on the grounds that if an H-1B worker were paid less than

comparable Americans, he/she would simply move to another employer. For example, Stuart Anderson, the author of the ITAA report and later the architect of the H-1B expansion bills in 1998 and 2000,[203] quoted an employer as saying, "You cannot pay foreign-born engineers less. These are smart people; if you try to fool with them, they will go someplace else."[204] The harsh reality, though, is that the H-1Bs typically cannot "go someplace else," and are forced to stick with their exploitative employers.

Most H-1Bs hope to be sponsored by their employers for permanent residence, i.e. green cards.[205] This is a multi-year process. Toward the end of the 1990s, the processing time for the two largest H-1B nationalities, Indian and Chinese, was approaching six years.[206] During the time an H-1B's green card application is being processed, he/she is essentially immobile; switching employers during this time would necessitate starting the green card process all over again, an unthinkable prospect for most.[207]

This situation renders the affected H-1Bs *de facto* indentured servants. Thus, they are highly exploitable.[208] As an Australian who had worked as an H-1B in the U.S. put it, "[b]e wary of H1-B visas in the USA—you basically get shackled to a company . . . Being a non-American in the USA is almost like being a second-class citizen."[209] Murali Devarakonda, a member of the Board of Directors of the Immigrant Support Network, an H-1B organization, said, "This is legal human rights violation in America . . . You [as an H-1B] are an indentured servant, a modern-day slave . . ."[210]

This *de facto* indentured servant nature of the H-1Bs has been openly pitched to employers, euphemistically referred to as "loyalty." One immigration attorney described it well:

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203. See *supra* note 32.
204. Stuart Anderson, *They Don't Work Cheap; They Don't Steal Jobs*, INT'L EDUCATOR, Fall 1996, at 27.
205. *See, e.g.*, the comment by Stephen Yale-Loehr, an immigration lawyer and adjunct professor at Cornell Law School, in Nguyen, *supra* note 13, at 3.
206. Hanna Rosin, *A Worn-Out Welcome Mat*, WASH. POST, Sept. 16, 2000, at A1.
207. Sara Robinson, *High-Tech Workers are Trapped in Limbo by I.N.S.*, N.Y. TIMES, Feb. 29, 2000, at A12.
208. In some cases, the indentured servitude has been contractual. In a landmark court case in 2001, a court held that the onerous contracts which many H-1Bs are forced to sign amounted to illegal indentured servitude. *See* Ronald White, *U.S. Slowdown Leaves Immigrant Workers in Lurch*, L.A. TIMES, July 1, 2001, at W1. However, this Article will concentrate on *de facto* forms of indentured servitude.
209. Nathan Cochrane, *Fairfax IT: Fame, Fortune, and a Bit of Nirvana*, FAIRFAX IT, *available at* http://linuxtoday.com/infrastructure/1999071300209PS (last visited July 13, 1999).
210. *Straight Talk* (Santa Clara County Democratic Club weekly television broadcast, June 10, 2000).

[Attorney Sherry] Neal said foreign nationals may appear to be more loyal workers because they aren't as mobile as other in-demand tech workers. The Immigration and Naturalization Service must give approval before foreign nationals change jobs—a process that can take six weeks. "Some of the U.S. workers, they get a job offer and they are gone in a week," she said.[211]

Similarly, *Workforce Magazine,* a publication for HR executives, pointed out that from the employer point of view,

[T]here are two good things about H-1Bs. First, they allow you to travel the globe while you identify technical professionals who want to work in the United States. Second, the H-1B is valid only for the employer who arranges it. If you bring a technical professional into the country and he or she decides to jump ship, its likely that the ship he or she will have to jump on is the one thats going back to the home country. If the person wants to come back, he or she has to start the immigration process all over again. As a result, most H-1B visa holders demonstrate remarkable loyalty.[212]

It should be noted that the indentured servitude of the H-1Bs is attractive to all employers, including the major firms. As former Sun Microsystems manager Robert Smith put it:

Sun used to cover costs, as well as the administration, of the conversion of H-1B visa holders to green card holders in exchange for an approximate 4–5 year commitment from the H-1B visa holder ... For that period of time, Sun has an employee who will not, and in some cases cannot, jump to another company ... This situation provides companies like Sun with a relatively stable workforce at a fairly consistent pay level that doesn't need to keep pace with inflation, so to speak, as the local developers who had freedom of motion move on to their next job.[213]

Immigration attorney Jose Latour also recognized this problem of "indentured servitude" in describing for prospective foreign-national clients the advantages of the National Interest Waivers

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211. Bischoff, *supra* note 14.
212. Wentworth, *supra* note 144.
213. E-mail from Robert Smith to Norman Matloff, Professor of Computer Science, University of California, Davis (Jan. 3, 2003) (on file with author).

("NIW"), a "fast track" to a green card, in which a foreign national of truly exceptional ability may apply on his/her own, rather than the employer applying on his/her behalf. Latour cites the benefits of NIW as opposed to the ordinary green card route:

> The applicant sponsors himself/herself based upon his/her abilities, education, and experience. This means that present employment is not required, and if the applicant is employed, the employer does not have to get involved in the process. Why is this important? FREEDOM! The applicant does not have to stay with the employer for a certain number of years while the process is undertaken. Second, permanent residency is taken away from the employer as a bargaining chip in the employer/employee relationship.[214]

Only applicants of truly outstanding ability qualify for NIW, so it is not an option for most H-1Bs, but Latour's comments certainly illustrate the dilemma faced by the workers.

Even the pro-industry National Research Council report recognized the problem: "Foreign nationals dislike [labor certification, one of the stages in obtaining a green card] because the process is so lengthy (often 3 years or longer in some areas of the country) and prevents them (on pain of having to begin the process all over again) from changing employers . . ."[215]

Because of this, many H-1B workers change employers soon after obtaining their green cards. The DOL audit data associated with are shown in Table 10.[216]

TABLE 10
ATTRITION AFTER OBTAINING GREEN CARD

TIME AFTER GREEN CARD	% LEAVING EMPLOYER
0 months	11 %
6 months	17 %
12 months	33 %

The 2000 H-1B legislation made some useful technical corrections by essentially removing the per-country quotas on green cards

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214. Latour & Lleras, P.A. web site, *available at* http://www.usvisanews.com/fasttrack.html (last visited Dec. 24, 2002) (emphasis in the original).

215. NRC, *supra* note 55, at 171.

216. OIG, *supra* note 23.

and by allowing the worker to switch employers without jeopardizing the green card application in the very last stage of the process. Nevertheless, the process still takes several years, during which the H-1B still remains "loyal" to the employer.

Indeed, immediately after that legislation was enacted, immigration attorney Latour hastened to assure nervous employers that business would continue as usual in terms of indentured servitude. An employer had asked him, "Won't this [new bill] mean that H-1B employees will start jumping from job to job more often?" Latour answered that there may be some reduction in green card time, but assured the employers that "the labor cert[ification] process . . . [still] requires a trusting relationship between employer and employee . . . the need for stable employment for the realization of permanent residency remains unchanged," i.e. H-1Bs will continue to need to stick with their employers for the several years while the green card is pending.[217]

In the years of economic slowdown beginning in 2001, a new variety of *de facto* indentured servitude began to appear: Many employers stopped offering their H-1Bs green cards as part of the offer package.[218] There were so many excess foreign workers available that employers who wished to hire foreigners (again, for their "loyalty") could afford to not offer green cards. Jobs were in short supply for Americans too, but for the H-1Bs loss of job would mean loss of visa status. Thus the H-1Bs were just as beholden to their employers as before.

The H-1Bs who had been laid off, and the new workers who hoped to get H-1B visas, were so desperate that the Adea Group, a major employer of H-1Bs, openly sought them for their status of desperation, stating in a press release, "We are currently focusing on professionals with H-1B visas because they most likely have the level of experience we need for mission-critical projects and a sense of urgency in securing new employment if they have been recently laid off."[219]

The *de facto* indentured servitude of the H-1Bs is key to their being exploited as cheap, compliant labor. This is a major driving force underlying employer preference for H-1Bs over American

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217. *Available at* http://www.usvisanews.com/edit80.html (last visited Dec. 24, 2002).

218. Interview with Kim Fanning, immigration attorney at Cooley Goddard L.L.P. (Apr. 2, 2001).

219. *Adea Group Launches Recruiting Campaign for Technical Professionals on H-1B Visas in Dallas, Austin, Atlanta and Tampa*, BUSINESSWIRE, May 3, 2001. The Programmers Guild filed a complaint with the Office of the Special Counsel of the Dept. of Justice. DOJ found that Adea's actions were illegal, and Adea agreed not to engage in such actions in the future. *See The Guild Wins Legal Settlement in Discrimination Case*, THE OFFICIAL PUBLICATION OF THE PROGRAMMERS GUILD, Mar. 1, 2000.

workers. It is quite important to note in addition that another major driving force in this regard is the "loyalty" itself, i.e. the indentured servitude. Employers do not want their programmers jumping to other firms, leaving the old employers in the lurch in the midst of big projects.[220] For many employers, this factor alone makes H-1Bs the worker type of choice, even if the employers are giving the H-1Bs salary parity with comparable Americans.

B. Methodological Issues

Before getting into the details of wage exploitation of H-1Bs, it is important to emphasize that one must be extremely careful with salary studies, because if the proper variables are not adjusted for, salary differences can be masked.

For example, it is important to note that salary exploitation occurs primarily in the early years of the foreign national's time in the U.S. A typical H-1B will, as seen earlier, have *de facto* indentured servant status for several years while waiting for his/her green card. After finally obtaining the green card, the worker begins on a road to salary parity with comparable U.S. workers. Full parity may not be achieved immediately, since HR staff tends to require that salaries of new hires have some basis on their previous salaries, but a salary-conscious worker can generally achieve wages equal to those of his/her American peers within a few years after obtaining a green card.[221]

The implication of this is that salary studies which lump together all immigrant workers, both newly-arrived and long-established, may not reveal the exploitation of the H-1Bs. Even worse, if a study merely looks at foreign-born status, it will pick up those who immigrated to the U.S. as children under family reunification laws; these people had green card or citizen status when they entered the workforce and thus were not exploitable by employers.

In statistical methodology, a variable which is related to another variable under study is called a *covariate*. In the example given above, for instance, the variable under study might be salary, and one of the important covariates might be length of time in the U.S., and another might be the type of immigrant status. Failure to include important covariates in an analysis renders the results of very limited usefulness. If direct data on a certain covariate is

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220. Wentworth, *supra* note 144.
221. Whether they be natives or long-time immigrants.

unavailable, the analyst should at least make an attempt to include *proxy* variables, i.e. reasonable substitutes for the given covariate, in order to produce meaningful results.

On the other hand, the preceding discussion is implicitly concerned with what I have called Type I salary savings accrued in hiring H-1Bs, i.e. savings obtained through paying the H-1Bs less than comparable Americans. However, I have also defined what I call Type II savings, i.e. hiring young H-1Bs when the supply of young Americans is exhausted, in order to avoid hiring the more expensive older Americans. To assess Type II savings, it is necessary to remove the age covariate (even though it is still important to retain other covariates).

C. Quantitative Evidence

The following section presents the major quantitative evidence concerning the issue of whether the H-1Bs are hired as cheap labor. Again, keep in mind that this could be either Type I or Type II salary savings (or both). Since the various studies are structured differently, some of them directly address the Type I issue, while others can only show that H-1Bs are cheaper than Americans without revealing whether the savings is of Type I or II. I will present the studies roughly in chronological order, in terms of the dates during which the data was collected.

1. Work by Papademetriou and Yale-Loehr—Let us first consider some work by Papademetriou and Yale-Loehr.[222] One interesting aspect of this study is that the authors come from different sides of the H-1B issue: Papademetriou is a former DOL researcher while Yale-Loehr is an immigration attorney who actively lobbies Congress on immigration issues.[223] Their data involved labor certification applications for employer-sponsored green cards during 1988–1990. The authors tabulated job and INS jurisdiction combinations for which the mean actual wage paid to the foreign national is lower than the 45th percentile for the given job market. For computer-related occupations, they found significant discrepancies in hourly wages, as shown in Table 11.

The gaps here are sizable, ranging from 10.4 percent to 29.6 percent. It would have been more meaningful if other covariates

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222. DEMETRIOS G. PAPADEMETRIOU & STEPHEN YALE-LOEHR, BALANCING INTERESTS: RETHINKING U.S. SELECTION OF SKILLED IMMIGRANTS 66–67 (1996).

223. Yale-Loehr also is co-editor of INTERPRETER RELEASES and holds an adjunct faculty position at the Cornell University Law School.

had been accounted for, notably education, and we cannot tell whether this is a Type I or Type II situation, but in either case it is clear that the H-1Bs are generally cheaper than Americans.

TABLE 11
FOREIGN-NATIONAL VS. LABOR MARKET SALARIES

JOB	STATE	MEAN FOREIGN-NATIONAL WAGE	MEAN MARKET WAGE
Comp. Sys. Analysts and Scientists	NJ	$15.24	$21.64
Comp. Sys. Analysts and Scientists	NY	$16.28	$20.57
Comp. Programmers	NJ	$15.65	$19.74
Comp. Programmers	TX	$14.12	$15.76

2. *The UCLA Study*—Next, consider a UCLA study of engineers, based on the 1990 census.[224] The authors focused on immigrant engineers who had been in the U.S. for five years or less because, as I explained earlier, a foreign worker is exploitable mainly during the period of de facto indentured servitude. Also, to avoid racial issues, the authors compared Asian-immigrant workers with native Asian-American workers. The study controlled for a wide variety of covariates, including education level, geographical region of work, and level of English proficiency.

The UCLA study found that recent Asian-immigrant engineers make 33 percent less than their native Asian-American counterparts. This is an indication of substantial Type I savings due to hiring foreign nationals.[225]

Stuart Anderson, an active proponent of the H-1B program,[226] contended that the UCLA study did not show wage exploitation of

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224.   Paul Ong & Evelyn Blumenthal, *Scientists and Engineers, in* NEW AMERICAN DESTI-NIES: A READER IN CONTEMPORARY ASIAN AND LATINO IMMIGRATION 163 (Darrell Hamamoto & Rodolfo Torres eds., 1997). Ong, a professor of Asian-American studies and urban planning, has been a proponent of high-tech worker immigration. *See, e.g.*, Bellinger, *infra* note 229.

225.   *Id.*

226.   *See supra* note 32.

the immigrant engineers.[227] He noted that another study conducted by the UCLA authors found that having an American education accounts for a nearly 10 percent higher salary, and he asserted that the 33 percent pay gap found in the other study merely reflects lack of an American education. Yet clearly, this 10 percent figure is well short of the 33 percent overall gap the UCLA authors found.[228] Moreover, as discussed in Part IV.D, during the era covered by the UCLA study, recent immigrant programmers and engineers typically did have an American education. Finally, the 10 percent figure itself is inflated, as it includes people who had immigrated as children with their families, and thus who already had green cards or citizenship by the time they entered the labor market and were not exploitable by employers.

In any case, the UCLA authors' comments as to the meaning of the 33 percent wage gap were quite clear. They cited earlier findings that the foreign engineers may be "willing to accept lower salaries in order to obtain full-time employment in the U.S., a prerequisite for permanent residency," and the senior author, Ong, noted that "Companies took advantage of immigrants."[229]

3. The Matloff Study—This author also analyzed the 1990 census data, although concentrating on Silicon Valley.[230] An individual was excluded if he/she worked less than 48 weeks in 1989, or had less than a Bachelor's degree. In all, the data set consisted of 1,551 individuals. The predictor variables were Age (a proxy for years of experience), Foreign-Born status (1 if foreign-born, 0 if native), and Education (1 for Bachelor's, 2 for Master's, 3 for Ph.D.). This author only included immigrants who entered the U.S. in the five years prior to the date of the census.

The resulting regression equation was:

$$\text{Salary} = 657\,\text{Age} - 6744\,\text{Foreign Born} + 6135\,\text{Education} + 19187$$

In other words, if one fixes years of experience and level of education, the immigrant engineers were on the average paid nearly $7,000 less in salary than the natives. This differential is nearly 15% of the $50,000 average salary found in the data set. Again, this would indicate Type I salary savings.

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227. Anderson, *supra* note 204.

228. Anderson speculated that if the second study had been restricted to very recent immigrants, American education would have had a much larger effect.

229. Robert Bellinger, *Study Warns of Backlash, Resentment*, ELECTRONIC ENGINEERING TIMES, July 18, 1994, at 89.

230. *See* PUMS, *supra* note 86.

Regression models comprise the standard tool for analysis of salary data, but to get additional perspective this author subsequently ran another analysis on this same data set, in this case using a direct tabulation rather than applying a regression model. This tabulation was again limited to the Silicon Valley, but this time this author added the further constraints that the worker has a Master's degree (and does not have a PhD), and that the worker is at most 32 years old. For the foreign-born, the worker was included if his entry to the U.S. had been no more than eight years earlier. This author then simply computed mean salaries for all native and all foreign-born. The results were as shown in Table 12. Again, this indicates Type I savings, of about 17 percent.

TABLE 12

NATIVE VS. RECENT-IMMIGRANT WAGES

NATIVITY	MEAN WAGE 1990	MEAN WAGE 2000
Native	$51,480	68,816
Immigrant	$42,845	58,176

A simple but very meaningful data set that should be mentioned here is the age distribution of the H-1Bs. In the H-1B age distribution in general, that 61 percent are younger than age 30.[231] Among the computer-related H-1Bs, the concentration in the under-30 age group is even more pronounced: The computer-related H-1Bs have a median age of 27.4, compared to 30.2 for the non-computer-related H-1Bs.[232] This compares to a mean age of 37.2 for all programmers and engineers.[233] This illustrates Type II savings. The corresponding data from the 2000 census is displayed in the third column of the table. Here the pay of recent immigrants is about 15 percent below that of the natives.[234]

This author also broke down median wage data for computer-related H-1Bs by nationality, and another interesting pattern

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231.   INS, *supra* note 3, at 4.

232.   *See* GAO, *supra* note 66, at 15.

233.   PUMS, *supra* note 86. This statistic is for all of California, not just Silicon Valley as in note 86.

234.   As mentioned, this data is for California as a whole, but the figures for Silicon Valley are similar.

emerged, as seen in Table 13.[235] This data set is not conclusive by itself, since it does not account for important covariates like education and skills, and the pattern is arguably not perfect. Nevertheless, it certainly suggests that the H-1Bs from Third World countries are more exploitable, due to the fact that the American standard of living is so much higher than in their home countries.

TABLE 13
MEDIAN-WAGE OF COMPUTER-RELATED H-1BS, BY NATIONALITY

Australia	$75,000
United Kingdom	$74,000
Canada	$70,000
France	$64,000
Germany	$70,000
South Africa	$70,000
Brazil	$59,000
Hong Kong	$55,000
China	$55,000
Taiwan	$54,000
Mexico	$54,000
India	$52,000
Philippines	$52,000
Korea	$51,000
Russia	$50,000
Pakistan	$50,000
Ukraine	$48,000
Malaysia	$48,000
Indonesia	$47,000

4. The NSF Study—Another analysis of the 1990 census data[236] was conducted by Mark Regets of the NSF, at the request of Stuart Anderson, who was then an analyst with the Cato Institute.[237] This analysis appears to show that foreign-born scientists and engineers who have a postgraduate degree actually make slightly more (typically around 2 percent) than do natives. However, there are very serious problems with this study.

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235.   Hoefer, *supra* note 88. The countries listed are the ones which had provided at least 175 computer-related H-1B workers. Median values have been rounded off to the nearest $1,000.
236.   Supplemented in 1993 under the National Science Foundation's SEASTAT project.
237.   See *supra* note 32 for related information.

The first problem arises in the definition of foreign-born. As explained earlier, an immigrant worker is exploitable only during the time—if any—when he/she is a de facto indentured servant. A worker who was originally sponsored for immigration by an employer but who has long had permanent-resident or naturalized-citizen status is not exploitable. A worker who came to the U.S. via family immigration statutes has never had a period of exploitability. Yet this analysis includes all such workers under the rubric of "foreign-born." Since the vulnerable workers comprise only a small portion of the analysis' foreign-born sample, any exploitation effects would be largely masked.

Second, the analysis conflates the science and engineering populations.[238] The H-1Bs tend to be much more concentrated in engineering (including computer science) than in the sciences.[239] Since engineering salaries tend to be much higher than those in the sciences, the analysis is in essence comparing immigrant engineer wages to native science wages, a comparison that falsely raises the immigrant wages relative to the natives.

Third, the analysis does not account for geography. Immigrants settle disproportionately in urban areas, where wages are higher than for similar jobs in non-urban settings. This again falsely raises the immigrant wages relative to the natives.

Even with these biases the analysis' results still only showed approximate parity between immigrants and natives. This in itself shows that if those biases had been addressed, the H-1B wages would have been found to be substantially lower than those of natives, again indicating Type I savings.[240] Note by the way that the UCLA study, which did show such savings, adjusted for all three of these covariates (timing of immigration, field of work and geography) that the NSF study failed to incorporate.

   5. *The DOL Audit*—Recall that the DOL audit found that 19 percent of the H-1Bs were not being paid even the wage their employers had promised on the Labor Condition Applications,[241] as well as a myriad of other problems. They summarized,

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   238. An exception is the analysis' data on salaries in academia, where the data show natives being paid slightly more than non-natives in engineering while the immigrants have a slight edge over natives in the sciences. However, given that academic salaries—and even more importantly, titles—are less subject to negotiation than in industry, the academic data do not tell us much.

   239. For the year 1993, there were 25,523 H-1B engineers and computer/mathematical scientists but only 3,841 H-1Bs in the natural sciences. *See* NORTH, *supra* note 201, at 64.

   240. The NSF study did include at least one important covariate besides education, namely time since the last degree (a proxy for years of experience).

   241. OIG, *supra* note 23.

In our opinion, while [DOL] is doing all it can within its authority, the [green card labor certification] and LCA programs do not protect U.S. workers' jobs or wages and, therefore, neither program meets its legislative intent. DOL's role amounts to little more than a paper shuffle for the PLC program and a "rubber stamping" for LCA program applications. As a result, annual expenditures of approximately $50 million for DOL's foreign labor certification programs do little to "add value" to the process of protecting American jobs and wages.[242]

6. INS/BLS Data—Next, this Section looks at a side-by-side comparison of the INS and the BLS data, in Table 14.[243] The table shows 75th percentile wages for H-1Bs in Computer-Related Occupations and the 50th percentile figures for all U.S. Software Applications Engineers. The table shows that the vast majority of H-1B programmers make considerably lower wages than do American programmers, indicating Type I and/or Type II wage savings by employers.

TABLE 14

PROGRAMMER WAGE COMPARISON, H-1BS VS. ALL U.S.

YEAR	75% H-1Bs	50% U.S.
1999	$57,000	$66,230
2000	$61,500	$70,300
2001	$62,200	$72,370

An issue which arises in this study is that different job titles were used in the two data sets. However, both titles essentially refer to programmers. As discussed in Part III, the vast majority of the computer-related H-1Bs are programmers, and the modern job title for programmers is Software Engineer, rather than Programmer. This comparison uses the Software Applications Engineer category in BLS, since it is more "mainstream" than the somewhat higher-paid Software Systems Programmer.

7. The NRC Study—Finally, the National Research Council ("NRC") subcontracted Hal Salzman of the University of Massachusetts to study the question of cheap labor and other

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242.   *Id.*
243.   See *supra* notes 82, 187, 196, and 198.

issues.[244] The NRC states that, ". . . based on interviews with some H-1B employers, Salzman reported that H-1B workers in jobs requiring lower levels of IT skill received lower wages, less senior job titles, smaller signing bonuses, and smaller pay and compensation increases than would be typical for the work they actually did."[245]

This is Type I salary savings. However, the NRC downplayed the findings of their own commissioned report. In addition to using the qualifier "lower levels," the NRC cautioned, "However, it is unclear whether these employers are representative of all IT employers." Let us consider these points.

Salzman's report does not state how many employers he interviewed, nor how he selected them. He does make it clear, though, that "lower levels" means work normally performed by workers holding only a Bachelor's degree,[246] as opposed to research positions requiring a postgraduate degree. This is important, since as shown earlier, the vast majority of computer-related H-1Bs do have only a Bachelor's degree. Indeed, Salzman and Biswas[247] found that, "The top tier skill pool is a limited number . . . The increase in H-1B visas, at least for Indian workers who comprise the largest single group of H-1B workers, does not appear to be an expansion driven by a quest for the highest level of talent." So, at least in that sense, Salzman's employer sample is mainstream.

The NRC report goes on to say,

> That said, it is the judgment of the committee that direct employers of H-1B visa holders—especially large ones—are probably less likely than others to violate the laws and regulations that govern the H-1B program. The reason is that large employers are likely to have the internal human resources expertise to directly manage H-1B workers in their companies in a manner consistent with their corporate values and with the law.[248]

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244.   The NRC cites HAL SALZMAN & RADHA ROY BISWAS, THE INDIAN IT INDUSTRY AND WORKFORCE: PERSPECTIVES FROM THE U.S. (Center for Industrial Competitiveness, Univ. of Mass., Lowell, Apr. 25, 2000). However, the NRC reference actually appears to be HAROLD SALZMAN, THE INFORMATION TECHNOLOGY INDUSTRIES AND WORKFORCES (Center for Industrial Competitiveness, Univ. of Mass., Lowell, Nov. 2000).

245.   NRC, *supra* note 55, at 175.

246.   In SALZMAN, *supra* note 244, at 53, for example, Salzman says "the elite foreign talent has entered the U.S. workforce by way of U.S. graduate programs." *See also* pages 37ff.

247.   SALZMAN, *supra* note 244.

248.   NRC, *supra* note 55, at 176.

Yet this contradicts a point made by Salzman:

> An important qualification to these findings is that we did not
> interview employment contractors [i.e. "non-direct employers"
> in the language of NRC above]; these are the firms most often
> cited in reports of hiring H-1B workers at below-market rates
> and offering unfavorable employment conditions.[249]

The fact is that Salzman found that direct employers did indeed
underpay their H-1B workers. The pay discrepancy[250] would have
been even worse if he had included non-direct employers in his
sample.

8. Issues of Firm Size—It is also quite important to note the NRC's
phrasing above, that large firms "are probably less likely than others
to violate the laws and regulations that govern the H-1B program."
But as will be seen in Part VII, those laws and regulations are so
riddled with loopholes that employers can attain excellent Type I
savings while being in full compliance with those requirements. In-
deed, in essence the large firms wrote those laws and regulations,
through their lobbying of the legislative and executive branches of
the federal government. Moreover, there is no law at all against
Type II salary savings.

Indeed, the large firms are very much interested in H-1Bs as a
source of cheap, *de facto* indentured servant labor. Consider for in-
stance Sun Microsystems, one of the foremost lobbyists for the H-
1B expansions in 1998 and 2000. Robert Smith, a former Sun De-
velopment Manager at the Broomfield, Colorado site has described
hiring in his group between August 2000 and November 2001:[251]

> Most of the candidates that we saw or talked to were H-1B visa
> holders . . . I asked [two managers], at different times, why we
> couldn't get better qualified candidates, and that was when
> they told me that local candidates with the qualifications we
> were looking for wanted too much money . . . At that time,
> experienced Java developers were changing jobs for about

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249. SALZMAN, *supra* note 244, at 43.
250. Which, unfortunately, Salzman did not quantify.
251. Smith, *supra* note 213. *See also* Complainant's Prehearing Statement, Santiglia v. Sun
Microsystems, U.S. Dept. of Labor, Office of Administrative Law Judges, Case No.: No. 2003-
LCA-2, and Smith's comments cited earlier, in the text associated with *supra* note 213.

$100K, or more in some cases ... We did hire an H-1B ... at $80,000 per year.[252]

A manager at another major firm, Intel, stated that Intel gives such hiring preference to H-1Bs that he had to resort to recruiting on his own to get a good domestic applicant.[253] Similar situations exist at many large firms, such as this one alleged for Netscape:

"Betrayal is the word that would come to mind," said Allan Masri, a 52-year-old San Jose engineer who was laid off from his quality assurance engineering job at Netscape a year ago. His colleague, an H-1B worker with the same job title, stayed on. Masri said he spent weeks training him on things such as the XML programming language. Masri said he feels he was replaced; Netscape said he was not.[254]

Masri later stated that when his manager informed him he was being laid off, "She kept on saying I was making too much money."[255]

And it is not just the large computer software/hardware vendors who find hiring H-1Bs so appealing. It is also the computer-using firms. Take the Bank of America, for example. In 1997, the following report came out:

Bank of America's technology center is in the early stages of an unsettling cost-cutting experiment. The San Francisco-based bank is asking its computer engineers in Concord to undermine their own job security by helping to train potential replacement workers imported from India before shipping an untold number of positions overseas ...

The bank also maintains none of its Concord employees will be dropped from the payroll if the pilot program with the India workers proves to be a success.[256]

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252. Smith also mentioned that this H-1B's salary, though lower than market rates, was higher than those of several somewhat lesser-qualified members of the group who had been hired in earlier times. The latter group was subject to a wage freeze Sun had imposed on existing employees.

253. Straight Talk, *supra* note 210.

254. Bjorhus, *supra* note 75.

255. E-mail from Allan Masri to Norman Matloff, Professor of Computer Science, University of California, Davis (Jan. 16, 2003) (on file with author).

256. Michael Liedtke, *BofA Tech Workers Fear Jobs Heading off to India*, CONTRA COSTA TIMES (East San Francisco Bay Area), Apr. 27, 1997.

That latter statement by the bank proved to be false. After completion of the outsourcing program, the bank did indeed lay off its IT workers in Concord and elsewhere in 2002:

> Spreading some pre-holiday cheer, Bank of America this week announced that it is cutting 900 tech positions—with the twist that some layoff victims have to help train replacements if they want to get severance pay . . .

> The job cuts, 232 of them in the Bay Area, come as BofA is outsourcing an increasing amount of tech work abroad, particularly to India. That has earned the Charlotte, N.C.-based institution the nickname of Bank of India among disgruntled soon-to-be-ex-employees.

> Sure enough, dozens of Indian tech workers have been visiting BofA's major tech centers in Concord, Jacksonville, Fla., and other cities around the country recently. They're getting training on work they'll do back at home for about half what departing employees are paid. The bank confirms that some laid-off workers are being required to help train new ones (and not speak to the media) as a condition of receiving severance.[257]

The outsourcing involved a mixture of H-1B workers in the U.S. and counterparts in India. Pay for the H-1Bs was quite low, as shown in detail in Part VII below.

D. Other Issues

The following section discusses several miscellaneous aspects regarding the issue of H-1Bs as cheap labor.

   1. Long Work Hours for H-1Bs—First, one of the implications of the *de facto* indentured servitude of the H-1Bs is that they cannot refuse their managers' demands to work long hours. A variation of Type I savings involves working the H-1Bs long hours. Whereas American workers must be cajoled into occasional overtime work, H-1Bs can be forced. This amounts to indirect Type I salary savings, since most programmers are exempt from overtime laws. And in the case of contractors, the savings is direct:

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   257.   Jim Gardner, *Bank Job: You're Fired, Now Go Train Your Replacement*, S.F. BUS. TIMES, Nov. 22, 2002.

Raj Subbaram, a manager at HCL Perot and himself an immigrant from India with permanent resident status, often hires H-1B tech workers to fill the staffing needs of clients such as Cisco, eBay, and Sun. Among other reasons, he says foreign workers' willingness to work long hours adds to their appeal. 'The H-1B guy is ready to put in a lot of hours, up to 14 hours a day, and they don't charge for the extra hours,' Subbaram says.[258]

2. Even the Industry Admits H-1Bs are Used to Reduce Labor Costs— The industry has admitted that it desires to control labor costs and that H-1Bs provide a means to do so. The ITAA report, for instance, says,

At a certain level, in a global market, U.S. companies risk their profitability if they must pay individuals premiums beyond that which customers are willing to pay for the product or service those employees produce ... The lack of mobility of labor across international borders, whether through practical or legal restrictions, means that a current inability to hire skilled people in America pushes U.S. companies to outsource abroad or relocate facilities internationally to obtain labor at a competitive price.[259]

Similarly, consider these statements from top officers at Gemini, the first from 1998 and the second from 2002:

Robert Walley, executive vice president of Gemini, says that unless his company and others are able to find a new source of workers, "it would increase the prices of the resource pool. The people out there looking for jobs, they're demanding premium salaries now, and it will just drive that higher."[260]

Global outsourcing is a growing business, said Bob Pryor, a vice president of Cap Gemini Ernst & Young and head of the firm's outsourcing practice in the Americas. In the past, he said, US companies relied on foreign workers with H-1B visas

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258.   Diane Khirallah, *Where Does H-1B Fit?*, INFORMATIONWEEK, Feb. 4, 2002, *available at* http://informationweek.com/story.IWK20020201s0021.

259.   ITAA, *supra* note 32.

260.   Fred Katayama, CNN, Feb. 9, 1998, *available at* http://www.cnn.com/TECH/computing/9802/09/high.tech.visas/.

to reduce costs. "Now they are focusing on offshoring," or sending the work overseas.[261]

Sun Microsystems, one of the firms which has most vigorously lobbied for expansion of the H-1B program, made the following complaints about the labor market for UNIX system administrators:

> Costs continue to rise . . . . At Sun we clearly feel the hiring pinch. Qualified SA professionals have thinned out in the Silicon Valley over the years. This smaller pool of candidates has driven salary expectations even higher than they are in other parts of the country. . . . Contractors continue to inflate local salary expectations.[262]

In other words, Sun does not want to pay the market rate, suggesting that they use H-1Bs for either Type I or Type II savings.[263]

3. The Alternative of Shipping Software Work Abroad—Another aspect of the use of H-1Bs as cheap labor concerns the alternative of shipping software development work abroad, where labor is even cheaper. The industry lobbyists frequently threaten, "If U.S. firms cannot bring H-1Bs from India to the U.S., they will have to ship the work to India." Salzman nevertheless dismisses this as a motivating factor for hiring H-1Bs on the employers' part, claiming that if employers really were focused on cheap labor they would simply outsource overseas: "[Any] cost savings obtained by paying H-1B workers below market rates is . . . paltry compared to the cost savings obtained through offshore IT work."[264] However, this analysis is incorrect, because it assumes that software development work can easily be performed abroad, which is not the case.

Software development needs to be done in a face-to-face, integrated manner. If that were not the case, employers would not bother with bringing the H-1Bs to the U.S. in the first place; they would simply ship all the work abroad.

As Microsoft's Bill Gates has put it,

> For a company like Microsoft, it's worth a real premium for us to have very strong collaboration. We have found projects that

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261. Diane E. Lewis, *Shift of Tech Jobs Abroad Speeding Up, Report Says*, BOSTON GLOBE, Dec. 25, 2002, at E1. The offshoring issue is discussed below.

262. *Available at* http://www.mission-online.org/sun/hist.html (last visited Dec. 2, 2002).

263. *See supra* notes 213 and 251. Sun has long used foreign labor for cost saving overseas. For example, it boasted of hiring programmers in Russia "at bargain prices" in 1993. *See* Leslie Helm, *Creating High-Tech Sweatshops*, L.A. TIMES, Nov. 15, 1993, at 1.

264. SALZMAN, *supra* note 244, at 43, 47.

make sense to do other places, in Israel, in Tokyo for example.
But it makes sense for the bulk of our operations to be in one
location and for the foreseeable future we're going to stick
with that. We will spend what is necessary to have most of our
development groups at our headquarters and have them meet-
ing face-to-face every day.[265]

Tom Furlong, former manager of Digital Equipment Corporation's
workstation group in Palo Alto, has pointed out:

Physical proximity is important to just about everything we do
. . . The level of communication is much higher when you can
see each other regularly. You never work on the same level if
you do it by telephone and airplane . . . An engineering team
simply cannot work with another engineering team that is
three thousand miles away, unless the task is incredibly explicit
and well defined—which they rarely are.[266]

A good account of the disincentives against overseas outsourcing is
given in the NRC report.[267]
     In fact, very little software development work is shipped abroad.
According to a Merrill Lynch survey of 50 CIO's from major IT user
organizations in the US, both commercial (Fortune 500) and gov-
ernment, "only 25 percent of the CIO's outsource to India and
even those who do currently outsource only about 6 percent of
their software/services budget offshore."[268] Moreover, all indica-
tions are that in that phrase *software/services* above, the emphasis is
on services, e.g. staffing of call centers, not software.[269] Thus, it is
clear that only a minuscule percentage of U.S. software develop-
ment work is shipped abroad.
     It should be noted, however, that in those cases in which overseas
outsourcing actually is used, H-1Bs are often used as "bridges" be-
tween offshore and U.S.-based portions of a project.[270] In other
words, even in the offshoring case, the H-1B program plays a major

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265. Interview with Bill Gates, SAN JOSE MERCURY NEWS, Mar. 9, 1997.

266. AnnaLee Saxenian, REGIONAL ADVANTAGE, 1994, at 156. Furlong is referring to bi-
coastal U.S. projects; global projects are of course even more difficult.

267. NRC, *supra* note 55, at 180, 184.

268. Priya Ganapati, *Outsourcing Holds Huge Promise for India: Merrill Lynch,* INDIA
ABROAD, Sept. 13, 2002, at B2.

269. See quote of Stephanie Moore in Larry Greenemeier, *GM Taps The Offshore Market,*
INFORMATIONWEEK, Jan. 16, 2002, *available at* http://www.informationweek.com/story/
IKW20020116s0003.

270. *See, e.g.,* NRC, *supra* note 55, at 185.

role. Again, overseas outsourcing does not comprise a major frac-
tion of U.S. software development, but the "bridge" concept is
interesting, in light of the industry lobbyists' threat to move work
overseas if H-1B caps are not raised. The lobbyists use this point to
claim that the H-1B program saves U.S. jobs, but instead H-1Bs are
used to *facilitate* shipping work abroad, rather than to prevent it.

4. *Legal Fees*—Finally, the industry lobbyists claim that it actually
costs more to hire an H-1B, rather than less, due to legal fees and
other costs. But their estimates of these costs have been exagger-
ated, and even those figures are smaller than the savings in salary.

Filing for an H-1B is quite simple and cheap; the typical legal fee
for it is only about $1,500 for small employers and down to about
$700 for large employers who hire many H-1Bs. A *Computerworld*
article reported, "Congress instituted a $500 fee when it raised the
H-1B cap last summer . . . Additionally, employers pay a $110 filing
fee plus attorneys' costs. All told, companies estimate the cost of
obtaining an H-1B visa under the new regulations will range from
$1,300 to $2,500, including attorneys' fees."[271]

In a different category, that of employer-sponsored green cards,
the fees do tend to be around $10,000. However, it should be noted
that many employers have the foreign employees pay the legal fees
for green cards themselves, and much more importantly, even
when employers foot the bill, the cost is usually far less than they
save in salary. From data presented earlier it is clear that Type I sal-
ary savings per worker, totaled over the multi-year period of *de facto*
indentured servitude, is easily $50,000, often much more.

E. Conclusions

In assessing any complex issue such as this one, no single study is
alone sufficient. No study adjusts for all the important covariates.
Thus it is necessary to look at the totality of studies, and formulate
a judgment that is not only based on the data but also makes quali-
tative sense.

The data presented here consistently indicate that the H-1Bs
bring employers either Type I or Type II salary savings.[272] Let us

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271. Julia King, *ABCs & H-1Bs*, COMPUTERWORLD, Mar. 8, 1999. The $500 fee was in-
creased to $1,000 under AC 21. The industry lobbyists sometimes also cite the cost of
importing an H-1B from his home country. However, many if not most of the H-1B hires
occur in the U.S., and in situations in which the H-1B is hired from abroad, the employer
typically deducts such expenses from the worker's salary.

272. Even the NSF study, after accounting for missing covariates, is consistent with this.

consider whether this makes sense according to the qualitative aspects.

First, as shown earlier the employers' stated reasons for hiring H-1Bs do not jibe with the evidence. This already suggests that the motivation is instead reduction in labor costs. And as noted earlier, the employers themselves have repeatedly expressed their desire to achieve such a reduction.

Second, as pointed out in the NRC report,

> ... economic theory implies that an increase in the supply of IT workers, including temporary nonimmigrant workers, will cause the corresponding IT wage rates to be lower than they otherwise would have been. Theory alone does not imply any particular numerical magnitude of this effect. It is the committee's judgment that the current size of the H-1B workforce relative to the overall Category 1 IT workforce is large enough to exert a nonnegligible moderating force that keeps wages from rising as fast as might be expected in a tight labor market.[273]

Third, economic theory makes an even stronger point than the one made by the NRC, involving the effect of the *de facto* indentured servitude of the H-1Bs. An H-1B cannot move around freely in the open market to achieve the best salary, nor can she negotiate a better salary from her current employer by threatening to leave. Thus economic principle alone shows that on average the H-1Bs make less than they would on the open market.

Thus, both on quantitative and qualitative grounds, it is clear that H-1Bs are indeed commonly used as cheap labor.

VI. ADVERSE IMPACTS ON AMERICAN WORKERS

Both the size of the H-1B population, and the exploitation of the H-1Bs, have negative impacts on U.S. workers. However, different worker groups are affected in different ways, which will be analyzed in this Part.

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273.   NRC, *supra* note 55, at 187.

A. General Impact Issues

The National Research Council report states that the sheer size of the H-1B population in IT is bound to have an adverse impact on IT wages. The IT H-1B population stood at about 255,000 in 2000, or about 10 percent of the programmer/electrical engineering workforce.[274]

Moreover, even that 10 percent figure understates reality, as it includes older jobs filled before the H-1B boom of the late 1990s. During the latter period, H-1B usage was sharply increasing. Recall that the Department of Commerce calculated that 28 percent of new IT hires between 1996 and 1998 in jobs normally requiring a Bachelor's degree were H-1Bs.[275] An analysis by the Federal Reserve Bank of Boston found that in 1999, "Foreign workers accounted for half of all the new jobs created in system analysis, programming, and other computer-related occupations that year."[276]

As discussed in Part IV, there was no IT labor shortage during this period of heavy growth in H-1B usage the late 1990s. Thus the impact of H-1Bs on American IT workers during that time was substantial, especially on older workers and new graduates, as will be seen below.

It was even worse in the severe IT slowdown that began in late 2000. More than 80,000 H-1B visas were issued in 2002.[277] Noting that this was down from 163,000 the previous year,[278] industry lobbyists claimed that the system was "working," with H-1B usage being reduced as the job market shrinks. Yet in such a dire economic situation, employers cannot justify hiring any substantial number of H-1Bs. In fact, the impact on American workers is staggering, as can be seen, for example, as follows.

Applying the INS' 52 percent figure for the proportion of computer-related H-1Bs to the 2002 count of 80,000 H-1B visas granted[279] results in a figure of approximately 40,000 visas that were issued to IT H-1Bs in 2002. Meanwhile, the IT unemployment rate

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274.   NRC, *supra* note 55, at 163.

275.   DOC, *supra* note 85.

276.   Miriam Wasserman, *EllisIsland.com?*, REGIONAL REV., Quarter 4 2000/Quarter 1 2001, *available at* http://www.bos.frb.org/economic/nerr/rr2001/q1/island.htm.

277.   Mike Angell, *H-1B Program Gets More Heat*, INVESTOR'S BUS. DAILY, Nov. 20, 2002, at A4.

278.   Karen Kaplan & Alex Pham, *Industry Downturn Hasn't Killed Tech's Big Appetite for Top Talent*, L.A. TIMES, Dec. 9, 2001, at C1.

279.   *Id.*

was more than 5 percent,[280] which, using the NRC numbers[281] would work out to around 100,000 unemployed workers. In very rough terms, then, it can be argued that about 40 percent of the unemployed American IT workers were displaced by H-1Bs. Furthermore, there were an estimated 890,000 H-1Bs in the U.S. at that time,[282] which again from the INS percentage figure for IT would mean approximately 463,000 computer-related H-1B workers. This further places the 100,000 statistic for unemployed computer-related Americans in alarming perspective. Note that this is just counting formal unemployment, not including underemployment, e.g. former programmers now working as bus drivers because they cannot get programming work.

B. Adverse Impacts on American Workers Over 40

Recall the terms *Type I* and *Type II salary savings*. The former comes from paying H-1Bs less than comparable American workers, while employers attain the latter by hiring young H-1Bs in lieu of older Americans. Older workers are perceived as being more expensive than younger ones. When employers exhaust the supply of young American workers, they turn to hiring younger H-1Bs in lieu of older Americans. In this manner, the H-1B program is providing employers with cheap labor.

The Type II savings issue is of signal importance in discussing reform of the H-1B program, for several reasons:

- The magnitude of savings, and the number of Americans impacted, under Type II is arguably greater than under Type I.[283]

- Most analysts of the H-1B program, in academia, government and so on are unaware of Type II savings.

- Moreover, there is nothing at all in the H-1B worker protection statutes regarding Type II savings.

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280. Stephanie Overby, *Cap On, Cap Off*, CIO MAG., Jan. 1, 2003, *available at* http://www.cio.com/archive.010103/40_content.html. It should be noted that unemployment rates severely underestimate the degree of the problem, as was discussed in Part IV.A.3, *supra*.

281. NRC, *supra* note 55, at 64.

282. *See supra* note 277.

283. See data analyses in Part V.C.

Furthermore, as discussed in the following studies, the data demonstrates that IT workers over age 40 experience difficulty in finding work in their profession.

1. Langbein Study—First, in a study commissioned by IEEE-USA, Dr. Laura Langbein of American University found:

> Older engineers are significantly more likely to report that their job search is very difficult than younger engineers . . . Similarly, the mean age of those who said that it was fairly easy to find a new job was significantly lower than the mean age of those who did not select that response . . . older respondents report significantly more weeks of unemployment than younger respondent. Specifically, for each additional year of age, unemployment goes up by 2 weeks.[284]

2. The NRC Report—The pro-industry National Research Council report found that:

> . . . older workers are at greater risk for losing Category 1 IT jobs than are younger workers. This difference becomes even more pronounced when compared to the fact that in the rest of the economy older workers are less likely to lose their jobs than are younger workers . . . [this difference is] consistent with actions taken by employers motivated by the reduction of labor costs. For example, an employer that terminated more experienced (hence older), higher-salaried workers and hired less experienced (hence younger), lower paid workers would not necessarily be violating the statutes prohibiting age discrimination . . .
>
> . . . older displaced Category 1 IT workers take about 2.6 more weeks to find a new job than do younger displaced Category 1 IT workers, though their length of unemployment is about the same as that of older displaced workers in the rest of the economy . . .
>
> . . . younger male displaced Category 1 IT workers experience a 6.6 percent wage gain on their new job; in contrast, older male displaced Category 1 IT workers experience a 13.7 percent

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284. LAURA LANGBEIN, AN ANALYSIS OF UNEMPLOYMENT TRENDS AMONG IEEE U.S. MEMBERS 7 (IEEE-USA, 1999).

wage loss on their new job–a difference between older and younger workers of 20 percentage points . . .[285]

The data are presented in Tables 15, 16 and 17.

TABLE 15
PERCENTAGE LAID OFF

FIELD	40+ YRS OLD	< 40 YRS OLD
IT	12.3%	10.6%
Non-IT	8.2%	6.7%

TABLE 16
MEAN WEEKS TO RE-EMPLOYMENT
AFTER BEING LAID OFF

FIELD	40+ YRS OLD	< 40 YRS OLD
IT	13.5	11.1
Non-IT	13.6	10.1

TABLE 17
PERCENTAGE CHANGE IN WAGES IN RE-EMPLOYMENT
AFTER BEING LAID OFF

FIELD	40+ YRS OLD	< 40 YRS OLD
IT	-13.73%	+6.57%
Non-IT	-19.73%	-5.73%

The NRC's point that ". . . [this difference is] consistent with actions taken by employers motivated by the reduction of labor costs"

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285. NRC, *supra* note 55, at 142. NRC's term *Category 1 IT workers* basically means programmers. The NRC also says that these effects are "consistent with IT employers ending projects or product lines that rely on older technologies and skills (e.g., FORTRAN and COBOL) and beginning to invest in projects or product lines requiring newer programming approaches (e.g., object-oriented languages such as C++)." The references to FORTRAN and COBOL are misleading. Almost none of the hundreds of job-seeking older programmers I talk to each year are specialists in those languages. However, the point that the skills issue is intertwined with the age issue is important, and will be discussed later.

is very significant, showing the connection to the H-1B issue and Type II salary savings. Though it would be inaccurate to claim that the H-1B program is entirely responsible for the problems older programmers encounter in the job market—defense industry firms, which employ few H-1Bs, exhibit the same behavior—the fact is that the large pool of young H-1B workers is obviously a major factor.

 3. Manager Surveys—An *Information Week* IT manager survey presented a striking illustration of the problems which older programmers face:

> It seems safe to say that experience may not be the most valued commodity, according to a survey of 200 IT managers nationwide conducted by InformationWeek Research in May. Though age wasn't specified in the question, only 2% of the managers said they would most likely hire a worker with 10 or more years' experience. Almost half—46%—preferred to hire a worker with four to 10 years' experience, while 26% said they would hire a worker with less than three years' experience, and another 26% wanted an entry-level worker or recent college graduate.[286]

FIGURE 3
INFORMATIONWEEK POLL RESULTS
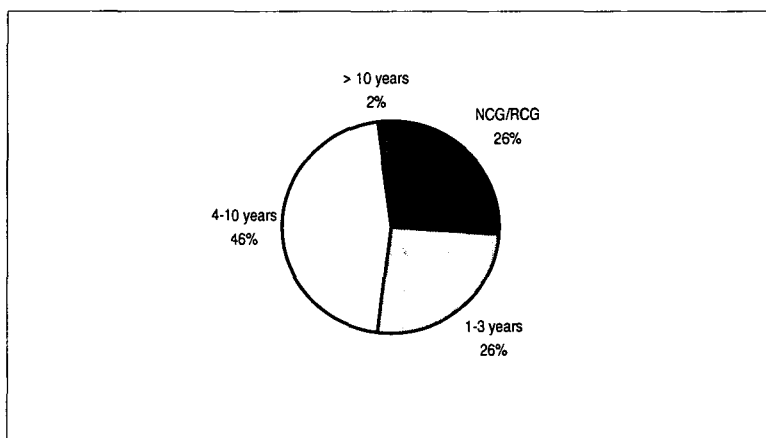
 286. Bob Violino, *The Age Factor,* INFORMATION WEEK, July 5, 1999, *available at* http://www.informationweek.com/742/agefact.htm.

Another manager survey found even more troubling problems:

Age does matter when it comes to IT hiring, according to a survey of 200 Network World readers with some degree of hiring responsibility. The survey clearly shows that younger network managers tend not to hire older workers.

Only 13% of the 30 survey respondents in the 20–30 age group hired anyone over 40 in the past year, but that percentage increased as the age of the hiring manager increased. Of the 80 network managers in the 31–40 age group, 24% had hired an over-40 person in the past year. The percentage rose to 39% for the 57 managers in the 41–50 age group and up to 45% for the 31 respondents over 50 . . .

The survey results don't surprise Kathy Nichol, who has 18 years' experience as a high-tech recruiter in the Dallas area. Nichol says she works with one thirtysomething hiring manager who gravitates toward "young fast-track managers." When Nichol has recommended older workers, her client rejected them, saying the candidate lacked energy, couldn't cut it in a fast-paced environment, or should have been further along careerwise. "He doesn't even recognize what he's doing," Nichol says . . .

Companies don't want to hire older workers for entry-level jobs because they don't want a 40-year-old reporting to a 24-year-old. "It's a cultural thing," [Nichol] says. Naturally, the company won't come right out and say age bias is coming into play, but managers will come up with some other reason not to hire that person, she says.[287]

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287. Neal Weinberg, *Help Wanted: Older Workers Need Not Apply*, NETWORK WORLD, Sept. 14, 1998, *available at* http://www.cnn.com/TECH/computing/9809/14/tooold.idg/.
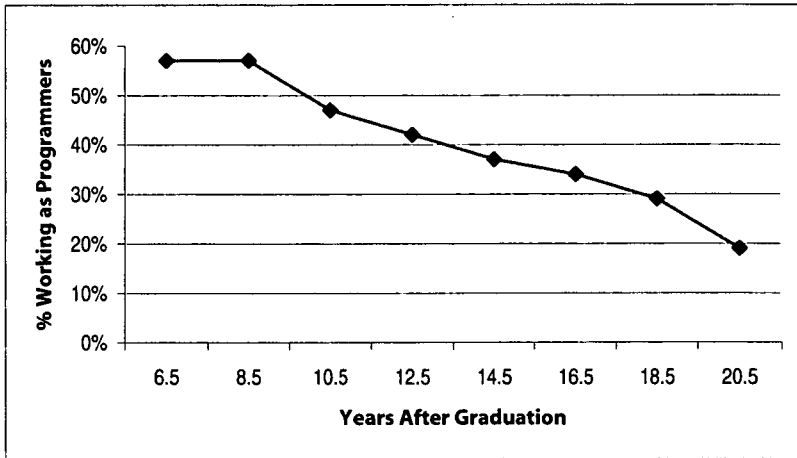
FIGURE 4
NETWORK WORLD POLL RESULTS
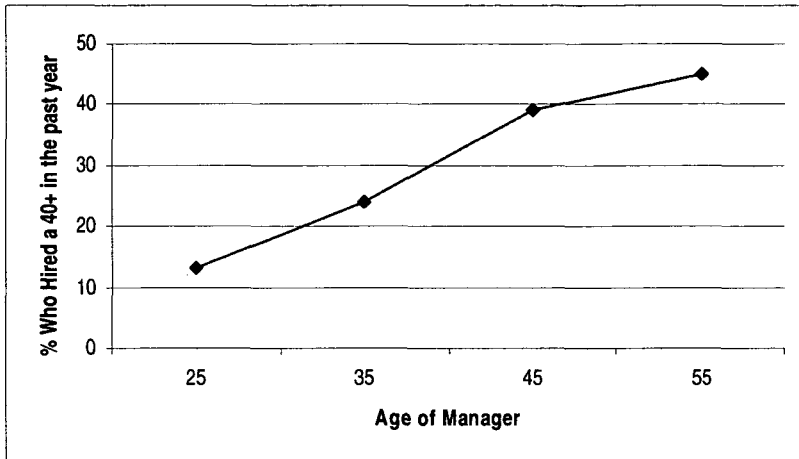
4. Resulting Attrition—As a result, many programmers leave the field when it is clear that they reach an age at which they have difficulty finding programming work.[288] An analysis of the National Science Foundation's SEASTAT data reveals a steep attrition rate. Figure 6 shows the percentage of computer science graduates working in software development various numbers of years after they finish school.

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288. The industry lobbyists claim that low programmer unemployment rates disprove assertions that older programmers are being displaced by H-1Bs. Yet, as my earlier quote of labor analyst Carolyn Veneri (*supra* note 106) pointed out, programmer unemployment rates are not informative to gauge the situation for older programmers, since many have left the field due to a hostile job market.

FIGURE 5
ATTRITION RATES FROM CS GRADS
WORKING AS PROGRAMMERS

These attrition rates are striking. Five years after finishing college, about 57 percent of computer science graduates are working as programmers; at 15 years the figure drops to 34 percent, and at 20 years—when most are still only age 42 or so—it is down to 19 percent.

Clearly part of this attrition is voluntary. But the several data sets presented earlier put this steep attrition rate in perspective: Most of those leaving the field do so because employers do not want to hire older programmers.

It should be noted that other technical fields do not show this rapid decline of work in their area. For example, consider civil engineering majors. Six years after graduation, 61 percent of them are working as civil engineers, and 20 years after graduation, the rate is still 52 percent; compare this to the decline for computer science majors from 57 percent to 19 percent seen above.[289]

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289. Industry lobbyists have tried to dismiss the large attrition rate among computer science graduates by saying "They all became managers! " But civil engineers become managers too, and yet we don't see a high attrition rate for that profession. On the contrary, my SEASTAT analysis found that among those who have been out of school 16 years or more, 13 percent of the computer science graduates were managers, while 18 percent of the civil engineering graduates held managerial positions. *See, e.g.*, Miller, *supra* note 115.

The short-lived nature of careers in this field is sharply evident in the age at which one attains Senior status at various firms, as shown in Table 18.[290]

TABLE 18
YEARS OF EXPERIENCE TO QUALIFY FOR A SENIOR POSITION

Best Buy	Senior Programmer Analyst	2 years
Compaq	Senior Software Engineer	3–5 years
Geoworks	Senior Software Engineer	5 years
Intel	Senior Software Engineer	5 years
Lotus	Senior Software Engineer	5 years
Oracle	Senior Software QA	4 years
Sun Microsystems	general technical	6 years
Corsair Communications	Senior Software Infrastructure Engineer	3 years
Baan USA	Senior Technology Engineer	3 years
The Learning Company	Senior Software Engineer	5 years

5. *Skill Sets*—As we have seen in Part VI.B.2, the NRC report cites employers' desires for "reduction of labor costs" and "newer programming approaches," i.e. the latest software skill sets, as possible explanations for the difficulties it found that older programmers encountered in the job market. Since my theme here is the impact the H-1B program has on older American programmers due to Type II salary savings, relating to the first of NRC's possible explanations above, it is important to consider the second as well. Is it really an issue of skills rather than money?

As seen earlier, the answer to this question is no. Employers recognize that a programmer can become productive in a new skill very quickly on the job,[291] but they fear that the newly-enfranchised worker would then demand a higher salary.

Thus the real issue is indeed money. Indeed, Intel, which had a representative on the NRC commission, reportedly has an active program to expel older workers, even if their performance is excellent.[292] The employer quote presented earlier compactly summarizes the problem, "I'd love to have somebody with 20 years

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290. These are drawn from specific jobs on the firms' web sites. An exception is Geoworks, whose information is drawn from a Geoworks job ad in *Tech Week,* July 12, 1999.

291. Not quickly enough, claim the industry lobbyists. Yet this claim does not jibe with the industry's actions. Employers typically go months before filling a position. *See supra* note 151.

292. TIM JACKSON, INSIDE INTEL 320 (1997).

of experience, but unfortunately I'm only paying for three or four."[293]

C. Impacts on New Graduates in Computer-Related Areas

Just as H-1Bs adversely impact job opportunities for older Americans by enabling employers to attain Type II salary savings, the H-1Bs negatively affect younger Americans due to Type I salary savings: Many employers hire young H-1Bs in lieu of young Americans, since the former are cheaper than the latter.

During the height of the Internet boom, industry lobbyists would often tell the press how "desperate" employers were to hire new graduates. They painted a picture in which new graduates had multiple offers, all with fat salaries and signing bonuses, months before they even graduated. Here, for instance, is what two industry executives testified to the U.S. Senate, concerning the bidding wars they said firms were having over hiring new graduates:[294] "Microsoft's Murray agreed that recruitment was incredibly competitive, saying, " 'It has almost become a frenzy.' " Texas Instruments' Leven added: " 'It's getting like athletics and I'm beginning to wonder if I'm living in a different solar system.' "

Yet the frenzied bidding wars were mainly for a few outstanding graduates. If you pinned one of these employers down and ask how many actual offers they made to graduates at a particular school in a given year, they admitted that it was only a handful. Amdahl, for example, made offers to only six new graduates at UC Davis during the two recruiting seasons 1998 and 1999, and the firm stated that this number was larger than for other schools.[295]

The industry lobbyists' claim that new graduates of university computer science programs could easily find good jobs in the field was also debunked in a *Computerworld* insert in college newspapers, titled *Careers Spring 1999*, which was filled with articles with job-hunting advice for graduating seniors in computer science. Again contrary to the stories fed to the press by industry lobbyists claiming that most new graduates in computer science were besieged

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293. Steen, *supra* note 135.

294. Patricia Wilson, *U.S. Tech Firms Seek Foreign Employees to Fill Void*, Reuters, Feb. 25, 1998.

295. E-mail from Jessica Boverio, Amdahl recruiter, to Norman Matloff, Professor of Computer Science, University of California, Davis (Feb. 1, 2000) (on file with author).

with job offers from anxious employers, the truth is that finding a job was not so easy after all. The insert starts by stating,

> As a computer science or engineering major at an institution of higher learning, you already have taken large strides toward building a lucrative career. Soon, however, you will be pounding the pavement alongside a horde of other recent grads armed with resumes touting the same impressive information technology credentials that you have. How do you distinguish yourself?[296]

If employers are courting the new graduates so heavily, why the need to "distinguish oneself"? The insert then says this more explicitly: "The Silicon Valley job market is so crowded that it isn't always easy for even the best-apportioned IT grads to differentiate themselves even with a broad array of programming language experience . . . Having fantastic technical skills just isn't enough in the highly competitive world of information technology . . ." The job market is "crowded," "highly competitive"? This certainly is not what the industry lobbyists were telling us. They claimed it was the employers who must compete for workers, rather than *vice versa.*

And it is not just an issue of finding a job, but rather of finding a technical job in which the graduates can make use of their skills. Even as of 1990, only 57 percent of new computer science graduates got programming jobs,[297] and my student surveys have shown the figure has been much lower in the last few years. To a large degree, this is due to employer preference for the cheaper, immobile H-1Bs.

This was illustrated well in comments by Steve Yurash, an engineering manager at Intel, in a panel discussion on television in Silicon Valley.[298] Another panelist was Murali Devarakonda, a director of the Immigrants Support Network, a national group of H-1Bs which was lobbying Congress to pass legislation to alleviate their *de facto* indentured servant status. Yurash discussed the fact that, as a manager at Intel, he had to take matters into his own hands in order to NOT hire an H-1B at Intel:

> It's a matter of what are the mechanisms, how does a hiring manager in Silicon Valley get a hold of résumés? What happens is, you get a lot of H-1B résumés. I had to go out myself,

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296. Joanie Wexler, *Help Wanted: IT Strategies,* COMPUTER WORLD CAREERS, Spring 1999, *available at* http://www.computerworld.com/news/1999/story/0.11280,34988,00.html.

297. *See* Figure 6.

298. *Straight Talk, supra* note 210.

instead of relying on the Personnel Dept., to go and advertise at several colleges where I thought I would be able to find some good employees. And lo and behold, I found a very good one at Cal Poly, Pomona.

Table 7 shows that starting salaries for new computer science graduates during 1995–1999 rose much more slowly than for other fields. One major difference between computer science and the other fields listed such as business administration and accounting on the other hand is strong the presence of H-1Bs in computer science labor pools. Yurash's comments show how this is occurring.

D. Impacts on PhDs

As already stated in Part IV.D, about 50 percent of PhDs in computer science at U.S. universities are awarded to foreign students, many of whom subsequently work as H-1Bs. This is an aspect of the H-1B question which grabs the interest of many Americans, who wonder how it has come to pass that so few American students seem interested in pursuing a doctorate in what is putatively one of the most dynamic topics in the world today. This alone demands some comment. Even more interesting is the fact, to be shown below, that in the late 1980s a group of policymakers in the U.S. government consciously planned for the situation we have today, i.e. to laden our PhD programs with foreign students, with a very familiar goal—to hold down PhD salaries in engineering and science.

Thus, even though I have demonstrated that PhDs only comprise about 1 percent of computer-related H-1Bs, it is an aspect of the H-1B program which is important to the American public, and which once again boils down to an issue of cheap labor. It will thus be addressed here.

First, why do so few American computer science students pursue a PhD? The answer is that it simply does not pay. During the five or six years of doctoral study, a PhD student is foregoing several hundred thousand dollars of income he/she would make in industry during that time. PhD salaries in computer science are higher than those for Bachelor's degree holders, of course, but not sufficiently higher to overcome this loss of income. The NRC study calculated that "Assuming a fully supported 5-year doctoral degree (effectively tuition and fees totaling zero), the total earnings [in comparing a

PhD with a worker holding only a Bachelor's] equalize in about 50 years."[299]

In other words, for most workers, the PhD never catches up financially. Add to that the perception—largely correct, as we saw earlier—that a doctorate is not necessary in order to make pathbreaking contributions in the computing world, so most American students simply do not see the point of pursuing a PhD.

The lopsided financial comparison of a PhD and a Bachelor's stems from the fact that the salary premium for a PhD over a Bachelor's is not large compared to other fields, as seen in Table 19.[300]

TABLE 19
SALARY PREMIUMS PAID TO PHDS RELATIVE
TO BACHELOR'S GRADUATES

Computer Science	38.7%
Economics	116.0%
Political Science	150.0%

Why does a PhD bring such a small percentage salary premium? As mentioned above, a group of policymakers in the federal government actually planned for this to occur. The central factor underlying the small magnitude of the salary premium in the CS case is the H-1B and related foreign-labor programs. A 1989 policy paper by Peter House, Director of the Policy and Research Analysis Division of the National Science Foundation warned of a trend of increasing PhD salaries in science and engineering, and proposed remedying this "problem" via having large enrollments of foreign students in U.S. PhD programs.[301] The NSF paper not only noted that the foreign influx would hold down salaries, but also conceded that this lid on salaries would dissuade domestic students from pursuing a doctorate:

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299. *See* NRC, *supra* note 55, at 245.

300. Edwin S. Rubenstein, *Piled Higher and Deeper*, AMERICAN OUTLOOK, Fall 1999.

301. Eric Weinstein, *How and Why Government, Universities, and Industry Create Domestic Labor Shortages of Scientists and High-Tech Workers*, NBER, MIT, 1998, *available at* http://nber.nber.org/peat/PapersFolder/Papers/SG/NSF.html#SG (last visited Jan. 6, 2003). The Weinstein paper also chronicles the NSF's lobbying of Congress to incorporate a major science and engineering component into the Immigration Act of 1990, by projecting a science and engineering shortage. That shortage never materialized; on the contrary, there was a science and engineering glut in the early 1990s, causing the NSF to come under congressional scrutiny. *See also* Daniel S. Greenberg, *A Shortage of Scientists and Engineers*, WASH. POST, Aug. 18, 1991, at C7.

A growing influx of foreign PhDs into U.S. labor markets will hold down the level of PhD salaries to the extent that foreign students are attracted to U.S. doctoral programs as a way of immigrating to the U.S.[302] A related point is that for this group the PhD salary premium is much higher [than it is for Americans], because it is based on BS-level pay in students' home nations versus PhD-level pay in the U.S. . . .

[If] doctoral studies are failing to appeal to a large (or growing) percentage of the best citizen baccalaureates, then a key issue is pay . . . A number of [Americans] will select alternative career paths . . . For these baccalaureates, the effective premium for acquiring a PhD may actually be negative.[303]

A foreign student in a PhD program who wishes to obtain a U.S. green card will typically be sponsored for an H-1B visa by a U.S. employer, and the foreign national will remain in H-1B status for the duration of the several years it takes for the employer-sponsored green card to be processed.

Note by the way that the influx of foreign students also holds down graduate assistantship pay, in the same manner as described for industrial pay above. This further dissuades American students from pursuing a PhD.

To be sure, some of the foreign doctoral students are indeed of truly outstanding talent. As discussed in Part IV.E, their immigration should be strongly supported. But they comprise only a small proportion of the foreign student population in PhD programs and that population is used, in effect, in the U.S. as a source of cheap labor.

E. Immigrant Entrepreneurship

The industry lobbyists have also claimed that the immigrant tech specialists have actually *increased* job opportunities for American programmers and engineers, by working on new products which lead to job creation, and also via entrepreneurship.[304]

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302. They could also try immigrating directly, i.e., become H-1Bs right after obtaining their Bachelor's degrees. However, PhDs go onto a faster, safer green card track. Moreover, by being already based in the U.S. when they enter the job market, they have more control over the type of job they get, and thus are somewhat less susceptible to exploitation.

303. *Id.*

304. *See* Cappelli, *supra* note 120.

The first claim is an obvious fallacy. The employers could fill those positions with Americans (U.S. citizens and permanent residents) instead of H-1Bs and still get the job-generating effect. But the second claim, though also misleading, is more subtle. The industry lobbyists cite a 1999 study by a UC Berkeley urban planning professor, AnnaLee Saxenian, showing data on Asian immigrant entrepreneurship in Silicon Valley.[305] However, Saxenian's data show that the rate of immigrant entrepreneurship is no higher than, and in fact is likely less than, immigrant representation in the workforce. She finds that the Asian immigrants comprised 21 percent of the scientists and engineers in the technical workforce in 1990, but founded only 19 percent of new businesses during 1985–1989. By the year 2000, the Asian-immigrant proportion of the technical workforce had grown to 37 percent,[306] while their proportion of new business lagged behind at 29 percent, according to Saxenian's data.

It must also be pointed out that these firms may not employ many programmers and engineers anyway. For instance, according to Saxenian, 36% of the Chinese-owned firms are in the business of "Computer Wholesaling," meaning that they are simply assemblers of commodity PCs, with no engineering or programming work being done.[307]

Moreover, as Saxenian notes, the situation is even worse because the immigrant entrepreneurs—and for that matter, immigrant managers in non-immigrant—founded firms—tend to hire only from their own immigrant ethnic groups. Those jobs are largely not open to the general workforce. This can be seen quantitatively from, for instance, the study by B. Lindsay Lowell of Georgetown University, who found that " . . . a study of the top 100 companies employing H-1Bs in 1998 shows that 60 percent of their CEOs had South Asian surnames."[308] Another researcher found that at Cadence Design Systems, a prominent computer-aided design (CAD) software firm, "foreign-born Chinese-American engineers may represent as many as 80 percent of the technical staff."[309]

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305. ANNALEE SAXENIAN, SILICON VALLEY'S NEW IMMIGRANT ENTREPRENEURS (Pub. Policy Inst. of Cal. (PPIC), 1999). PPIC is funded by an industry-related source, William R. Hewlett, co-founder of Hewlett-Packard.

306. *Supra* note 86.

307. SAXENIAN, *supra* note 305.

308. B. LINDSAY LOWELL, H-1B TEMPORARY WORKERS: ESTIMATING THE POPULATION, INSTITUTE FOR THE STUDY OF INTERNATIONAL MIGRATION 11 n.4 (Inst. for the Study of Int'l Migration, Georgetown Univ., 2000).

309. Melanie Erasmus, *Immigrant Entrepreneurs in the High-Tech Industry, in* THE STATE OF ASIAN PACIFIC AMERICA: REFRAMING THE IMMIGRATION DEBATE 180 (Ronald Lee & Bill Ong Hing eds., 1996).

The San Jose Mercury News ran an in-depth analysis of the situation, finding that:

> ... even among engineering professionals, subtle ethnic division is part of the valley's culture.

> A half-dozen university researchers studying the valley's workplaces say the segregation patterns are disturbing.[310]

> "You're seeing more and more firms that are homogenous ethnically, from the entrepreneur all the way down to the production worker," said Edward Park, a University of Southern California sociologist who has visited dozens of Silicon Valley firms over the past decade ...

> Workers say the tension is especially pronounced between engineers from India and mainland China. The Indian engineers coming on temporary H-1B work visas now outnumber the Chinese by 5-1 ...

> ... one Intel engineer who emigrated from mainland China [said] "Many Chinese think that Congress has a policy of favoritism toward India." He asked that his name not be used, saying it would hurt him in his largely Indian work group.

F. Conclusions

The magnitude of the H-1B population significantly impacts American IT workers adversely. This occurs both at the younger (new graduate) and older (age 40+) ends of the age spectrum. Moreover, despite the small number of computer-related PhD H-1Bs, the adverse impact on PhD salaries is substantial.

VII. PROPOSALS FOR REFORM

Demetrios Papademetriou, a former Labor Department immigration official, once observed, "Do you want me to call it a sham?

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310.   Ken McLaughlin & Ariana Eunjung Cha, *Divisions: Segregation Trends Emerge in High-Tech Industry, Experts Say*, SAN JOSE MERCURY NEWS, Apr. 16, 1999.

Do you want me to call it a hoax? Sure it is. This program has never worked, and it never will."[311]

Assuming that Dr. Papademetriou's utter pessimism is too simplistic, what, then, can be done to fix H-1B? To answer this question, Part VII will first show why the current laws and regulations regarding H-1B are failing, and then discuss proposals—my own and those made by other—for reform.

A. Why the Current Laws and Regulations Fail

The law requires that the employer of an H-1B pay at least the *prevailing wage*, i.e., the average salary earned by American workers of comparable experience, education and skills. Industry lobbyists cite this law as ensuring that employers cannot underpay H-1Bs, i.e., will not attain Type I cost savings by hiring H-1Bs. But the regulations are riddled with such gaping loopholes as to render this law virtually useless.[312] These loopholes, which are well-known to Human Resources (HR) staff, immigration lawyers and so on, include (but are certainly not limited to) the following

- The DOL recognizes a wide variety of sources of wage data from which the employer can choose in claiming prevailing wage for a given position. These sources include both government agencies—the State Employment Security Agencies (SESAs)[313]— and wage surveys conducted by numerous private firms. Moreover, different data sources are collected in different manners, using different definitions of job titles, different granularities in categorization of workers, and so on. As a result, there is wide variation from one survey to another, thus allowing the employer to select the lowest of many widely varying figures.

- Job titles, most of which are far too coarse, are not standardized across data sources. A given job title

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311.   Mike McGraw, *Boon or Boondoggle: Visa Programs Hurt U.S. Workers, Foster Abuse*, KANSAS CITY STAR, July 16, 1995.

312.   Therefore, the laws imposing penalties on employers who violate the law are virtually useless. Most employers who use H-1Bs for Type I salary savings have nothing to fear, as they are in full compliance with the regulations. The law actually states that the employer must pay the higher of the prevailing wage and the *actual wage*, the latter being the average wage of similar workers in the same firm. This too is subject to abuse via a myriad of loopholes. *See, e.g.*, FRAGOMEN, *supra* note 24.

313.   Also known as State Workforce Agencies (SWAs).

might encompass many quite different jobs with very different wage levels. For example, in some surveys the category Software Engineer could include both programmers who do operating systems kernel work—one of the most challenging types of software development—and those who write very simple application software. An employer of an H-1B kernel programmer could use the average salary of all Software Engineers as the prevailing wage, even though it would be far lower than what kernel programmers make. Even more importantly, a programmer could have job titles such as Programmer, Software Engineer, Systems Analyst, Member of the Technical Staff, and so on. The employer can then exploit the fact that these titles are defined differently in different surveys, and then simply assign to the H-1B a job title for which one of the surveys quotes a lower average salary.

* In the open labor market, specific software skills play a major role in determining salary.[314] Yet most surveys do not take specific skill sets into account, and the employer of an H-1B can simply choose a survey which doesn't do so. In this way, the employer can hire an H-1B programmer who has a "hot" skill worth, say 20 percent more in the open market, but pay him the salary of a general programmer—all in full compliance with DOL regulations.

* Levels of experience, education, skill sets and so on are also generally tabulated in a very coarse manner, if even tabulated at all. For example, an employer who wishes to hire an H-1B who has a Master's could choose a survey which doesn't take education into account, and thus get a Master's-level worker for the price of a Bachelor's level worker.

As an example, taking simple information from an entry from the DOL's Online Wage Library[315] for 2002 wages of Software Applications Engineers in Santa Clara County, California (i.e. Silicon Valley), the data reveals much about the H1B program. The entry lists Level I (0–2 years of experience) and Level II (more than 2

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314.   *See* Table 4.

315.   U.S. Dep't of Labor, Employment Training Administration, Online Wage Library, *at* http://www.flcdatacenter.com (last visited Sept. 17, 2003).

years of experience) mean wages of $62,171 and $97,864, respectively.

First, the prevailing wage pertains to the *job*, not the worker. The employer can define the job to be Level I even though the worker may have 4 or 5 years of experience. The employer thus hires a more-experienced worker for the salary of someone with less experience. As immigration lawyer Sean Olender puts it, "This disparity often results in very experienced candidates being underpaid."[316]

Oleander goes on to say that the disparity can result in "very inexperienced candidates being overpaid," but more likely the employer will choose a different wage survey, or simply hire the worker under another job category. Another possibility is to try the Service Contract Act data, also available through DOL; this data, for instance, defines four experience levels for the Programmer title, rather than just two.

Second, note that education and skill sets are not mentioned in this SESA entry at all, again because the prevailing wage is based on the job. For instance, as long as the job does not require a Master's degree, the employer need not account for the H-1B's Master's degree in determining prevailing wage. Moreover, even though the employer may be hiring the H-1B because she may have experience using the XML data language, the general job category Software Applications Engineer would not have such a requirement, and thus the prevailing wage determination need not account for XML experience.

These points were well illustrated in an investigation of actions by the Bank of America by John Miano of the Programmers Guild.

> In 2001 Bank of America (BofA) in Charlotte, NC "outsourced" its Human Resources (HR) functions to a company called Exult. As part of the arrangement, the Bank of America employees supporting these functions were made Exult employees.
>
> At the end of 2001, Exult announced it was "outsourcing" its computer programming work to two "H-1B bodyshops," HCL and Hexaware. Unlike in the previous "outsourcing," the existing employees were fired and replaced by foreign H-1B workers. The American BofA/Exult employees were forced to

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316. Oleander law office web page, Prevailing Wage Analysis, *at* http://www.usvisa-law.com/prevaili.htm (last visited Jan. 9, 2003).

train their replacements in order to collect a severance pack-
age.

The affected employees had very specialized skills in that they
worked with PeopleSoft and Oracle ... reported salaries
[were] $70,000–$90,000 for the BofA/Exult employees who
lost their jobs ...

Attached below is [a Labor Condition Application] filed by
HCL for some of the H-1B replacements at BofA/Exult. The
salary for the H-1B workers is $39,184, about half of what the
people they replaced made ...

The first step used here in the wage depression process is to
call the H-1B workers generic "systems analysts." So instead of
using the higher-than-average wage for the specialized skills of
Oracle and PeopleSoft, the employer uses the wage for systems
analysts as a whole.

... employers can get a prevailing wage for Level 1 and Level
2 ... which in this example are $41,246 and $69,618 respec-
tively. So now the employer claims the H-1B workers are
"Beginning level employees" and uses the lower wage as the
prevailing wage.

The law only requires H-1B workers to be paid within 95% of
the prevailing wage. The employer takes 95% of $41,246 and
comes up with a wage of $39,184. Thus, the company is paying
the H-1B workers about half of what the workers they replaced
made.[317]

It is important to reiterate that all of this appears to be fully
compliant with the regulations. The employer does not have to take
skill sets, e.g. PeopleSoft, into account, and the job titles are vague
enough that these jobs could be described as Systems Analyst posi-
tions. Nor do the regulations forbid hiring a more experienced
worker into a Level I job and paying Level I wages. It is also not a

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317. JOHN MIANO, *How to Underpay H-1B Workers,* Programmers Guild web site, *at*
http://www.colosseumbuilders.com/Guild/h1b/howtounderpay.htm (last visited Jan. 8,
2003).

violation of the H-1B statute to lay off Americans and replace them with H-1Bs.[318]

The loopholes are so pervasive and intricate that immigration attorney Joel Stewart has boasted, concerning the green card process that most H-1Bs undergo and which also uses prevailing wage, "[e]mployers who favor aliens have an arsenal of legal means to reject all U.S. workers who apply."[319]

Another key point is that H-1B law is concerned only with preventing Type I salary savings, not Type II. There is nothing in the law or regulations aimed at employers who hire younger H-1Bs in lieu of older Americans.

B. A Proposal for Reform

This section will discuss reform of the H-1B and employer-based green card systems, as well as of related nonimmigrant visa types, such as the L-1 visa for intracompany transfers, under the following rubric of goals:

- First, reform must remove the employers' ability to attain both Type I and Type II salary savings. The latter is just as important as the former.

- Second, beyond salary issues, reform must remove the employers' ability to hire guest workers for the reasons of their "loyalty." The guest workers must be allowed full mobility in the labor market, including during most of the time they are being sponsored for green cards.

- Third, reform must include *all* employers of guest workers. As discussed earlier, the abuses of the program include many large firms, contrary to the claims of the industry lobbyists.[320]

- Fourth, reform must include guest workers of higher-level educational qualifications. As discussed in Part VI.D, these workers are subject to abuse too, and do have adverse impacts on Americans.

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318. Unless the employer is considered H-1B-dependent, a category comprising only 50 out of 50,000 H-1B employers. *See supra* note 51.

319. Joel Stewart, *Legal Rejection of U.S. Workers,* IMMIGRATION DAILY, Apr. 24, 2000, *available at* http://www.ilw.com/lawyers/colum_article/col_joels/2000,0424.shtm.

320. *See, e.g., supra* notes 75–79.

- Fifth, reform must not apply only to times of economic slowdown. Many American workers were displaced during the boom times circa 1998.

- Sixth, reform must include not only the H-1B program, but also related alternative work visas such as L-1, which can be used as substitutes for H-1B.

- Finally, the guest worker and employer-sponsored green card processes must be streamlined. Currently there is an elaborate bureaucracy which annoys employers while providing little or no protection to U.S. workers.

The crux of this proposal is a radically revamped, *integrated* guest worker and green card processing system with the following features:

1. *Scope:*

The proposal would apply to all computer- and engineering-related (CER) guest workers, including those in the present H-1B and L-1 nonimmigrant programs, as well as the employment-based EB-series green card categories. In other words, CER workers would be removed from the coverage of those programs, and covered by the new one proposed here. Yearly caps in those existing programs would be reduced accordingly.

Employer Eligibility:

To be eligible for hiring a guest worker in a given job, the employer must not have laid off Americans in the same OES job category within the past 6 months; must attest that she will not lay off Americans in the same OES job category within the next 6 months; must not have any more than 15 percent of her technical workforce consisting of guest workers;[321] and must not have been found to be a violator of guest worker hiring laws in the past.

The wage paid for the position must be at least equal to the median national wage for the given job category, according to the government OES data.[322]

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321.   Note the qualifier *technical.*

322.   There are no levels of experience factored into this median. It is simply the median over all workers in the given profession. For example, the OES figure for the 50th percentile (i.e. median) salary for all Software Application Engineers in 2001 was $70,210; *see supra* note

> In addition, the employer must attest that the wage is "competitive," given the nature of the position, education and skills required and so on; however, this would not be subject to government review, except in the case of an enforcement action.

The Job Advertisement Period:

> This phase would replace the current H-1B Labor Condition Application with a public, Web-based process. An employer who wishes to hire a guest worker would first add an entry to a fully-public DOL database on the Web, listing the nature of the job and the salary range to be paid. The employer need not have an actual foreign national ready for hire, but the job must be real, ready to be filled if qualified Americans apply.

During this phase of the process, American workers who see the database entry could apply to the employer for the position. If the employer fills the position with an American, the employer then would mark the database entry accordingly.

If, however, the position is still unfilled after 30 days, the employer would have automatic permission to hire a guest worker, without any DOL review. As a condition for this, the employer must attest that no American applicant for the position possessed the minimum requirements for the position and was willing to work at a salary in the stated range. The employer must keep on file her reasons for rejecting the American applicants in case of a future enforcement action, but would ordinarily not have to make such information public.

The employer would be required to update the database to reflect the foreign hire, and would be required to state the main qualifications of that worker, specifically including his college degrees and subject majors, and his work experience. The employer need not state the worker's salary for public inspection, but it must be at least the minimum stated in the database, and the employer must enter the worker's salary in a nonpublicly-accessible portion of the database for DOL use. In addition, the employer

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198. This idea is borrowed from the recent AFL-CIO/CWA proposals to reform H-1B, in *AFL-CIO Unions, CWA propose H-1B reforms*, TechsUnite.org, Dec. 20, 2002, *available at* www.techsunite.org/news/techind/h1breforms.cfm (last visited Aug. 21, 2003). Employers may argue that this requirement harms guest workers who are new graduates, but as AFL-CIO/CWA points out, "This will help assure that these guest workers will be paid a minimally appropriate salary commensurate with the highly prized and difficult-to-find skills that they allegedly possess." *Id.* This provision would be an important component in preventing Type II abuse of the H-1B program.

must disclose whether anyone involved in the hiring process is a relative or friend of the guest worker.[323] The guest worker would then be granted a work visa.

The 3-Year Work Period:

> The guest worker would be permitted to work in the U.S. for up to 3 years after being granted the work visa. He would be permitted to move from employer to employer at any time. However, each new employer would be required to undergo the 1-month job advertisement period described above. If the worker were to leave a given employer, the employer would be required to notify the DOL (via an entry in the database), on penalty of future debarment from the guest worker program.

If the guest worker were to be unemployed for more than 60 consecutive calendar days, his work visa would be canceled immediately, and he would be given 15 days to leave the U.S. Failure to leave within that time period would result in his debarment from guest work for five years.

Employment-Based Green Cards:

> If, at the conclusion of the 3-year work period, the guestworker has never been unemployed for more than 60 consecutive calendar days, he would be deemed to have proven his value to the U.S. economy, and granted a temporary green card. No employer sponsorship would be involved.[324] The temporary green card would be valid while he waits for an immigrant visa under the yearly green card quotas. He would be free to work during this time, and any new employer from this point onward would not go through the job advertisement procedure.

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323. OIG, *supra* note 23, discusses the fact that the H-1B and employment-related green card programs have often been used to bring relatives or friends of the employer or manager to the United States.

324. This idea is borrowed from, though is greatly different from, the proposal made in 2000 by consultant Paul Donnelly, a former staffer for the Congressional Commission on Immigration Reform (CIR). Donnelly's proposal was adopted by IEEE-USA, and endorsed by some prominent industry figures, such as Linux inventor Linus Torvalds, Apple Computer co-founder Steve Wozniak and industry analyst Esther Dyson. *See* Letter from IEEE-USA to Sen. Trent Lott, May 10, 2000, *available at* http://www.ieeeusa.org/forum/POLICY/2000/00may10.html (last visited Jan. 10, 2003).

Hiring Priority for Americans:

> The law would state very explicitly that American workers are to be given strong priority in hiring, and would include the following provision:

> An employer may not fill a position with a guest worker if an American who meets the qualifications is willing to accept an offer in the salary range stated in the database. Qualified American applicants may not be rejected on the grounds that they are "overqualified" or have higher demands for compensation than do foreign applicants.

> Moreover, qualifications for the position may not be specified in undue detail. A specific skill may not be included in the list of qualifications if the worker could become reasonably productive in the use of that skill within a month, via on-the-job learning. Qualifications for an applications programmer job, for example, should not normally include unreasonable demands regarding specific programming languages, operating systems, and so on.

Establishment of a Commission:

> A Commission on Technical Guest Workers would be established within the DOL. The Commission would appoint review committees in each major DOL region, consisting of members from industry, professional and labor groups, and academia.

> Any American who felt he had been wrongly rejected for a position in favor of a guest worker would be able to file a simple, convenient Web-based challenge, citing the information given by the employer about the worker and the position.

If the Commission finds in a challenger's favor, the employer would be required to offer a similar position to the challenger, at a salary to be worked out among the interested parties, including the local review committee. An employer whose hires of guest workers are successfully challenged in a specified number of instances would be debarred from hiring guest workers for a substantial period of time.

As industry lobbyists are fond of pointing out, the DOL has received relatively few complaints over the years. Thus, workload for the Commission should presumably be low, though this could

change once workers update their current "You can't fight City Hall" perception of DOL.

The National Interest Waiver:

> Currently, the National Interest Waiver (NIW) exception to permanent labor certification allows a foreign national of truly exceptional ability to apply for a green card on his own, without employer sponsorship. Under the proposal here, a candidate for a NIW would first need to obtain a work visa as described above. He would then submit an application for a NIW, which would be adjudicated by the Commission on Technical Guest Workers, using the same criteria used in the current NIW program. If this status is granted, the worker would receive a temporary green card as described earlier, and the job would be exempted from the requirement that American applicants must be given priority. Note that even if the Commission declines the worker's application for a NIW, the worker can still obtain a green card via the 3-year process outlined here.

Yearly Cap:

> The normal yearly cap on guest workers would be set at 65,000. The Commission on Technical Guest Workers would have the power to increase that number by 20 percent in a given year if unusually rapid economic expansion warranted it; larger increases would be left to Congress.

Note what is missing from this proposal—bureaucracy and delay. The adjudication of the work visa and green card would be almost completely automated, and should work in "real time." The system would eliminate the need of large firms to maintain special Immigration Departments, and small firms would find that their expenses for legal fees would be reduced to a small fraction of their current level. The DOL would be able to re-assign its army of LCA reviewers to much more productive activities and paperwork for the INS should be reduced as well.

Labor advocates may be alarmed at my elimination of what has up to now been the cornerstone of the H-1B and green card processes—the notion of prevailing wage. But it should be clear from my analysis of loopholes above, as well as from the industry's extremely aggressive history of lobbying Congress and DOL for

favorable laws and their implementation (Part II), that establishing a truly fair and effective prevailing wage determination system would be both technically and politically of very high difficulty.

Instead, the safeguards in this proposal against Type I and Type II wage abuse by employers take on different forms. This proposal guards against Type I savings by eliminating the indentured servitude problem which currently enables those savings. To guard against Type II savings, it includes the provision that the guest worker be paid at least the median for the given profession, a requirement that Table 14 shows would be effective in eliminating much of this kind of abuse of the H-1B program. In addition, the system has recruitment and anti-layoff provisions, makes the entire process transparent to American workers in a timely manner, and establishes the Commission on Technical Guest Workers, which would give them a clear, easy avenue through which they could file complaints.

The proposed requirements that employers recruit American workers and not be allowed to hire H-1Bs if they have laid off Americans are hardly radical. On the contrary, as pointed out earlier,[325] under GATS employers are already required to do so. The Commission's work, as well as maintenance of the database and so on, would be funded by the money saved in DOL and INS bureaucracy due to this new system. Additional funds, if needed, could come from the $1,000 H-1B user fee currently earmarked for training. (As discussed earlier, the training programs are neither necessary nor effective.) Part of the user fee revenue should go toward funding special graduate assistantships for U.S. citizen/permanent resident PhD students, at a stipend level at approximately double the levels common today, in order to reduce usage by U.S. doctoral programs of foreign students as cheap labor.

No single component of this plan would be sufficient to deal with the problems of the current system, and of course even all the components collectively would not be 100 percent fail-safe. However, the system should be quite workable, and should be attractive to sincere employers.

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325. *See supra* text associated with note 26.

VIII. Overall Conclusions

The H-1B program has a long history of abuse by IT employers of all types and sizes. The abuse is largely, but not exclusively, due to the *de facto* indentured servitude of the H-1Bs.

Meanwhile, the industry lobbyists have a long history of manipulating the development of H-1B statutes and regulations in both the legislative and executive branches of the federal government. They have engaged in massive public relations campaigns that claim IT labor shortages of various kinds, claims that have proven to be false. The bottom line is that the industry wants H-1Bs as a source of cheap, compliant workers who will gladly work 14-hour days.

Given the tenacious manner in which the industry has acted to quash needed reforms of the program, an impasse might appear inevitable. Yet on the contrary, many employers will find this proposal appealing because it greatly facilitates their hiring of H-1Bs while adding reasonable safeguards against abuse.